WETLANDS OF THE SWAN COASTAL PLAIN

Volume 7

Waterbird Usage of Wetlands on the Swan Coastal Plain

A W Storey, R M Vervest, G B Pearson and S A Halse

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Preface

The wetlands of the Swan Coastal Plain provide a habitat for many millions of animals and plants. Prior to European settlement the flora and fauna of these wetlands would have been as rich and diverse as the wetlands of Kakadu today. Many of the wetlands that once existed on the Swan Coastal Plain have been filled, drained, mined for peat or clay, or cleared of vegetation. As the urban and rural areas continue to expand and engulf more wetlands, the remaining wetlands become pressured by vegetation clearing, grazing, flooding, organic and metal contamination, nutrient enrichment and groundwater extraction. Clearly, there is a need to establish the extent of the wetland resource and develop strategies for wetland management.

Good management requires detailed information about the groundwater, the plants and the animals that live in these wetlands and the processes that bind them together. Good wetland management requires wetland boundary description, detailed information about surface and groundwater hydrology and the plants and animals that depend on them. Research provides information that enables managers to restore unhealthy wetlands and protect and conserve healthy ones.

Jeff Kite at the Water Authority of Western Australia, and the late Jenny Arnold, Bob Humphries and John Sutton at the Environmental Protection Authority and the Australian Water Resources Advisory Council (now Land and Water Resources Research and Development Corporation) have been instrumental in coordinating and funding five wetland research projects. The first of these projects commenced in 1988 and each project ran for at least 3 years and cost a total of $1.2 million in funding.

Research proposals for these projects were developed by Lloyd Townley and Jeff Turner at CSIRO Division of Water Resources, by Stuart Halse and Jim Lane at the Department of Conservation and Land Management in Woodvale in association with Rodney Vervest and Roger Jaensch of the Royal Australasian Ornithologists Union and Tony Ford at the Water Authority, by Jenny Davis and Arthur McComb at Murdoch University and Ron Rosich at the Water Authority. Other people that have been involved in coordinating these projects are Brian Kavanagh, Charlie Nicholson, Paul Lavery, Roy Stone and Karen Hillman.

Together with information on mapping and classification of wetlands by the V & C Semeniuk Research Group, initiated and coordinated by Alan Hill at the Water Authority, the results of this research form volumes 2 to 7 in this series Wetlands of the Swan Coastal Plain.

In order to encourage use of the information resulting from this research, volume 1 is a synthesis of information on wetlands of the Swan Coastal Plain and a tool for managers of wetlands.

Shirley Balla
May 1993

Wetlands of the Swan Coastal Plain

Volume 1. **Their nature and management.** S A Balla.

Volume 2. **Wetland mapping, classification and evaluation.** A Hill, C Semenuik & V Semenuik.

Volume 3. **Interaction between lakes, wetlands and unconfined aquifers.** L Townley, J Turner, A Barr, M Trefry, K Wright, V Gailitis, C Harris & C Johnston.

Volume 4. **The effects of altered water levels on wetland plants.** R H Froend, R C C Farrell, C F Wilkins, C C Wilson & A J McComb.

Volume 5. **Managing Perth's wetlands to conserve the aquatic fauna.** S A Balla & J A Davis.

Volume 6. **Wetland classification on the basis of water quality and invertebrate community data.** J A Davis, R S Rosich, J S Bradley, J E Growns, L G Schmidt & F Cheal.

Volume 7. **Waterbird usage of wetlands on the Swan Coastal Plain.** A W Storey, R M Vervest, G B Pearson & S A Halse.

Acknowledgments

Collection of waterbird data would not have been possible without the dedicated help of volunteer observers and permission from many landowners to enter properties. Every endeavour has been made to list all observers and we apologise for any omissions. Some volunteers deserve special mention: Sue Kelly and Chris Wilder provided enormous office support for the project and dealt with many aspects of collating, checking and entering data; David James collected a vast amount of data on waterbirds around Jandakot and was responsible for collecting much of the breeding data from this area; Ben Carr assisted Rodney Vervest in the field on numerous occasions and Doug Watkins provided advice and support. Volunteers at the Western Australian RAOU office were always willing to assist with the project.

We would also like to thank: Roger Schulz, Dean Cunningham and Bob Taylor, Chemistry Centre of Western Australia, for analysis of water samples and assistance with measurement of chlorophyll and phaeophytin; Alan Hill and Andrew Del Marco, Water Authority of Western Australia, for wetland mapping and providing data on wetland areas; Lee Belbin, CSIRO, Matthew Williams and Michael Yung, Department of Conservation and Land Management, for statistical advice; David Bishop for assistance measuring wetland parameters and colour-marking ducks; Alan Clarke for preparing figures; Phil Fuller for assistance colour-marking wading birds; and the late Don Munro for organizing the colour-marking program. Shirley Balla, Roger Jaensch and Paul Lavery provided useful comments on a draft of the manuscript and Raelene Hick prepared it for publication.

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Volunteer observers

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Bamford, Michael and Mandy
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Blyth, John and Judy
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Bremner, Mary
Brockman, Norah
Brooker, Michael
Buchanan, Bruce and Anne
Burbidge, Allan
Cake, Martin
Carr, Ben
Clark, Helen
Creed, Kate
Curry, Steve
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Donohoe, Jack
Drakes, Dan
Finch, Barbara
Frederiksen, Helen and Keld
Fremlin, Bryony
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Garton, Martin and Sue
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Hale, Barbara
Halse, Norman and Pat
Hamilton, Neil
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Smith, Rod
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Watkins, Doug
Whackett, Mark
Wilder, Chris
Wilmot, Peter
Wright, Lisa
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1 Summary

(1) The Swan Coastal Plain Wetlands Study (Scopewest) investigated the relationships between environmental characteristics and waterbird use of 251 wetlands on the Swan Coastal Plain around Perth, Western Australia. The types of wetland studied were permanent and seasonal swamps, winter-wet areas, river sections, drains, estuarine lagoons and artificial wetlands. The boundaries of the study area were Lancelin in the north, Bunbury in the south and the Darling Scarp in the east. Movements of ducks and large wading birds were studied by colour-marking birds.

(2) Waterbird surveys were conducted every three months for two years by volunteers organised through the Royal Australasian Ornithologists Union. Officers of the Department of Conservation and Land Management measured environmental conditions at each wetland to quantify wetland conditions. Some variables were measured each survey period, some were measured for one year and others associated with static features of a wetland were measured only once.

(3) Considerable effort was spent evaluating the efficiency and adequacy of Scopewest waterbird surveys. While the number of waterbird species and number of individual birds recorded per survey were similar to results from previous studies on the coastal plain, eight surveys over two years were not enough to produce complete species lists for about half the wetlands studied.

Incomplete species lists are unlikely to have affected the validity of relationships that were inferred between environmental characteristics and waterbird usage of wetlands, however. Sampling effort was even across wetlands and waterbird abundance was taken into account when determining relationships, which reduced the importance of species that rarely occurred.

(4) Seventy-nine species of waterbird were recorded during Scopewest. Abundant species were mostly waterfowl, with cumulative totals of 56 745 Eurasian Coot, 53 552 Grey Teal and 47 515 Pacific Black Duck being counted during the study. Thirty-nine species were recorded breeding. The Black Swan was recorded breeding most frequently (138 breeding attempts), followed by the Eurasian Coot (120) and Pacific Black Duck (112).

(5) The wetlands on the coastal plain that support large numbers of waterbirds and act as drought refuges are well known and Scopewest re-affirmed their importance. Altogether 33 569 waterbirds were recorded at Thomsons Lake, 26 498 at Bibra Lake and 24 559 at Lake Forrestdale. Largest numbers of species were recorded at Lake McLarty (51 species), Thomsons Lake (47) and Lake Forrestdale (43).

Wetlands supporting most breeding species during Scopewest were not all known as important waterbird sites. Twelve species were recorded breeding at Holmes-Balfour Swamp and The Spectacles, 11 species bred at Herdsman Lake, James Swamp and Mary Carroll Park. Some important sites for breeding on the coastal plain probably are still to be identified.

(6) Individual wetlands supporting the most breeding of some common species do not necessarily coincide with the wetland types where most breeding of those species occurs. For example, 86% of Grey Teal and 55% of Pacific Black Duck breeding occurred on winter-wet areas, although the individual wetlands supporting most breeding of Grey Teal were a seasonal wetland, Blyths Lake, and a river section, Riverlea Farm. Individual wetlands supporting most breeding of Pacific Black Duck were a permanent wetland, Lake Claremont, and a seasonal wetland, Lake Joondalup north of the causeway.

(7) Many of the 48 environmental variables measured or derived to characterize wetland conditions were inter-dependent. Nevertheless, for ease of interpretation all were used as a basis for a general classification of wetlands instead of reducing the variables to a series of pseudo-variables. The general classification of wetlands incorporated a very large amount of information about topography, limnology, vegetation and environmental disturbance. Six groups of wetlands were identified. Amount of submerged macrophyte, area, extent of wetland buffer and area of emergent vegetation were strongly correlated with the groupings.

(8) Data on waterbird species and their abundance at each wetland were used to classify wetlands into groups that supported similar waterbird communities. Three groups of wetlands were identified. Group 1 comprised wetlands with low species richness and low waterbird abundance, Group 3 comprised wetlands with high species richness and high waterbird abundance. Group 2 wetlands had intermediate levels of waterbird use.

Environmental variables best correlated with the waterbird groupings of wetlands were ones associated with wetland size, depth, vegetation structure and primary productivity. All were positively correlated with waterbird use.

Waterbird usage of wetlands showed no relationship with the groups produced by the general wetland classification based on environmental variables. Nor did it show a relationship with the pre-defined wetland types used in Scopewest or geomorphic settings used by Semeniuk (1988) to classify wetlands on the Swan Coastal Plain.

(9) The occurrences of individual species of waterbird (using presence/absence data) showed the greatest numbers of associations with area, pH, complexity of vegetation structure, water regime (depth and permanence), width of wading zone and salinity.

(10) With multiple discriminant analysis, environmental variables were used to allocate nearly 90% of Group 1 and 80% of Group 3 wetlands to the correct waterbird-based group but 55% of Group 2 wetlands were incorrectly assigned to Group 1. Multiple linear regression using area, area of reeds and rushes, depth, pH and nitrogen levels explained 57% of species richness in wetlands. Area alone accounted for 44% of species richness.

(11) Colour-marking Pacific Black Duck and large wading birds to render them uniquely identifiable revealed few clear patterns of movement. It appeared that most Pacific Black Duck found in the Perth metropolitan area during summer dispersed into rural areas during

winter to breed. Some Pacific Black Duck remained, and bred, in the metropolitan area, however.

Among large wading birds, Straw-necked Ibis and Great Egret moved greater distances than Yellow-billed Spoonbill. Straw-necked Ibis were seen extensively in rural areas, especially in farm paddocks, and rarely in the metropolitan area.

(12) During the eight surveys of each wetland in Scopewest, detailed data were collected on clutch and brood sizes of waterbirds to measure breeding success of the species that bred frequently. Of the four species for which there were enough data for analysis, Black Swan and Grey Teal had smaller brood sizes at urban than rural wetlands. Black Swan, Grey Teal and Eurasian Coot had smaller broods at permanent wetlands than winter-wet areas. Size of Pacific Black Duck broods did not vary with habitat.

(13) This study was able to make limited recommendations about monitoring. There was reasonable concordance between the environmental variables affecting waterbird and aquatic invertebrate communities (Davis *et al.* 1993). Monitoring depth, vegetation structure, dissolved oxygen, chlorophyll *a*, nutrients and salinity should provide an indication of changes in suitability of wetlands for waterbirds and aquatic invertebrates. The amount of submerged macrophyte and extent of buffer vegetation may be useful indicators of overall wetland conditions when a general monitoring program is undertaken that is not focussed on a particular biological group.

(14) Analyses of the Scopewest dataset identify broad, generalised relationships between waterbirds and wetland characteristics. Additional, more intensive analyses may reveal stronger relationships, particularly for ecologically or taxonomically related sub-groups of waterbirds. Because the relationships identified so far between waterbird usage and wetland characteristics are not tight ones, there are many wetlands that will be exceptions to any general rules formulated. Therefore, wetland management for waterbirds on the Swan Coastal Plain is not yet at the stage of being undertaken according to routine prescriptions. Instead it must be done on a wetland-by-wetland basis, incorporating all available relevant information about waterbird biology and wetland processes.

2 Introduction

2.1 General Introduction

Prior to European settlement the Swan Coastal Plain was extremely rich in wetlands. Over the past 150 years more than 70% of these have been drained, cleared or drastically modified as a result of urbanisation and agriculture (Serventy 1948; Halse 1989), a phenomenon that has occurred around most Australian cities. The remaining wetlands have, therefore, assumed great importance for conservation and recreation.

There are a number of threats to these wetlands. Firstly, because wetlands are usually connected to the water table, groundwater use for public or private supply has the potential to reduce the depth of water in wetlands (Cargeeg *et al.* 1987) and, therefore, affect their ecological functioning. Secondly, wetland loss has occurred and will continue to occur as the Perth urban area expands and wetlands are drained and filled to provide land for housing and amenities. In many instances, as urban development encroaches, vegetation surrounding the wetlands that remain is removed. This presents a third threat. Without 'buffer' vegetation wetlands eventually become degraded (Lane 1991). The organic matter input from surrounding vegetation, which acts as a food source for invertebrates (Briggs and Maher 1983), is lost and there is less habitat for terrestrial wildlife and waterbird nesting (Lane 1991). There is usually an increase in levels of nutrients in the water as a result of fertiliser leaching from surrounding gardens and septic tanks in urban areas and from horticulture and other farming activities in rural areas (Humphries *et al.* 1989).

Constraints must be recognized when planning urban development, water extraction, and activities such as control of nuisance insects (Keeling 1984), because of their effect on the ecological health and conservation value of wetlands. Before constraints can be recognised, however, the conservation values of wetlands must be documented and the effects of changes wrought by development must be identified. It seems that four major biological groups currently determine the conservation value of a wetland: (1) aquatic vertebrates, especially waterbirds, (2) aquatic invertebrates, (3) submerged aquatic macrophytes and algae, and (4) emergent and riparian wetland plants.

Until this and associated projects began, there was no comprehensive study of wetlands on the Swan Coastal Plain that provided an overview of the different types of wetlands in terms of their physical and biological characteristics and their conservation importance. Riggert (1966) classified wetlands of the Swan Coastal Plain in terms of their usage by waterbirds, especially ducks, and waterbirds had been studied at many individual wetlands (Ford 1958; Sedgwick 1973; Morris and Knott 1979; Curry 1981; Hnatiuk 1985, 1987). The importance of large lakes in the metropolitan area of Perth was widely recognized (Jaensch *et al.* 1988). Little was known, however, about usage of small seasonal wetlands, drains, rivers and farm dams, which may be of equal or greater importance for waterbird breeding and feeding. Furthermore, there was no information about the extent to which large summer aggregations of waterbirds on the well-known lakes relied on the availability of other sites in winter and spring.

2.2 Project aims and approach

The Swan Coastal Plain Wetlands Study (Scopewest) was designed to investigate relationships between environmental characteristics and waterbird usage of the different types of wetland occurring on the coastal plain. The aims of the project were:

(1) to document which waterbird species use each type of wetland, in what sort of numbers and at what time of the year

(2) to identify the characteristics (e.g. vegetation structure, water quality) that make a wetland a good or poor example of its type in terms of waterbird usage

(3) to predict the effect of changes in a wetland, particularly with regard to water depth, on its use by and value for waterbirds

(4) to determine the extent of movement between different types of wetlands during the year as birds undertake different activities in their annual cycle

(5) to provide a catalogue of the environmental characteristics of a large number of wetlands

(6) to highlight specific wetlands or areas of wetlands that are important for waterbirds or because of other physical or biological features.

The study involved regular surveys of waterbirds at different types of wetlands over two years by a large group of volunteers, who were coordinated by an officer of the Royal Australasian Ornithologists Union (RAOU). Officers of the Department of Conservation and Land Management (CALM) simultaneously collected data on environmental characteristics of the wetlands and colour-marked waterbirds to study their movements.

2.3 Study sites

A total of 255 wetlands between Lancelin and Bunbury on the Swan Coastal Plain, west of the Darling Scarp, were selected for monitoring. Some wetlands were on the Dandaragan Plateau. Locations of study sites are shown in Figure 2.1 and described in Appendix 1. The wetlands were initially classified into seven pre-defined types that were easily recognised in the field. It was envisaged that this classification would be useful for the management of waterbird communities on wetlands on the Swan Coastal Plain if differences in waterbird use of the seven types could be demonstrated. The types were:

(1) artificial wetlands (A, *N*=22)
(2) drains (D, *N*=19)
(3) estuarine lagoons (E, *N*=16)
(4) permanently inundated wetlands (P, *N*=41)
(5) river sections (R, *N*=33)
(6) seasonally inundated wetlands (S, *N*=76)
(7) seasonally waterlogged winter-wet areas (W, *N*=48).

Artificial wetlands included all man-made wetlands, such as permanent wetlands in the metropolitan area constructed for recreational/aesthetic purposes, farm dams constructed for watering stock, wetlands rehabilitated from mining activities (Plate 1) and some extensively modified wetlands (Plate 2). Drains mostly occurred in agricultural areas and typically were straight channels, with steep banks and little emergent and no riparian vegetation (Plate 3). Estuarine lagoons were shallow pools, mostly located on the margins of the three major estuaries in the study area: Swan/Canning, Peel/Harvey and Leschenault. The lagoons were usually tidal, with samphire as a dominant vegetation cover (Plates 4 and 5). Permanent wetlands had a history of containing water all year around, except in exceptionally dry years. These wetlands had varying amounts of emergent vegetation around the edges but usually had a high proportion of open water (Plate 6). River sections consisted of approximately 1 km stretches of relatively large, slow-flowing rivers. They were generally deep, with varying amounts of vegetation along the edge (Plate 7). Seasonal wetlands usually contained water for most of the year. They varied in size but generally had extensive cover of emergent vegetation (Plates 8 and 9). Winter-wet areas were usually on agricultural land, were highly modified and contained shallow water from mid-winter to late spring or occasionally early summer in wet years. They were usually devoid of emergent vegetation and were characterised by a cover of grasses with a few isolated *Melaleuca* trees (Plate 10).

2.4 Related research

When Scopewest was designed there was no published study examining relationships between waterbird use and environmental characteristics of such a large number of wetlands and wetland types. No study had been specifically designed to examine the effects of urbanisation and groundwater extraction on regional waterbird populations although Crome (1986, 1988) had studied the effect of water levels on breeding in New South Wales.

Several Australian studies had attempted to relate physiognomic classifications of wetlands to waterbird usage (e.g. Riggert 1966; Cowling 1977; Corrick 1981) but these were not intended to explain habitat preferences and had very limited predictive value. Overseas studies at the community level also had limited value (e.g. Sillen and Solbreck 1977). Recently Fjeldså (1985) attempted a reverse analysis on Australian waterbirds, firstly identifying suites of birds that occurred together and then examining the kinds of habitats the suites occupied. However, Fjeldså's analysis seemed to produce information that was too generalised to be useful for management. The most useful relationships between waterbird use and wetland characteristics have come from studies of single species (e.g. Swanson *et al.* 1984; McAuley and Longcore 1988) where detailed habitat and behavioural data were collected.

Since Scopewest began five studies examining relationships between waterbird use and environmental characteristics of a large number of wetlands have been published. Gibbs *et al.*

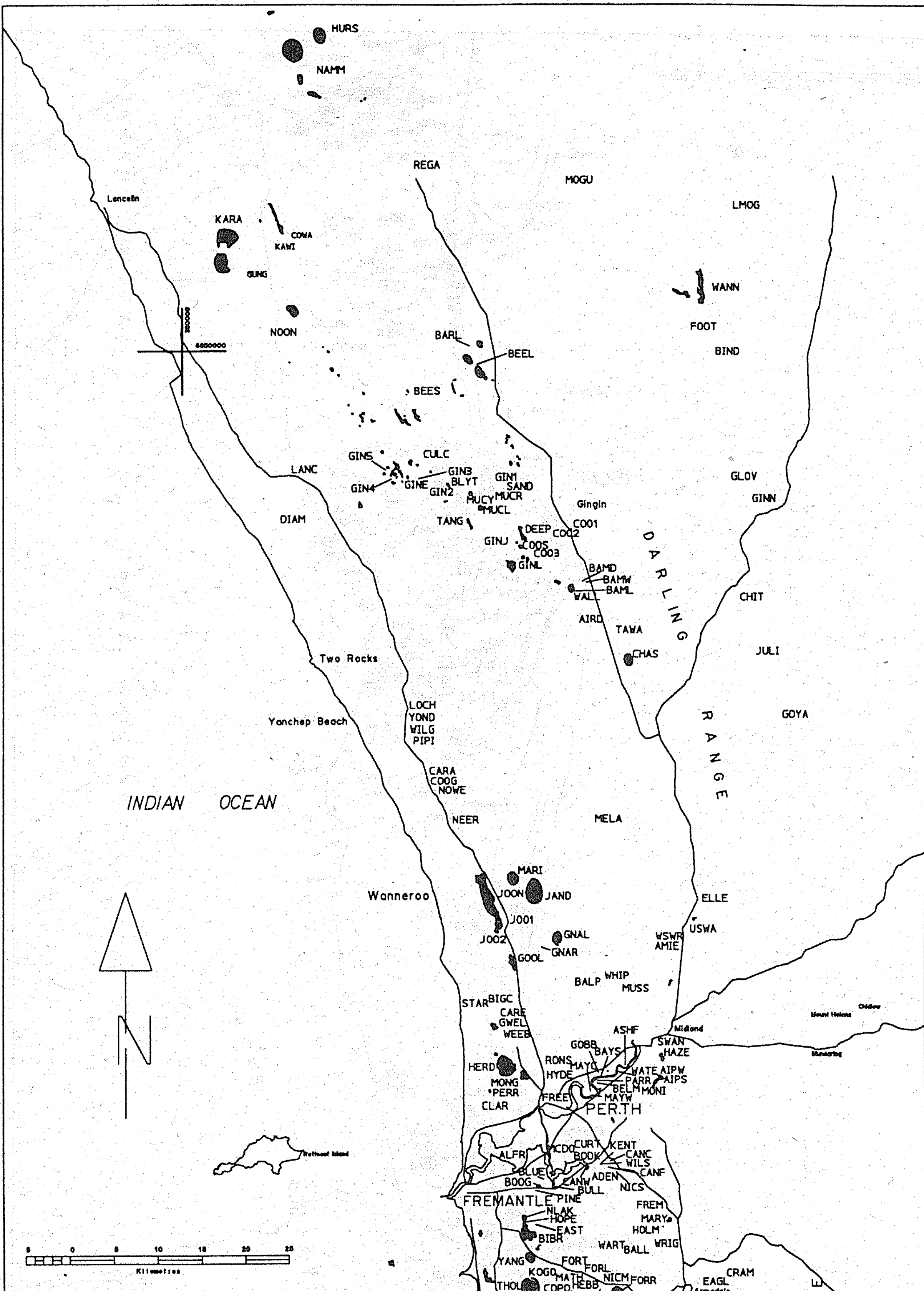


Figure 2.1 Location of study sites. A, northern Swan Coastal Plain; B, southern Swan Coastal Plain.

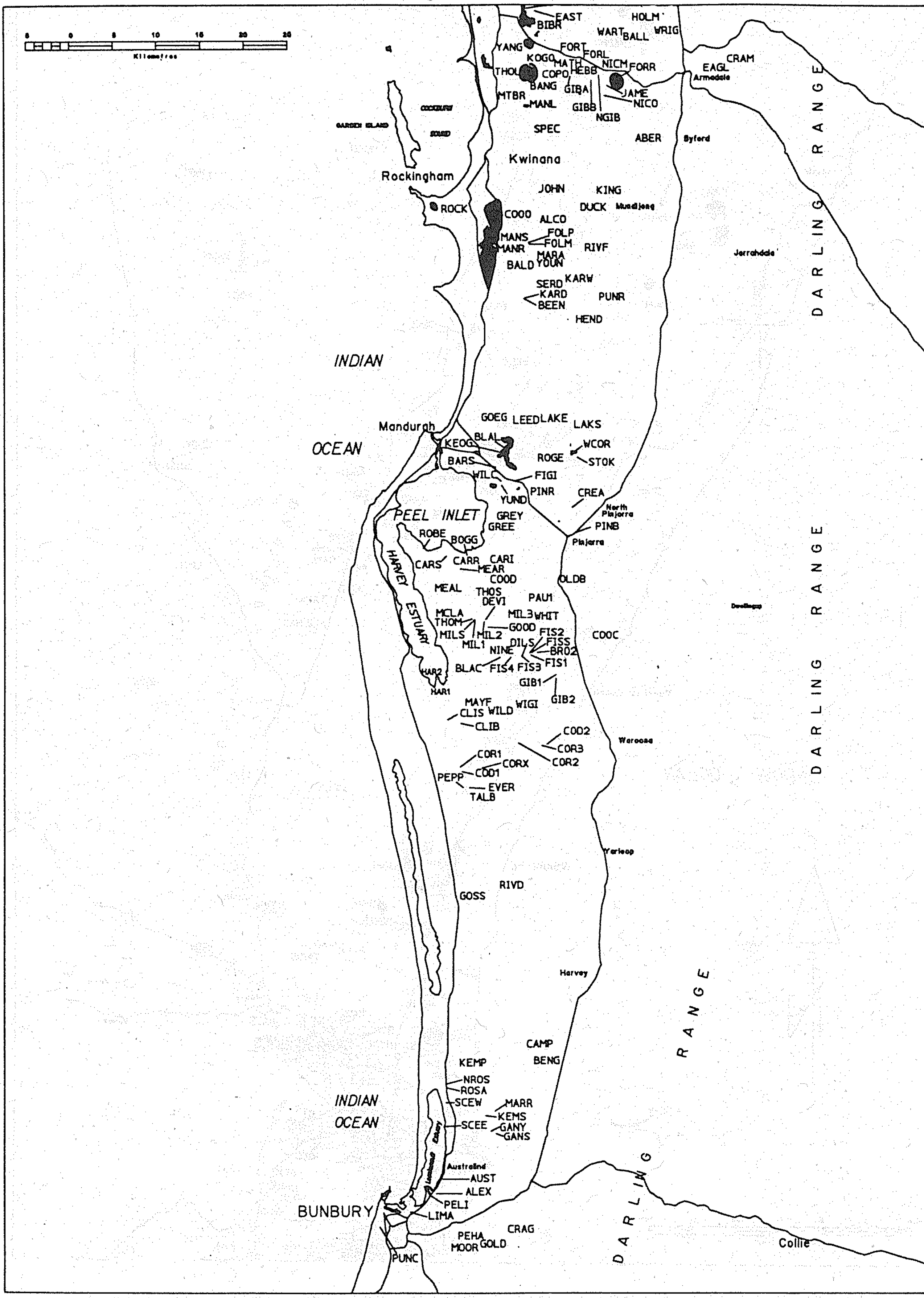


Figure 2.1 contd.

(1991) surveyed 87 palustrine and lacustrine wetlands for non-game species of waterbird over an eight year period (1977-1985). Waterbird use of the wetlands was examined in relation to 20 habitat features and wetland area, inter-wetland distance, emergent vegetation cover and pH were shown to influence waterbirds. From these data Gibbs *et al.* (1991) constructed predictive models of habitat selection for 15 species of waterbird using regression analysis.

Higgins *et al.* (1992) studied waterfowl production over a 17 year period at 548 wetland basins in south-central North Dakota. They observed that (1) a positive linear relation existed between the estimated number of duck pairs and the percentage of basins with water in spring, (2) predation was significantly reduced by good vegetation cover at nest sites, and (3) all species used a complex of sizes and classes of wetlands for space, food, and shelter necessary for nesting and raising broods.

Habitat preference of Teal *Anas crecca* in France was modelled by Genard and Lescourret (1992) using discriminant barycentric analysis. Using 20 independent habitat variables and presence/absence data for Teal at a range of sites, they reported Teal to prefer vast open spaces dominated by gorse and shallow, slightly salty stretches of water with gently sloping banks.

Goodsell (1990) investigated the occurrence of waterbird broods in relation to wetland salinity and pH at 67 wetlands in south-western Australia, using data collected by the RAOU between 1981-1985. He reported that 90% of all records of brood use were for waters with salinities $<15.3g\ L^{-1}$, but the most successful species were those whose broods could use saline waters. Using the same data set as Goodsell (1990), Halse and Ward (1987) and Halse *et al.* (1993) examined presence/absence of 61 waterbird species on 95 wetlands in relation to wetland characteristics in south-western Australia. More species preferred brackish waters than fresh or saline wetlands, and very few species occurred in hypersaline conditions. Vegetation life-form and water depth were the next most influential characteristics after salinity.

There have been several studies over the past 40 years in which Australian waterbirds have been banded (e.g. Carrick 1962; Frith 1962, 1963; Norman 1973; Maddock 1989). With the exception of Maddock (1989), the studies were primarily concerned with hunting or long-distance movement. There has been no large-scale colour-marking programme to study the way in which different types of wetlands within a region are used during the year by individual birds.

2.5 Current research on Swan Coastal Plain wetlands

Scopewest complements four other projects that investigated aspects of the ecology and hydrology of Swan Coastal Plain wetlands.

(1) Drs J.A. Davis, R.S. Rosich and J.S. Bradley examined the invertebrate fauna of 40 wetlands on the Swan Coastal Plain in a project entitled "Wetland Classification on the Basis of Water Quality and Invertebrate Community Data" (Davis *et al.* 1993). The aim was to construct a system for ranking wetlands in terms of their aquatic invertebrates and design management strategies to maximize the value of wetlands for invertebrates. The wetlands studied were included in Scopewest (see Appendix 1).

(2) In a project entitled "Managing Wetlands to Conserve the Aquatic Invertebrates", Dr J.A. Davis and S.A. Balla studied life histories of some aquatic invertebrate fauna in relation to hydrological regimes, fish abundance and nutrient enrichment (Balla and Davis 1993).

(3) In a project entitled "Effects of Altered Water Levels on Wetland Plants", Prof. A.J. McComb and Dr R.H. Froend examined the effect of changes in water levels on emergent wetland plant communities through laboratory investigations and studies of a small number of field sites.

(4) In a project entitled "Interactions Between Lakes, Wetlands and Unconfined Aquifers", Drs L.R. Townley and J.V. Turner investigated nutrient input and groundwater flow through coastal plain lakes (Townley *et al.* 1993).

The projects should provide a better understanding of the kinds of conservation values that different wetlands possess, their tolerance of disturbance and the extent of management required in both the wetland and its catchment to maintain conservation values. An additional benefit has been the gathering of information about the importance of particular wetlands or groups of wetlands.

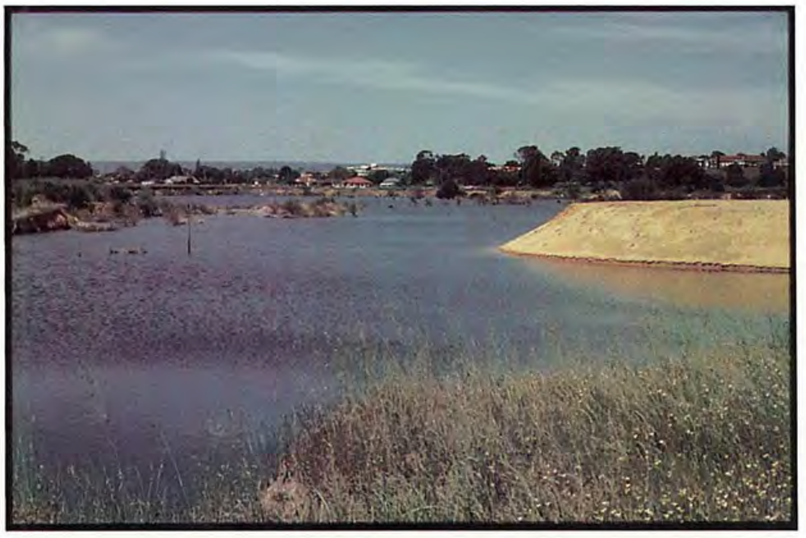


Plate 1. Maylands claypit
October 1991

Plate 2. Hyde Park Lake
October 1991

Plate 3. Abernethy Road drain
October 1991

Plate 4. Scenic Road estuarine lagoon August 1988

Plate 5. Boggy Bay estuarine lagoon October 1991

Plate 6. Lake Bambun August 1988

Plate 7. Harvey River October 1988

Plate 8. Keogh Swamp
April 1991

Plate 9. Keogh Swamp
July 1991

Plate 10. Williamson/Gibbons Road
winter-wet October 1991

3 Waterbird Usage of Swan Coastal Plain Wetlands

3.1 Introduction

Wetlands of the Swan Coastal Plain support all 116 species of waterbird known to occur in south-western Australia (Storr and Johnstone 1988; Storr 1991; RAOU unpubl. data). Ducks, swans and coots, collectively known as waterfowl, are numerically dominant. Approximately 300 000 of them, or one-fifth of the waterfowl in south-western Australia, occur on the Swan Coastal Plain (Halse *et al.* 1990, 1992a, unpubl. data). Although waterfowl are the most abundant group, approximately 30 000 migratory Palaearctic shorebirds occur at coastal plain wetlands during the summer months (J.A.K. Lane unpubl. data; Jaensch 1988), boosting the resident populations of endemic shorebirds and migratory species that over-wintered from the previous migration.

The coastal plain contains a range of wetland types that provide year-round habitat for many species. Nevertheless, the large numbers of birds on some wetlands in summer make it likely that there is regular summer movement of waterbirds onto the coastal plain. Gentilli and Bekle (1983) have described coastwards movement of Grey Teal and migration between the coastal plain and other areas has been inferred for species such as the Clamorous Reed-Warbler (Blakers *et al.* 1984).

As well as providing habitat for feeding, moulting and drought-refuge, coastal plain wetlands play an important role in breeding of waterbirds. Most of the wetlands in south-western Australia known to be used for nesting by colonial waterbirds are located on the coastal plain. During surveys in south-western Australia between 1986-88, nine of the 10 active colonies of the Great Egret occurred there (Jaensch and Vervest 1989). Fifty to sixty per cent of all breeding records collected during annual waterfowl counts in south-western Australia came from regions encompassing the Swan Coastal Plain (Halse *et al.* 1990, 1992a), which is far in excess of the proportion of waterfowl occurring there.

3.2 Methods

3.2.1 Use of volunteer observers

Waterbird counts were organised by the RAOU. R.M. Vervest allocated wetlands to volunteer observers, ensured all wetlands were counted in each survey period and collated the bird counts. A total of 98 regular observers monitored the 255 wetlands, although 120 individuals were involved in stages of the project. Most observers recruited for the coastal plain study had 5-10 years experience collecting data on waterbirds. To maintain observer competence and enthusiasm for the project, Mr Vervest corresponded regularly with observers and arranged special excursions and meetings.

3.2.2 Wetland surveys

Observers were allocated a wetland or group of wetlands for the duration of the project. Wetlands that were likely to be difficult or in outlying parts of the study area were allocated to more experienced observers or were surveyed by Mr Vervest. After visiting their wetland(s), observers sent maps showing access and survey route to the RAOU Office. Surveys were conducted in April, July, October and January of two 'years', starting in April 1990 and finishing in January 1992, which resulted in eight survey periods.

Field Record Booklets were issued to all observers. The booklets contained instructions for conducting surveys and completing data sheets, a list of waterbirds known to occur in south-western Australia and illustrations to help to determine age of young waterbirds. Survey methods followed those outlined by Jaensch (1984): each survey of a wetland, observers counted the total number of fully fledged birds of each species. A breeding attempt by a species at a wetland was recorded if either clutches of eggs in active nests or broods of young were seen. Observers were given the option of recording further breeding data in a special section on the back of the data sheet, which was divided into categories whereby observers could record number of eggs in a clutch, whether eggs were being incubated or had hatched, number of young in a brood and their age.

3.2.3 Data analysis

Wetlands and waterbird species were ranked on a range of criteria to identify the most abundant species and most important wetlands for waterbirds. Analysis of variance was used to

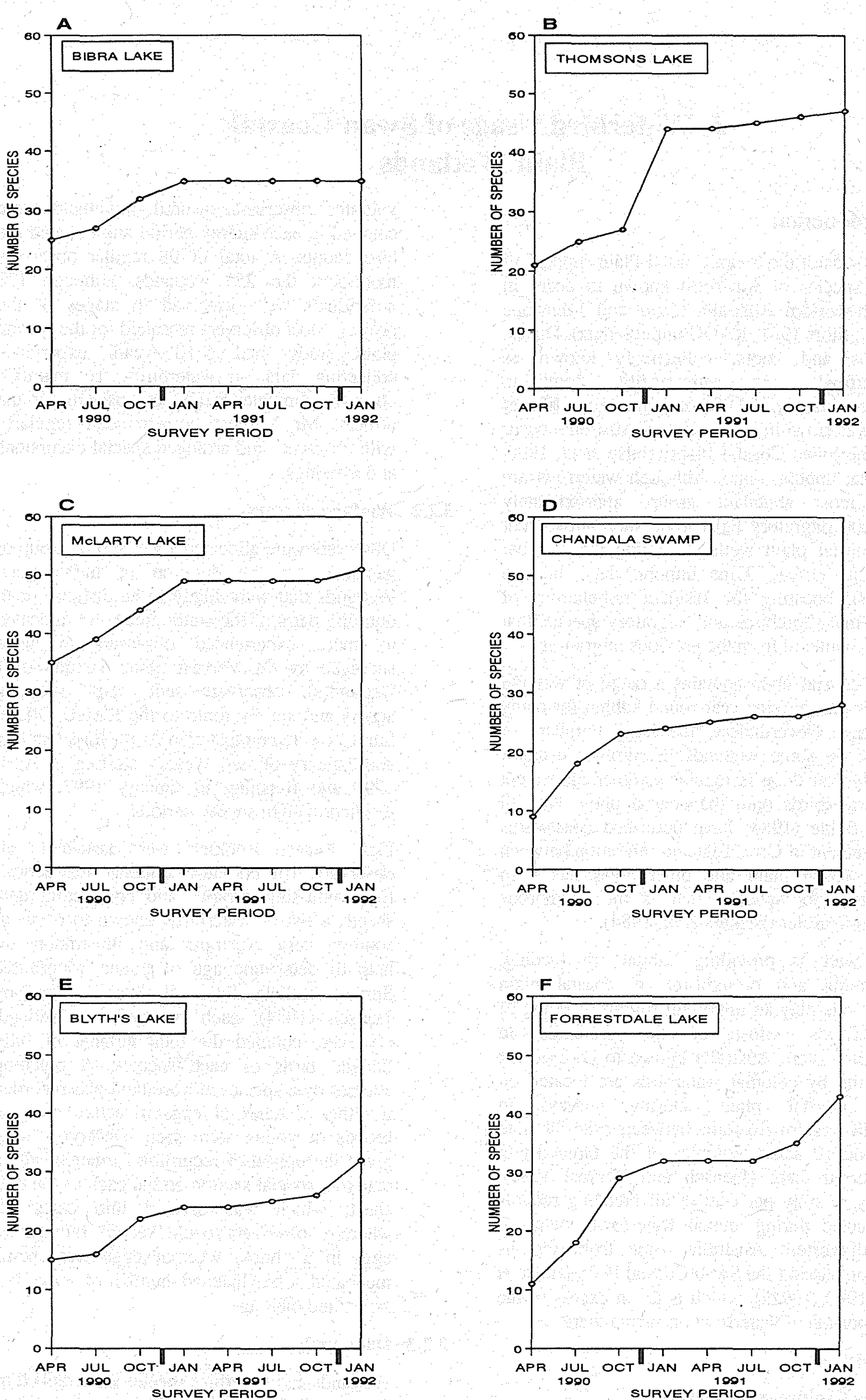


Figure 3.1 Cumulative number of waterbird species recorded each survey period at selected wetlands on the Swan Coastal Plain 1990-92

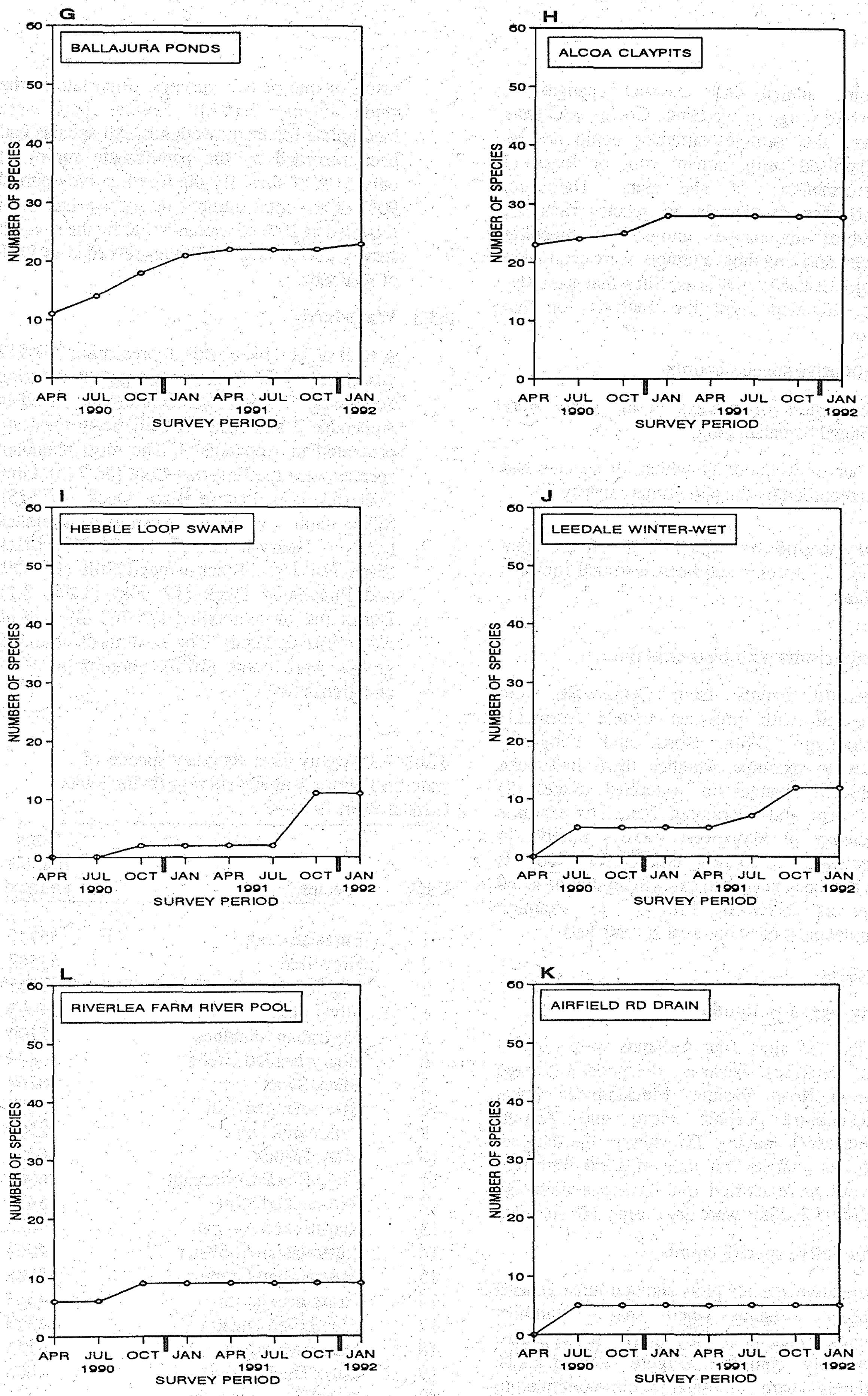


Figure 3.1 contd

examine annual and seasonal changes in waterbird usage of wetlands. Cochrans C tests showed that sample variances could not be standardised using square root or log(x+1) transformations of the data. Therefore, significance of changes in species richness, waterbird abundance, number of breeding species and breeding attempts were examined using Kruskal-Wallis tests. Sites that were dry were excluded from the analysis for that survey.

3.2.4 Cumulative species counts

Completeness of surveys in the study were examined by calculating:

(1) number of wetlands at which all species had been recorded by the penultimate survey

(2) survey period by which 90% of the total number of species had been recorded for each wetland.

3.2.5 Comparisons with historical data

Waterbird counts from Scopewest were compared with previous counts from (1) Cooloongup, Bibra, North and Yangebup Lakes to examine whether there had been long-term changes in waterbird usage, (2) Herdsman and Claremont Lakes to examine efficiency of Scopewest surveys relative to other waterbird surveys, and (3) five wetlands that had been surveyed extensively by the same observers between 1981-88 to examine completeness of Scopewest species lists.

3.3 Results

3.3.1 Coverage of wetlands

Of the 255 sites, four wetlands were omitted from analyses because of poor coverage (Mason Road Swamp, Muckenburra Lake, Muckenburra Yabbie Farm and Airport Winter-wet), leaving 251 sites in the data set that was analysed. A total of 1966 waterbird surveys were carried out, giving a coverage rate of 98%. Sites were dry during 346 surveys.

3.3.2 Cumulative species counts

Cumulative species plots showed three general patterns: wetlands where species numbers reached a plateau and the species list appeared reasonably complete (Figure 3.1a,c,g,h,k,l), wetlands where additional species continued to be recorded (Figure 3.1d,e,f) and wetlands where species numbers increased abruptly as a result of one or two surveys, often late in the study (Figure 3.1b,i,j). Species lists were incomplete for many wetlands. All species had been recorded by the penultimate survey at only 51% of sites. By the fourth survey period 90% of the total number of species had been recorded at 20% of wetlands and by the seventh survey period 90% had been recorded at 78% of wetlands.

3.3.3 Waterbirds

A total of 11 414 records, representing 357 912 waterbirds of 79 species, were gathered during Scopewest. The species recorded are listed in Appendix 2 and data on their occurrence are presented in Appendix 3. The most abundant species were the Eurasian Coot (56 745), Grey Teal (53 552), Pacific Black Duck (47 515), Silver Gull (31 993), Australian Shelduck (22 106), Hoary-headed Grebe (16 848), Black Swan (16 169), Black-winged Stilt (13 659) and Pink-eared Duck (12 508) (Table 3.1). Ducks and swans totalled 175 762 (49% of all waterbirds counted). The next most abundant groups were coots (16%), shorebirds (10%) and grebes (6%).

Table 3.1 Twenty most abundant species of waterbird during wetland surveys on the Swan Coastal Plain 1990-92

Rank	Species	Total number counted
1	Eurasian Coot	56745
2	Grey Teal	53552
3	Pacific Black Duck	47515
4	Silver Gull	31993
5	Australian Shelduck	22106
6	Hoary-headed Grebe	16848
7	Black Swan	16169
8	Black-winged Stilt	13659
9	Pink-eared Duck	12508
10	Maned Duck	6457
11	Little Black Cormorant	6007
12	Red-necked Stint	5475
13	Red-necked Avocet	5422
14	Australasian Shoveler	4967
15	Australasian Grebe	4888
16	Straw-necked Ibis	4565
17	Blue-billed Duck	4319
18	Dusky Moorhen	4155
19	Musk Duck	4000
20	Little Pied Cormorant	3721

Table 3.2 Twenty waterbird species occurring in highest numbers during one survey period on the Swan Coastal Plain 1990-92

Rank	Species	Maximum number	Survey period
1	Grey Teal	17817	Jan 92
2	Eurasian Coot	16055	Jan 92
3	Pacific Black Duck	9371	Jan 92
4	Silver Gull	7082	Jan 91
5	Australian Shelduck	6046	Oct 91
6	Hoary-headed Grebe	5126	Jan 92
7	Black-winged Stilt	4494	Jan 91
8	Pink-eared Duck	4226	Jan 92
9	Black Swan	3406	Jan 92
10	Red-necked Stint	3240	Jan 91
11	Red-necked Avocet	2745	Jan 91
12	Sharp-tailed Sandpiper	1749	Jan 91
13	Australasian Shoveler	1749	Jan 92
14	Curlew Sandpiper	1599	Jan 91
15	Maned Duck	1422	Jan 91
16	Little Black Cormorant	1313	Jul 91
17	Blue-billed Duck	1071	Jul 90
18	Hardhead	1032	Jan 92
19	Australasian Grebe	973	Jan 91
20	Straw-necked Ibis	911	Jul 90

Table 3.3 Twenty most frequently occurring species of waterbird during wetland surveys on the Swan Coastal Plain 1990-92

Rank	Species	Percentage occurrence
1	Pacific Black Duck	70
2	Grey Teal	46
3	White-faced Heron	44
4	Eurasian Coot	41
5	Australian Shelduck	33
6	Little Pied Cormorant	33
7	Australasian Grebe	31
8	Black Swan	31
9	Maned Duck	25
10	Australian White Ibis	21
11	Musk Duck	21
12	Purple Swamphen	21
13	Great Egret	18
14	Little Black Cormorant	17
15	Dusky Moorhen	17
16	Yellow-billed Spoonbill	15
17	Black-winged Stilt	15
18	Australasian Shoveler	15
19	Hardhead	15
20	Black-fronted Plover	14

The highest count of a species in a single survey period was for Grey Teal with 17 817 individuals in January 1992 (Table 3.2). Other high counts were Eurasian Coot (16 055) and Pacific Black Duck (9371) in January 1992, Silver Gull (7082) in January 1991, and Australian Shelduck (6046) in October 1991. The most frequently occurring species were the Pacific Black Duck (70% of surveys where water present), Grey Teal (46%), White-faced Heron (44%), Eurasian Coot (41%) and Australian Shelduck (33%) (Table 3.3).

A total of 2631 clutches and broods of 39 species of waterbirds were recorded during Scopewest (Appendix 4). The species recorded breeding most frequently were the Black Swan with 138 breeding attempts, Eurasian Coot (120), Pacific Black Duck (112), Australasian Grebe (58), Grey Teal (58), Dusky Moorhen (45), Purple Swamphen (39) and Australian Shelduck (30) (Table 3.4). Ducks and swans dominated breeding attempts with 455 (54%) of all records.

3.3.4 Wetlands

Data on mean number of each species at each wetland during Scopewest are listed in Appendix 3. The highest cumulative total of waterbirds was recorded at Thomsons Lake (33 569), followed by Bibra Lake (26 498), Lake Forrestdale (24 559), Lake Monger (17 909) and Lake Wannamal (17 189) (Table 3.5). Some wetlands consistently supported high numbers of waterbirds (Table 3.6). For example, Thomsons Lake held 18 472 individuals in January 1991, 6763 in January 1992 and 3422 in April 1990. Lake Forrestdale, Lake Wannamal, Bibra Lake, Lake Monger and Lake McLarty also contained high numbers of waterbirds consistently.

Fifty-one species occurred at Lake McLarty during Scopewest, which represented 65% of all species recorded. Other species-rich wetlands were Thomsons Lake (47), Lake Forrestdale (43), Alfred Cove (41) and Herdsman Lake (40) (Table 3.7). Herdsman Lake contained the highest mean number of species per survey (27.8). Lake McLarty (26.1), Bibra Lake (23.5), Thomsons Lake (23.0), Kogolup Lake (21.1) and Alfred Cove (20.3) regularly supported high numbers of species (Table 3.8). All these wetlands either held water for the duration of Scopewest or were dry on only one occasion.

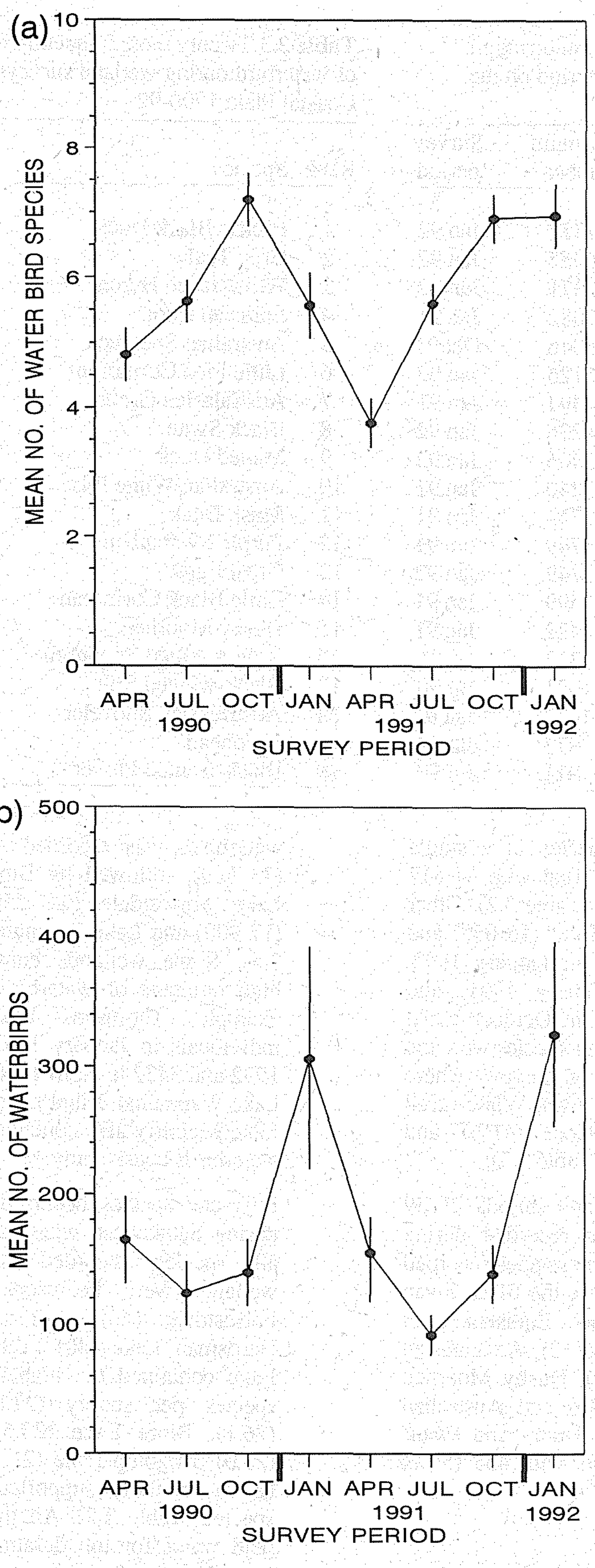


Figure 3.2 Number of waterbird species and number of birds recorded each survey period at wetlands on the Swan Coastal Plain 1990-92 (mean ± S.E.)

Table 3.4 Number of breeding attempts and number of survey periods in which breeding was recorded for waterbird species on the Swan Coastal Plain 1990-92

Species	No. of breeding attempts	Number of survey periods
Black Swan	138	7
Eurasian Coot	120	5
Pacific Black Duck	112	6
Australasian Grebe	58	6
Grey Teal	58	4
Dusky Moorhen	45	5
Purple Swamphen	39	5
Australian Shelduck	30	5
Maned Duck	29	5
Musk Duck	24	5
Little Pied Cormorant	23	4
Pink-eared Duck	21	5
Blue-billed Duck	16	5
Darter	15	5
Hardhead	15	4
White-faced Heron	14	4
Hoary-headed Grebe	11	4
Yellow-billed Spoonbill	10	4
Little Black Cormorant	8	5
Great Cormorant	7	5
Black-winged Stilt	6	3
Exotic Duck	6	4
Black-tailed Native-hen	5	2
Clamorous Reed-Warbler	5	3
Great Crested Grebe	5	3
Freckled Duck	4	2
Great Egret	4	3
Rufous Night Heron	4	2
Australian White Ibis	4	2
Banded Lapwing	2	2
Buff-banded Rail	2	2
Black-fronted Plover	2	2
Red-capped Plover	2	2
Australasian Shoveler	2	1
Little Grassbird	1	1
Little Bittern	1	1
Red-kneed Dotterel	1	1
Straw-necked Ibis	1	1
Spotless Crake	1	1

Breeding was recorded in 170 (68%) of the wetlands surveyed. Holmes-Balfour Swamp and The Spectacles each supported 12 breeding species (Table 3.9). Other wetlands supporting high numbers of breeding species were Herdsman Lake (11), James Swamp (11), Mary Carroll Park (11), Lake Claremont (10), Copolup Lake (10), Perry Lakes (10) and Warton-Wright Swamp (10). Gibb Road Swamp, Nicholson-Oxley Swamp and Lake Monger each supported nine breeding species, while eight species were recorded at Airport Swamp, Big Carine Swamp, Blyth's Lake and Bibra Lake. All these wetlands, except Blyth's Lake which is near Gingin, were in the Perth metropolitan area.

Total number of clutches and broods at each wetland studied are listed in Appendix 4. Carraburmup Swamp (504) and Booragoon Swamp (270) supported the highest numbers of clutches and broods (Table 3.10). These numbers reflect the presence of large colonies of breeding cormorants. Other wetlands with high numbers of clutches and broods were Herdsman Lake (88), Lake Monger (85), Keogh Swamp (82) and Lake Chittering (61).

3.3.5 Seasonal changes in waterbird numbers

There was no difference between years in species richness (P=0.69) or waterbird abundance (P=0.58) in the surveyed wetlands. Analysis on years combined showed seasonal differences in species richness (P<0.0001) and waterbird abundance (P<0.0001). Largest numbers of species and highest waterbird abundances were recorded in summer (Figure 3.2).

There was no difference between years in numbers of species breeding (P=0.22) or numbers of clutches and broods (P=0.21) in wetlands. Analysis on years combined showed seasonal differences in numbers of species breeding (P<0.0001) and numbers of clutches and broods (P<0.0001). Spring was the most important season for breeding (Figure 3.3). The high variance associated with numbers of clutches and broods in July 1991 was a result of 502 cormorant nests found at Carraburmup Swamp. There were more species breeding and more breeding attempts in January 1992, reflecting higher rainfall the preceding spring, than in January 1991.

3.3.6 Threatened species

Two species of waterbird listed under the Wildlife Conservation Act (1950, amended 1990) as "fauna that is likely to become extinct, or is rare" were recorded during Scopewest. They were the Australasian Bittern, which was recorded in January 1991 at Thomsons Lake and the Freckled Duck, which was recorded on 13 occasions and bred at Lake Chandala, Gibb

Table 3.5 Twenty wetlands supporting highest numbers of waterbirds during wetland surveys on the Swan Coastal Plain 1990-92

Rank	Wetland	Total number
1	Thomsons Lake	33569
2	Bibra Lake	26498
3	Lake Forrestdale	24559
4	Lake Monger	17909
5	Lake Wannamal	17189
6	Lake McLarty	16187
7	Herdsman Lake	11631
8	Hurstview Lake	10735
9	Namming Lake	8984
10	Alfred Cove	8343
11	Lake Cooloongup	8242
12	Black Lakes	7826
13	Perry Lakes	6939
14	Lake Claremont	6775
15	Lake Chittering	6358
16	Barrett-Lennard Lake	5294
17	Kogolup Lake	5126
18	Lake Bambun	4875
19	Lake Yangebup	4809
20	Emu-Ballajura Ponds	4058

Table 3.6 Nine wetlands supporting the 20 highest counts of waterbirds during one survey period on the Swan Coastal Plain 1990-92

Rank	Wetland	Maximum number	Survey period
1	Thomsons Lake	18472	Jan 91
2	Lake Wannamal	10347	Jan 92
3	Lake Forrestdale	10153	Jan 92
4	Bibra Lake	7598	Apr 91
5	Thomsons Lake	6763	Jan 92
6	Bibra Lake	5091	Apr 90
7	Lake Monger	4584	Jan 92
8	Lake Forrestdale	4243	Jul 90
9	Lake McLarty	3986	Apr 90
10	Lake Claremont	3758	Jan 91
11	Lake Forrestdale	3737	Jan 90
12	Lake McLarty	3625	Oct 90
13	Lake Forrestdale	3476	Oct 90
14	Lake Cooloongup	3449	Jan 91
15	Thomsons Lake	3422	Apr 90
16	Lake Wannamal	3247	Jan 91
17	Lake Monger	3216	Jan 91
18	Namming Lake	3097	Jan 92
19	Lake McLarty	3043	Oct 91
20	Lake McLarty	2967	Jan 92

Road Swamp and Holmes-Balfour Swamp in October 1991.

3.3.7 Species protected by international treaties

Twenty-two species of waterbird listed on international treaties with Japan and China (Appendix 2) were recorded during Scopewest. The majority were migratory shorebirds but records included three egrets (Cattle, Eastern Reef and Great Egret), the Caspian Tern, the Glossy Ibis and the White-Bellied Sea-Eagle.

3.3.8 Comparisons with historical data

The Swan River provided a focus for early observations of birds and, since John Gilbert's pioneering work as Gould's collector, a number of works have been published on the avifauna of the Swan River District (Alexander 1921; Serventy 1938, 1948; Sedgwick 1944). The Swan River District was a term used to refer to all the northern, metropolitan and part of the southern Swan Coastal Plain, extending from Gingin Brook to Peel Inlet and from the Darling Ranges to the offshore islands.

Most of the early documentation of waterbirds and wetlands is presented in annotated lists and few observers conducted systematic counts, making it difficult with most species to determine whether there have been changes in abundance. Nevertheless, it is clear that the Black Bittern and Australasian Bittern have declined. Both species were common last century and Serventy (1948) regarded them as moderately common in the 1930s and 1940s, with Australasian Bitterns being seen occasionally at Shenton Park Lake. Since then, both bitterns have been listed as rare in southwestern Australia (Wildlife Conservation Act 1950, amended 1990).

Data from two sets of systematic counts are compared below with data collected during Scopewest.

Lake Cooloongup

Sedgwick (1940) observed 30 species of waterbird at Lake Cooloongup (then called White Lake) between 1937 and 1940 (Table 3.11). By comparison, 21 species were recorded in the present study, eight of which were shorebirds. Seven additional species were recorded by the RAOU between 1981 and 1988 (Jaensch *et al.* 1988; RAOU unpubl. data), bringing the number of species recorded during the last decade to 28.

Table 3.7 Twenty wetlands supporting highest numbers of species during wetland surveys on the Swan Coastal Plain 1990-92

Rank	Wetland	No. of species
1	Lake McLarty	51
2	Thomsons Lake	47
3	Lake Forrestdale	43
4	Alfred Cove	41
5	Herdsman Lake	40
7	Hurstview Lake	39
7	Kogolup Lake	39
7	Lake Mealup	39
9	Barrett-Lennard Lake	37
10	Lake Yangebup	36
11	Bibra Lake	35
12	Joondalup South of Causeway	34
12	Namming Lake	34
14	Belmont Claypits	33
14	Joondalup North of Causeway	33
14	Lake Monger	33
14	Nicholson-Oxley Rd Winter-wet	33
14	The Spectacles	33
19	Blyths Lake	32
20	Lake Chittering	30

Table 3.8 Twenty wetlands with highest numbers of species per survey during wetland surveys on the Swan Coastal Plain 1990-92

Rank	Wetland	Mean no. of species
1	Herdsman Lake	27.9
2	Lake McLarty	26.1
3	Bibra Lake	23.5
4	Thomsons Lake	23.0
5	Kogolup Lake	21.1
6	Alfred Cove	20.4
7	Lake Mealup	19.9
8	Lake Chittering	19.7
9	Alcoa Pond	19.6
10	Hurstview Lake	19.4
11	Lake Monger	19.2
12	Namming Lake	19.1
13	Lake Forrestdale	17.9
14	The Spectacles	16.8
15	Mary Carroll Park	16.2
16	North Lake	16.1
17	Lake Yangebup	16.1
18	Joondalup South Lake	15.9
19	Barrett-Lennard Lake	15.8
20	Lake Beermullah	15.6

Sedgwick (1940) observed the Spotless Crake, Purple Swamphen, Little Bittern and Clamorous Reed-Warbler, which have not been recorded in the last 10 years. The abundance of Hoary-headed Grebe, Musk Duck and Little Pied Cormorant also appears to have declined since Sedgwick's surveys. No waterbird breeding was recorded by Sedgwick or in the earlier RAOU data (1981-88). During Scopewest the Pacific Black Duck bred once (October 1990). Lake Cooloongup has, therefore, been of little value for breeding by waterbirds either historically or recently, although more intensive searches of the rush-beds may reveal additional breeding species.

Bibra, North and Yangebup Lakes

Systematic counts were conducted at least once every fortnight from July 1954 to June 1957 at North, Bibra, South and Yangebup Lakes by Ford (1958). South Lake was seldom referred to by Ford (1958) and, therefore, it is likely that reasonably accurate comparisons can be made between Ford's (1958) data and Scopewest data for Bibra, North and Yangebup Lakes. The numbers of ducks recorded by Ford (1958) were comparable with numbers recorded since

Table 3.9 Twenty wetlands with highest numbers of breeding species during wetland surveys of the Swan Coastal Plain 1990-92

Rank	Wetland	No. of breeding species
1	Holmes-Balfour Swamp	12
1	The Spectacles	12
3	Herdsman Lake	11
3	James Swamp	11
3	Mary Carroll Park	11
6	Lake Claremont	10
6	Lake Copolup	10
6	Perry Lakes	10
6	Warton-Wright Swamp	10
10	Gibb Road Swamp	9
10	Lake Monger	9
10	Nicholson-Oxley Rd Winter-wet	9
13	Perth Airport Swamp	8
13	Bibra Lake	8
13	Big Carine Swamp	8
13	Blyths Lake	8
13	Booragoon Swamp	8
13	Lake Chittering	8
19	Bayswater Swamp	7
19	Blue Gum Swamp	7

Table 3.10 Twenty wetlands in which highest numbers of clutches and broods were recorded during waterbird surveys on the Swan Coastal Plain 1990-92

Rank	Wetland	Breeding activity
1	Carraburmup Swamp	504
2	Booragoon Swamp	270
3	Herdsman Lake	88
4	Lake Monger	85
5	Keogh Swamp	82
6	Lake Chittering	61
7	Gibb Road Swamp	58
8	Lake Forrestdale	55
9	The Spectacles	52
10	Lake Claremont	51
10	Bibra Lake	51
12	Bayswater Swamp	49
13	Nicholson-Oxley Rd Winter-wet	45
14	Holmes-Balfour Swamp	41
15	Perry Lakes	38
16	Blyths Lake	35
17	James Swamp	32
17	Mary Carroll Park	32
19	Kogolup Lake	28
19	West Corio Swamp	28

1982 (Table 3.11). The Freckled Duck was the only species Ford (1958) recorded that was not seen during Scopewest; Ford (1958) observed the species only three times during approximately 200 surveys. More species were recorded breeding during Scopewest than during Ford's (1958) period of observations.

3.3.9 Survey efficiency

Waterbird data for Herdsman Lake from the first year of Scopewest were compared with surveys conducted there 10 years earlier. During surveys in July, October, January and April Curry (1981) recorded 43 species, six of which were breeding, while Scopewest recorded 37 species, 10 of which were breeding. Waterbird abundance and numbers of species were higher in each survey period during Scopewest (Table 3.12) but Curry (1981) recorded more waders and cryptic species. Yellow-billed Spoonbill was not recorded by Curry (1981) and the Great Egret was recorded only once; both species were recorded on all four surveys in the first year of Scopewest. Numbers of Eurasian Coot increased by a factor of eight between the two studies.

Number of species and breeding species recorded at Lake Claremont during Scopewest surveys were similar to those recorded in the same months during 1984-85 by a regular observer and were greater than recorded by Emory *et al.* (1975) and Morris and Knott (1979) (Table 3.12). Number of birds was higher during Scopewest because of the abundance of Silver Gull.

More species and breeding species were recorded during frequent 1981-88 surveys, undertaken predominantly by the observer who did the Scopewest surveys, than were recorded during Scopewest at six wetlands for which comparisons were made (Table 3.13, see also Herdsman Lake in Table 3.12). When results from the two sets of surveys were adjusted for survey effort, however, 1981-88 and Scopewest were similar except that species richness was higher at Lake Bambun and number of breeding species were higher at Lake Bambun, Lake Chandala and Thomsons Lake during the 1981-88 period (Table 3.13). Maximum numbers of birds recorded during one survey were similar during both periods, except at Lake Chandala where a breeding colony of 5000 Straw-necked Ibis was recorded during 1983-84.

Table 3.11 Summary of historical and Scopewest waterbird data for Cooloongup, Bibra, North and Yangebup Lakes on the Swan Coastal Plain

Wetland	Cooloongup			Bibra, North & Yangebup[a]		
Study[b]	1	2	3	4	2	3
No. of species	30	22	21	12	11	11
No. of breeding species	0	0	1	4	6	6
No. of birds[c]	1165	975	3449	4200	15273	2835
No. of surveys	34	3	8	78	61	8

[a]counts of swans and ducks only

[b]1, Sedgewick (1940); 2, RAOU 1981-88; 3, Scopewest 1990-92; 4, Ford (1958)

[c]highest number of birds counted during one survey

Table 3.12 Comparison of counts by Scopewest observers with results of previous studies at Lake Claremont and Herdsman Lake, Swan Coastal Plain

Wetland	Claremont				Herdsman		
Study[a]	1	2	3	4	5	6	3
No. of species	16	28	24	25	43	47	37
No. of breeding species	NA	9	10	6	6	9	10
No. of birds[b]	467	669	3760	1167	657	1515	2434
No. of surveys	4	4	4	4	4	23	4

[a]1, Emory *et al.* (1975)(October 1972, January 1973), Morris and Knott (1979) (April, July 1977); 2, E. Milne unpubl. data 1984-85; 3, Scopewest 1990-91; 4, Scopewest 1991-92; 5, Curry (1981); 6, D. Nash unpubl. data 1981-88

[b]Highest number of birds counted during one survey

3.4 Discussion

The efficiency of Scopewest surveys of numbers of species and individual birds appeared similar to that of earlier work at the same wetlands (Tables 3.12 and 3.13). Yet cumulative species curves, comparisons with 1981-88 counts and comparisons with species lists of Jaensch *et al.* (1988) suggested eight surveys did not provide complete lists of species for about 50% of wetlands on the Swan Coastal Plain. This was unexpected, although the results of Halse *et al.* (1993) suggested that to obtain complete species lists wetlands must be monitored over several years and the number of surveys must exceed number of species recorded. There are two reasons for this.

Firstly, wetlands with large numbers of species contain more species that are cryptic or present for only part of the year (Halse *et al.* 1993). Such species have a low probability of being recorded in any survey and, therefore, many surveys through an annual cycle are required to record all of them.

Secondly, the number of species for which a wetland is suitable varies between years as a result of changes in climate and conditions at other wetlands as well as changes in habitat at the wetland being studied (Morris and Knott 1979). For example, two species were recorded at Hebble Loop Swamp in 1990-91 when water levels were low but nine were recorded during the wetter 1991-92.

Scopewest surveys recorded fewer species breeding than expected from the 1981-88 data. The reasons for this are not clear but there were twice as many records of ducks breeding during Annual Waterfowl Counts in south-western Australia in spring 1988 than 1989, 1990 or 1991 (Halse *et al.* 1990, 1992a, unpubl. data). Similarly, there may have been better breeding seasons in the early to mid-1980s, when the data in Table 3.13 were collected, than in 1990-92. The trend for fewer breeding records during Scopewest surveys applied even when the Scopewest observers had also conducted the 1981-88 surveys, so observer competence is unlikely to have caused the differences.

In spite of smaller species lists for some wetlands from Scopewest surveys than from earlier work, equal sampling effort at each wetland meant there was minimal bias in the wetland classifications and data on habitat preferences of individual species presented in Chapter 5. It should be remembered, however, that sampling error was greater for data on cryptic species and those with sporadic occurrence than for regularly recorded species. Because fewer species than expected were recorded breeding, breeding data were not used in wetland classifications and Scopewest should not be regarded as a definitive study of waterbird breeding on the Swan Coastal Plain.

The abundant species of waterbird on the coastal plain were mostly waterfowl (Table 3.1), which is true throughout south-western and south-eastern Australia (Jaensch *et al.* 1988; Kingsford *et al.* 1991 and earlier publications). Silver Gulls were an exception; thousands occurred on metropolitan wetlands such as Bibra Lake and Lake Claremont, although there were few in rural areas. Numbers of Silver Gulls have increased over the past 50 years in many coastal Australian towns as a result of the species making extensive use of rubbish tips (Skira and Wapstra 1990).

The wetlands supporting largest numbers of waterbird species and most birds were all known to be important prior to Scopewest (Jaensch *et al.* 1988; Van Delft 1988). Not all wetlands supporting a lot of breeding were regarded as important before Scopewest, however. Given that not much breeding was

Table 3.13 Comparison of Scopewest 1990-92 counts with counts made by the same observers between 1981-88 at Bambun, Chandala, Chittering, Thomsons and Wallering Lakes, Swan Coastal Plain

Wetland	Bambun				Chandala				Chittering				Thomsons				Wallering			
Study[a]	1	2	3	4	5	6	3	4	7	8	3	9	10	11	3	4	1	2	3	9
No. of species	44	32	26	23	40	27	23	25	42	26	31	27	64	46	48	42	38	17	21	18
No. of breeding species	16	5	1	1	21	12	7	5	17	7	8	5	13	7	4	3	10	4	4	4
No. of birds[b]	1790	602	989	989	5202	5202	445	445	3794	2719	2546	2546	22196	16583	18472	18472	218	104	103	103
No. of surveys	78	4	8	4	57	4	8	4	61	4	8	4	197	4	8	4	58	4	8	4

[a]1, 1981-88, mostly B. and A. Buchanan unpubl. data; 2, *ibid.* 1982-83; 3, Scopewest 1990-92; 4, *ibid.* 1990-91; 5, 1981-88, mostly G. Agar unpubl. data; 6, *ibid.* 1983-84; 7, 1981-88, mostly B. Kneebone unpubl. data; 8, *ibid.* 1984-85; 9, Scopewest 1991-92; 10, 1981-88, mostly P. Clay unpubl. data; 11, *ibid.* 1982-83

[b]Highest number of birds counted during one survey.

recorded during Scopewest, some important sites on the coastal plain have probably not yet been recognized.

Eighteen of the 20 wetlands supporting most breeding species were situated in the Perth metropolitan area. The reason for that is unclear. Booragoon Swamp was the only metropolitan site where colonial species bred. Australian White Ibis, Great Cormorant, Little Pied Cormorant, Little Black Cormorant and Darter breed there regularly (Van Delft 1988; Jaensch, unpub. data).

Wetlands on rural parts of the coastal plain that were important for colonial species were Australind Nature Reserve, Barraghup Swamp, Carraburmup Swamp, Corio Swamp, McCarleys Swamp and Needonga Lake (Appendix 8).

Surprisingly, the wetlands that are listed as important for breeding in Table 3.9 do not appear to make much contribution, in terms of numbers of young, to recruitment of species that use widespread habitats, such as winter-wet areas, for breeding (see Chapter 5). Full assessment of the value of different types of wetland for breeding, however, requires more information about the breeding localities of cryptic species (e.g. Buff-banded Rail, Australian Crake) and threatened species (Australasian Bittern, Black Bittern, Freckled Duck) than Scopewest provided.

Scopewest provided limited information about seasonal patterns of activity and abundance because surveys were conducted only every three months. Nevertheless, the large number of birds per wetland in January each year supported the idea that waterbirds congregate into drought-refuges in summer, many of which are on the coastal plain (Ford 1958; Gentilli and Bekle 1983). Similarly, the large number of breeding records in October each year, and in January 1992 after spring rainfall, fitted with the patterns of breeding recorded by Halse and Jaensch (1989) for individual species.

The abundance of several species on the coastal plain has changed this century (Storr and Johnstone 1988). For example, numbers of ibises, spoonbills and egrets have increased over the last 40 years. Maned Duck have increased in abundance in the rural areas of the coastal plain and south-western Australia over the same period and are starting to occur at wetlands in Perth, such as Emu-Ballajura Ponds (Appendix 3). Scopewest provided little evidence of change in overall status of species, largely because of the lack of earlier quantified data, although it is apparent from Sedgwick's (1940) work that the status of some species at some lakes has changed. Comparison with Ford's (1958) counts suggested the numbers of ducks and swans in the southern suburbs of Perth have not changed over the past 40 years. The low number of sightings of rush-dwelling species, such as bitterns, compared with the sighting rates implied by Serventy (1938, 1948) suggest these are the species that have declined most (Storr and Johnstone 1988).

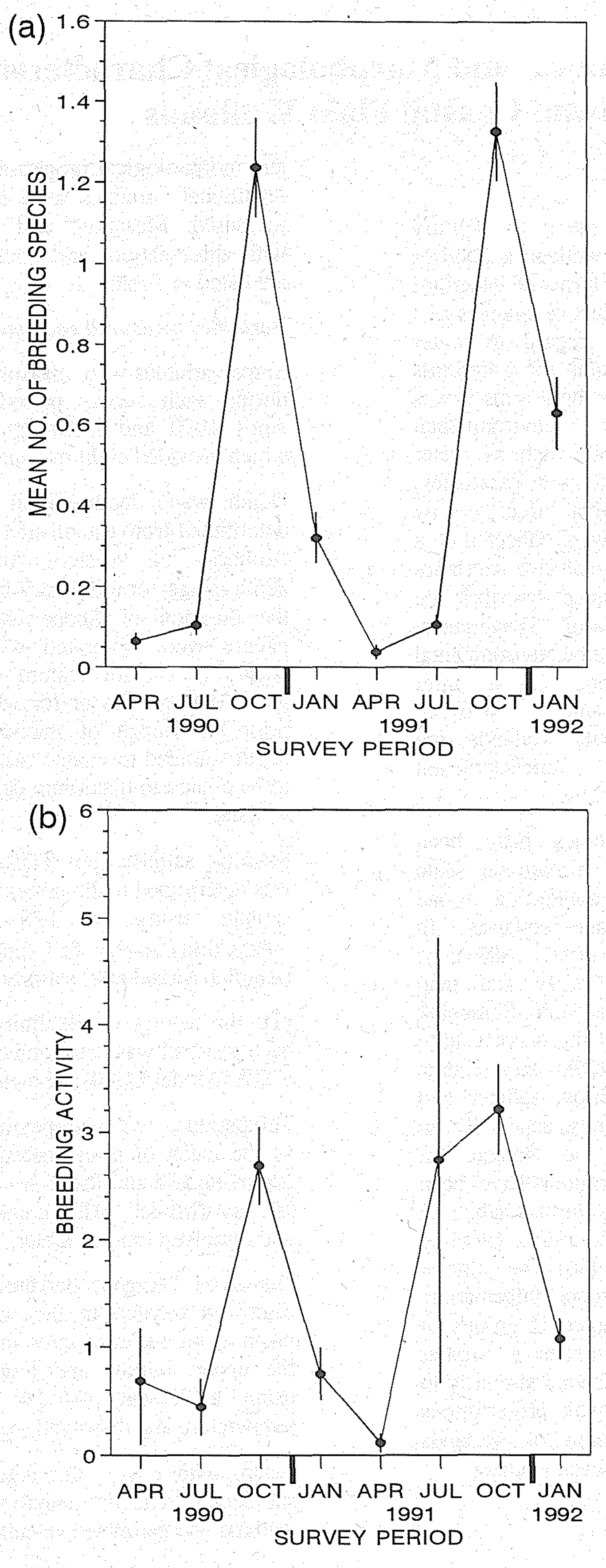


Figure 3.3 Number of breeding species and number of clutches and broods (breeding activity) recorded each survey period at wetlands on the Swan Coastal Plain 1990-92 (mean + S.E.)

4 Physical, Chemical and Morphological Characteristics of Swan Coastal Plain Wetlands

4.1 Introduction

Two aims of Scopewest were to identify characteristics that make a wetland a good or poor example of its type in terms of waterbird usage, and to predict the effect of changes in a wetland, particularly with regard to water depth, on its use by and value for waterbirds (see Chapter 2). To address these aims it was necessary to identify environmental characteristics of a wetland, such as water chemistry, food supply, vegetation parameters and wetland morphology that affect use by waterbirds. Therefore, data were collected on a large number of environmental characteristics in each wetland. This chapter describes the environmental characteristics of 251 wetlands. The data are used (1) to describe environmental variability between wetlands, (2) to infer process-derived relationships between variables, and (3) to classify wetlands into groups with similar environmental characteristics.

Several classification schemes have been proposed in Australia. At a national scale Paijmans *et al.* (1985) applied a broad classification to Australian wetlands. In Western Australia Semeniuk (1987, 1988) used wetland morphology to classify and map wetlands of the Swan Coastal Plain. Semeniuk *et al.* (1990) further divided the classification using vegetation. Riggert (1966) used a scheme based on period of inundation, salinity and vegetation to classify wetlands, especially on the Swan Coastal Plain, as habitat for waterbirds. Similar classifications have been constructed for wetlands as waterbird habitat in eastern Australia (Goodrich 1970; Cowling 1977; Corrick and Norman 1980). The value of classification is that it orders information, which makes inventory simpler. If groups of wetlands can be shown to have similar conservation values, or to respond similarly to perturbations, then management prescriptions can be formulated for groups of wetlands instead of having to examine each wetland.

4.2 Methods

4.2.1 Environmental variables

A range of environmental variables were measured to describe the physical, chemical and morphological properties of each wetland. Additional variables were derived from those measured. Measured and derived variables, with abbreviations and units of measurement, are listed in Table 4.1.

Variables measured each survey

Some variables were measured at each wetland during each survey period, commencing in April 1990 and finishing in January 1992, which provided eight measurements.

Depth: water depth (m) in each wetland was determined from established CALM and Water Authority of Western Australia (WAWA) depth gauges or temporary gauges installed for the duration of Scopewest. WAWA depth gauges were calibrated with respect to the Australian Height Datum (AHD). Wetlands with AHD gauges or for which there was no prior knowledge of maximum depths were depth-sounded to enable readings at the gauge to be related to maximum depth of water in the wetland.

Salinity: salinity (ppt TDS) in each wetland was determined in the laboratory from a 500 ml sample using a TPS (Model LC81) conductivity meter (≤ 5 ppt) and a Hamon (Autolab Model 602) salinity bridge (>5 ppt).

pH: the acidity or alkalinity of the water in each wetland was determined in the field using a TPS (Model LC80) pH meter.

Temperature: water temperature (^{o}C) was taken as the mean of three measurements from the upper, middle and lower water column using a Jenway (Model 9070) combined temperature and dissolved oxygen meter.

Dissolved Oxygen: percentage saturation of dissolved oxygen in the water column was taken as the mean of three measurements from the upper, middle and lower water column using a Jenway (Model 9070) combined temperature and dissolved oxygen meter.

Macrophyte cover: the percentage cover of submerged aquatic macrophyte within the wetland was estimated visually.

Macrophyte biomass: A 25 cm x 25 cm quadrat (0.0625 m^2) was used to enclose samples of aquatic macrophyte, which were then harvested

Table 4.1 Environmental variables (measured and derived), abbreviations and units of measurement used in Scopewest

Variable	Abbreviation	Unit of measurement
Water depth	Depth	m
Salinity	Salinity	ppt
pH	pH	#
Water temperature	Temperature	^{o}C
Dissolved Oxygen	DO	% saturation
Macrophyte cover	Macrocover	%
Macrophyte biomass	Macrobiomass	g dry wt m^{-2}
Fish relative abundance	Fish abundance	#
Zooplankton biomass	Zooplankton	g dry wt
Wading zone	Wading zone	m
Turbidity	Turbidity	NTU
Colour	Colour	TCU
Total soluble persulphate nitrogen	Total-N	mg l^{-1}
Total soluble persulphate phosphorus	Total-P	mg l^{-1}
Chlorophyll *a*	Chl *a*	mg l^{-1}
Phaeophytin	Phaeophytin	mg l^{-1}
Wetland area	Area	ha
Length of shoreline	Shoreline	m
Percentage cover of emergent vegetation	Vegetation cover	%
Percentage cover of:		
Grasses	Grasses	%
Reeds/rushes	Reeds/rushes	%
Samphire	Samphire	%
Shrubs/bushes	Shrubs/bushes	%
Trees	Trees	%
Dead trees/bushes	Dead trees	%
Vegetation heterogeneity	Vegetation types	#
Presence/absence of islands	Islands	0/1
Percent wetland buffered	Percent buffered	%
Width of wetland buffer	Buffer width	m
Percent buffer pristine	Buffer pristine	%
Disturbance level	Disturbance	#
Number of drains	Drains	#
Wetland plan geometry	Geometry type	type
Distance to the coast	Distance to coast	km
Duration of inundation	Permanence	#
Vegetation diversity index	Vegetation diversity	#
Area of vegetated wetland	Closed water	ha
Area of open water	Open water	ha
Area of:		
Grasses	Grasses	ha
Reeds/rushes	Reeds/rushes	ha
Samphire	Samphire	ha
Shrubs/bushes	Shrubs	ha
Trees	Trees	ha
Dead trees/bushes	Dead trees	ha
Vegetation complexes	Veg. complexes	complex
Classification of vegetation data	Veg. UPGMA groups	group

Table 4.2 The nine vegetation complexes into which the 251 wetlands were classified, using pre-defined criteria, based on the percentage cover of the six vegetation types at each wetland

Vegetation complex	Criteria
1	Open; all vegetation types ≤5% cover
2	Grasses dominant
3	Reeds/rushes 5-30% cover, other vegetation types (except grasses) ≤25% of reeds/rushes cover
4	Reeds/rushes >30%, other vegetation types (except grasses) ≤25% of reeds/rushes cover
5	Reeds/rushes >5% cover, shrubs/bushes and trees >25% of reeds/rushes cover
6	Shrubs/bushes and trees >5% cover, reeds/rushes >25% of shrubs/bushes and tree cover
7	Shrubs/bushes, trees and dead trees 5-30% cover, other vegetation types (except grasses) ≤25% of shrubs/bushes, trees and dead trees cover
8	Shrubs/bushes and trees >30%, other vegetation types (except grasses) ≤25% of shrubs/bushes and trees cover
9	Samphire >5% cover

by hand. For each wetland three samples from different locations were combined, preserved in 70% alcohol and returned to the laboratory where they were washed to remove sediment, dried at 60°C and weighed. Biomass was expressed as g dry wt m^{-2}.

Fish abundance: the relative abundance of fish was assessed from observations and hand-netting and scored as: 0, absent; 1, present; 2, common; 3, abundant; 4, very abundant.

Zooplankton biomass: a standardized 50 m sweep sample of the water column was taken to estimate the biomass (g dry wt) of zooplankton in each wetland using a modified FBA pond net with 110 μm mesh size. Samples were preserved in 70% alcohol and returned to the laboratory where all zooplankton were removed, dried at 50°C and weighed.

Wading zone: the width (m) of the zone that could be used by wading waterbirds (from the shoreline to approximately 30 cm depth) was measured at each wetland. The measurement was weighted by the percentage of the shoreline that was exposed or unvegetated because many wetlands had extensive shallow zones that were not available to wading species owing to dense cover of reeds, rushes, shrubs, bushes and trees.

Variables measured for one year

Some variables were measured at each wetland each season for one year, commencing in October 1990 and continuing until July 1991. Water samples for these variables were taken approximately 10-20 cm below the water surface in the vicinity of the depth gauge. Sample bottles were rinsed in the wetland prior to filling. Analytical methods followed those descibed by APHA (1989).

Turbidity and Colour: Turbidity and colour were measured from a 250 ml water sample. Turbidity is a measure of the extent to which the intensity of light passing through the water sample is reduced by suspended matter. It is expressed as Nephelometric Turbidity Units (NTU) and was determined on a Nephelometric turbidity meter against a standard turbidity solution. Colour is a measurement of the amount of light absorbed by inorganic (e.g. iron, manganese) and organic (e.g. humus, peat, tannin) substances in the water. Colour was determined after the sample was filtered through a 0.45 μm membrane to remove suspended matter (turbidity). Absorbance was measured on a spectrophotometer at 465 nm against a cobalt platinum standard solution, and colour was expressed as True Colour Units (TCU).

Total soluble persulphate nitrogen and total soluble persulphate phosphorus: Total soluble nitrogen and phosphorus concentrations were determined from a 100 ml sample that had been filtered in the field through a 0.45 μm membrane. A persulphate digestion was performed in an autoclave prior to colorimetric determination of total soluble nitrogen and total soluble phosphorus (mg l^{-1}).

Chlorophyll *a* and Phaeophytin: Chlorophyll *a* levels can be used to measure photosynthetically active algae in the water column. Phaeophytins are a degradation product of chlorophyll. The ratio of chlorophyll *a* to phaeophytin serves as an indication of the physiological condition of the phytoplankton. A known volume of water (maximum of 1 l) was filtered through a GFC filter paper in the field. Magnesium carbonate suspension (0.5 ml) was added to the filter paper to stabilize pH prior to freezing. In the laboratory samples

Table 4.3a Spearman rank correlation coefficients and significance levels among variables measured every survey period (N=1570) (*, P<0.001; ns, not significant)

	Salinity	pH	Temperature	DO	Macrocover	Macrobiomass	Fish abund	Zooplankton	Wading zone
Depth	-0.1934 *	0.0155 ns	-0.1092 *	-0.1251 *	-0.1288 *	-0.0977 *	0.1378 *	-0.1227 *	-0.4965 *
Salinity		0.4418 *	0.1699 *	0.2326 *	-0.1012 *	-0.1043 *	0.0133 ns	0.0199 ns	0.1262 *
pH			0.3474 *	0.5564 *	0.0810 ns	0.0815 ns	0.0631 ns	0.1195 *	0.1246 *
Temperature				0.3397 *	0.0245 ns	0.0435 ns	0.2976 *	0.0191 ns	0.1062 *
DO					0.1071 *	0.1034 *	0.0293 ns	-0.0157 ns	0.2033 *
Macrocover						0.9745 *	-0.1403 *	0.1437 *	0.2291 *
Macrobiomass							-0.1160 *	0.1344 *	0.1929 *
Fish abundance								-0.2621 *	-0.2227 *
Zooplankton									0.1880 *

were homogenised and extracted for 24 hrs in an aqueous acetone solution. After centrifuging for 20 minutes the clarified sample was decanted and chlorophyll *a* and phaeophytin concentrations (mg l^{-1}) determined on a spectrophotometer at 664 and 665 nm with HCl acidification.

Variables measured once

Some attributes, mostly related to wetland morphology, were measured only once. Data on wetland morphology were collected from ground observations, aerial photographs, Arnold (1990) and Department of Land Administration maps. The boundary of the wetland was taken to be high water mark.

Area: area of the wetland (ha).

Shoreline: length of shoreline (km).

Percentage cover of emergent vegetation : the percentage of the wetland covered by emergent vegetation.

Percentage cover of individual vegetation types: six categories of emergent vegetation, based on life-form, were recognized: (1) grasses/ground covers, (2) reeds/rushes, (3) samphire, (4) shrubs/bushes, (5) trees, and (6) dead trees/bushes. The percentage of the vegetated area of the wetland covered by each life-form was estimated visually.

Vegetation heterogeneity: the number of life-forms recorded at each wetland.

Islands: presence or absence of islands in each wetland was recorded.

Percentage wetland buffered: proportion of the circumference of the wetland that had a buffer zone of riparian vegetation.

Width of buffer zone: the average width (m) of riparian vegetation surrounding each wetland, up to a maximum of 200 m.

Percentage buffer zone that was pristine: the proportion of the wetland buffer comprised of

Table 4.3b Spearman rank correlation coefficients and significance levels among variables measured for one year (N=750) (*, P<0.001; ns, not significant)

	Colour	Total-N	Total-P	Chl *a*	Phaeophytin
Turbidity	-0.08857 ns	0.1338 ns	-0.0033 ns	0.3433 *	0.3388 *
Colour		0.5841 *	0.7045 *	-0.0774 ns	0.1997 *
Total-N			0.5388 *	0.2059 *	0.3154 *
Total-P				0.0172 ns	0.2520 *
Chl *a*					0.4473 *

Table 4.3c Spearman rank correlation coefficients among variables measured only once (N=251) (*, P<0.0001; ns, not significant)

	Shoreline	Vegetation cover	Vegetation types	Buffer width	Percent buffered	Drains	Buffer pristine	Disturb-ance	Distance to coast	Perman-ence	Open water(ha)	Grasses (ha)	Reeds/ rushes(ha)	Samphire (ha)	Shrubs/ bushes (ha)	Trees (ha)	Dead trees (ha)	Closed water(ha)	Grasses (%)	Reeds/ rushes (%)	Samphire (%)	Shrubs/ bushes (%)	Trees (%)	Dead trees (%)
Area	0.8404 *	0.0933 ns	0.3956 *	0.4504 *	0.3873 *	0.1279 ns	0.3081 *	-0.4323 *	-0.0760 ns	0.0813 ns	0.7473 *	0.2531 *	0.7379 *	0.0622 ns	0.7270 *	0.5949 *	0.3476 *	0.8606 *	-0.1919 ns	0.3392 *	0.0332 ns	0.2680 *	0.2602 *	0.2434 *
Shoreline		-0.0288 ns	0.2806 *	0.3596 *	0.3300 *	0.2665 *	0.2437 *	-0.2964 *	-0.0447 ns	0.1489 ns	0.6976 *	0.1884 ns	0.6142 *	0.0306 ns	0.5899 *	0.4898 *	0.3242 *	0.6945 *	-0.1864 ns	0.2249 ns	0.0058 ns	0.1432 ns	0.1661 ns	0.2024 ns
Vegetation cover			0.1906 ns	-0.1635 ns	-0.0028 ns	-0.1231 ns	0.0145 ns	-0.1248 ns	0.0517 ns	-0.5121 *	-0.4515 *	0.4351 *	0.2638 *	0.0829 ns	0.3723 *	0.2922 *	0.0872 ns	0.5323 *	0.4807 *	0.3567 *	0.0635 ns	0.5163 *	0.3375 *	0.0392 ns
Vegetation types				0.4743 *	0.4571 *	0.0382 ns	0.2548 *	-0.4899 *	-0.1200 ns	0.0995 ns	0.2344 ns	0.1902 ns	0.5178 *	0.2868 *	0.5341 *	0.6103 *	0.5440 *	0.4480 *	-0.0078 ns	0.4708 *	0.3029 *	0.4621 *	0.5710 *	0.5838 *
Buffer width					0.9053 *	-0.0147 ns	0.6842 *	-0.7095 *	-0.1064 ns	0.1607 ns	0.4336 *	-0.0721 ns	0.4704 *	0.1786 ns	0.4570 *	0.4957 *	0.3498 *	0.3982 *	-0.2759 *	0.3213 *	0.1572 ns	0.3012 *	0.4139 *	0.3466 *
Percent buffered						-0.0170 ns	0.5512 *	-0.6885 *	-0.0640 ns	0.2164 ns	0.3879 *	-0.0635 ns	0.4105 *	0.1473 ns	0.4197 *	0.4658 *	0.3430 *	0.3522 *	-0.2399 *	0.2820 *	0.1277 ns	0.2976 *	0.4196 *	0.3248 *
Drains							-0.1027 ns	0.1486 ns	-0.2470 *	0.1531 ns	0.1690 ns	0.0383 ns	0.1771 ns	-0.0134 ns	0.0409 ns	0.0332 ns	-0.0306 ns	0.0353 ns	-0.0454 ns	0.1098 ns	-0.0023 ns	-0.0965 ns	-0.0629 ns	-0.0452 ns
Buffer pristine								-0.5945 *	-0.0661 ns	0.0406 ns	0.3021 *	-0.0754 ns	0.3416 *	0.1394 ns	0.3227 *	0.3101 *	0.2714 *	0.2823 *	-0.2044 ns	0.2532 *	0.1256 ns	0.2002 ns	0.2224 ns	0.2746 *
Disturbance									-0.0197 ns	-0.1087 ns	-0.3478 *	0.0367 ns	-0.4604 *	-0.1937 ns	-0.5045 *	-0.4611 *	-0.3608 *	-0.4481 *	0.2382 *	-0.3501 *	-0.1744 ns	-0.3835 *	-0.4037 *	-0.3523 *
Distance to coast										-0.1185 ns	-0.1300 ns	0.1065 ns	-0.1558 ns	-0.3317 *	0.0035 ns	-0.0511 ns	-0.1015 ns	-0.0294 ns	0.1573 ns	-0.2012 ns	-0.3458 *	0.0947 ns	0.0176 ns	-0.1567 ns
Permanence											0.4226 *	-0.3828 *	0.0323 ns	-0.0762 ns	-0.0121 ns	0.0657 ns	0.1792 ns	-0.1552 ns	-0.4827 *	-0.0238 ns	-0.0830 ns	-0.1519 ns	0.0095 ns	0.1843 ns
Open water (ha)												-0.0857 ns	0.4644 *	0.0234 ns	0.4420 *	0.3495 *	0.2781 *	0.4205 *	-0.4656 *	0.1113 ns	0.0040 ns	0.0083 ns	0.0450 ns	0.2111 ns
Grasses (ha)													0.2375 *	-0.0899 ns	0.1643 ns	0.0503 ns	-0.0805 ns	0.4317 *	0.8443 *	0.1060 ns	-0.1027 ns	0.0816 ns	-0.0367 ns	-0.1480 ns
Reeds/Rushes (ha)														0.1750 ns	0.6096 *	0.5080 *	0.2541 *	0.7580 *	-0.1179 ns	0.8341 *	0.1566 ns	0.2859 *	0.2628 *	0.1813 *
Samphire (ha)															0.0985 ns	-0.0148 ns	0.1918 ns	0.1022 ns	-0.0991 ns	0.2006 ns	0.9713 *	0.0984 ns	-0.0308 ns	0.1945 ns
Shrubs/ bushes (ha)																0.6551 *	0.4238 *	0.7926 *	-0.1335 *	0.3661 ns	0.0736 *	0.7955 *	0.4223 *	0.3321 *
Trees (ha)																	0.4165 *	0.6531 *	-0.1911 ns	0.3412 *	-0.0343 ns	0.4178 *	0.8735 *	0.3615 *

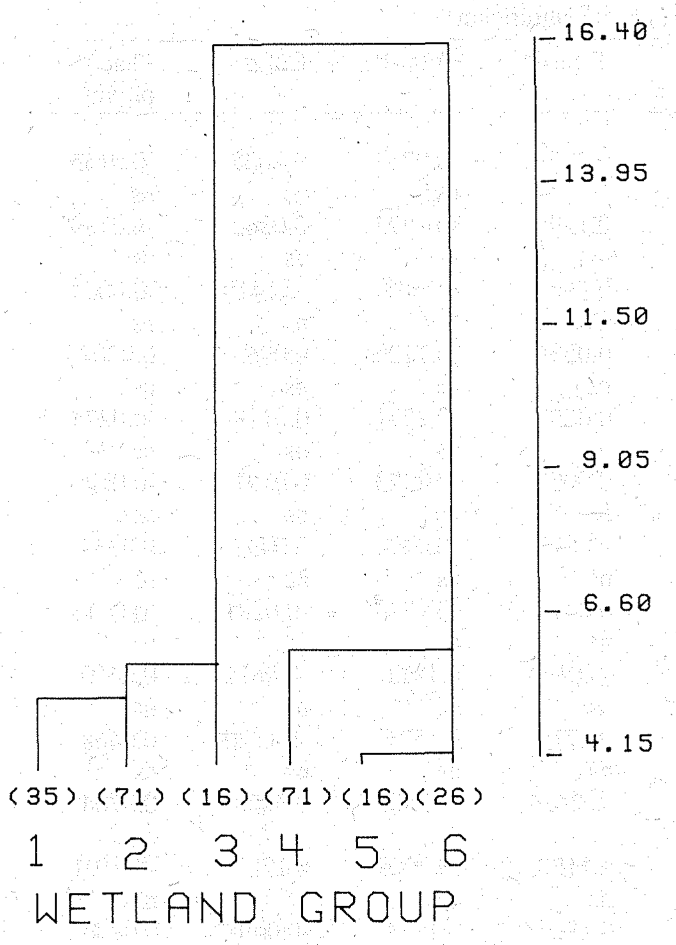
	Shoreline	Vegetation cover	Vegetation types	Buffer width	Percent buffered	Drains	Buffer pristine	Disturb-ance	Distance to coast	Perman-ence	Open water(ha)	Grasses (ha)	Reeds/ rushes(ha)	Samphire (ha)	Shrubs/ bushes (ha)	Trees (ha)	Dead trees (ha)	Closed water(ha)	Grasses (%)	Reeds/ rushes (%)	Samphire (%)	Shrubs/ bushes (%)	Trees (%)	Dead trees (%)
Dead trees (ha)																		0.3523	-0.2111	0.1413	0.1791	0.2998	0.3193	0.9306
																		*	ns	ns	ns	*	*	*
Closed water (ha)																			0.0758	0.4623	0.0739	0.4767	0.3914	0.2389
																			ns	*	ns	*	*	*
Grasses (%)																				-0.0667	-0.1014	0.0031	-0.1238	-0.2396
																				ns	ns	ns	ns	*
Reeds/rushes (%)																					0.1952	0.2638	0.2486	0.1223
																					ns	*	*	ns
Samphire (%)																						0.0821	-0.0477	0.2072
																						ns	ns	ns
Shrubs/bushes (%)																							0.4201	0.2709
																							*	*
Trees (%)																								0.3262
																								*
Dead trees (%)																								

Table 4.3d Spearman rank correlation coefficients and significance levels between variables measured only once and variables measured during every survey (*N*=251) (*, *P*<0.0001; ns, not significant)

	Depth	Salinity	pH	Temperature	DO	Macrocover	Macrobiomass	Fish	Zooplankton	Wading zone
Area	0.2111 ns	0.1497 ns	0.1708 ns	0.2616 *	0.0329 ns	-0.0301 ns	-0.0081 ns	-0.0643 ns	0.1659 ns	0.2932 *
Shoreline	0.2172 ns	0.1864 ns	0.1861 ns	0.2523 *	0.1043 ns	-0.1024 ns	-0.0722 ns	0.0961 ns	0.0695 ns	0.1875 ns
Vegetation cover	-0.4055 *	-0.2946 *	-0.2767 *	-0.3602 *	-0.2905 *	0.3257 *	0.2322 ns	-0.4017 *	0.2310 ns	0.2359 ns
Vegetation types	0.0831 ns	0.2046 ns	0.0187 ns	-0.0253 ns	-0.1301 ns	-0.0904 ns	-0.0806 ns	0.0265 ns	0.0698 ns	0.0946 ns
Buffer width	0.2394 *	0.2532 *	-0.0147 ns	0.0839 ns	-0.0862 ns	-0.0952 ns	-0.0626 ns	0.1323 ns	-0.0418 ns	0.0498
Percent buffered	0.2683 *	0.2446 *	-0.0293 ns	0.0632 ns	-0.1076 ns	-0.0891 ns	-0.0644	0.1843 ns	-0.0984 ns	-0.0154 ns
Drains	0.0843 ns	-0.0719 ns	0.1437 ns	0.1347 ns	0.1007 ns	-0.1178 ns	-0.0488 ns	0.3118 *	-0.0564 ns	-0.0610 ns
Buffer pristine	0.1044 ns	0.2515 *	0.0336 ns	0.0997 ns	-0.0025 ns	-0.0127 ns	-0.0098	0.0118 ns	0.0117 ns	0.0538 ns
Disturbance	-0.1577 ns	-0.2519 *	0.0191 ns	-0.0436 ns	0.1207 ns	0.0697 ns	0.0608 ns	-0.0858 ns	-0.0391 ns	-0.0668 ns
Distance to coast	-0.0761 ns	-0.0425 ns	-0.2105 ns	-0.0916 ns	-0.1769 ns	-0.0393 ns	0.08143 ns	-0.1600 ns	-0.0090 ns	-0.0220 ns
Permanence	0.8307 *	0.1186 ns	0.2188 ns	0.3652 *	0.0324 ns	-0.4833 *	-0.3564 *	0.6737 *	-0.2771 *	-0.4521 *
Open water (ha)	0.4636 *	0.3201 *	0.2766 *	0.4473 *	0.1593 ns	-0.1706 ns	-0.0979 ns	0.2020 ns	0.0304 ns	0.1130 ns
Grasses (ha)	-0.2884 *	-0.2197 ns	-0.0593 ns	-0.0927 ns	0.0375 ns	0.3185 *	0.2558 *	-0.3516 *	0.1982 ns	0.4304 *
Reeds/Rushes (ha)	0.0734 ns	0.0728 ns	0.0265 ns	0.1674 ns	-0.1016 ns	-0.0535 ns	-0.0366 ns	-0.0249 ns	0.0868 ns	0.2297 ns
Samphire (ha)	-0.2659 *	0.3870 *	0.1403 ns	0.0439 ns	0.2106 ns	0.1200 ns	0.0881 ns	-0.0041 ns	-0.0719 ns	0.2480 *
Shrubs/bushes(ha)	0.0845 ns	0.1308 ns	0.0349 ns	0.0741 ns	-0.1142 ns	0.0278 ns	0.0401 ns	-0.1037 ns	0.1666 ns	0.2133 ns
Trees (ha)	0.1518 ns	0.0645 ns	-0.0774 ns	-0.0275 ns	-0.2499 *	-0.1032 n	-0.0827 ns	-0.0185 ns	0.1262 ns	0.0290 ns
Dead trees (ha)	0.1925 ns	0.2114 ns	0.1426 ns	0.0437 ns	0.0615 ns	-0.0676 ns	-0.06114 ns	0.0768 ns	0.0841 ns	-0.0575 ns
Closed water (ha)	0.0185 ns	0.0254 ns	0.0048 ns	0.0474 ns	-0.1014 ns	0.1404 ns	0.1154 ns	-0.2269 ns	0.2430 *	0.3706 *
Grasses (%)	-0.4300 *	-0.3248 *	-0.1851 ns	-0.2378 ns	-0.0062 ns	0.3842 *	0.2956 *	-0.3677 *	0.1616 ns	0.3136 *
Reeds/rushes (%)	-0.0431 ns	-0.0096 ns	-0.1071 ns	0.0454 ns	-0.1851 ns	-0.0649 ns	-0.0340 ns	0.0134 ns	0.0348 ns	0.1125 ns
Samphire (%)	-0.2772 *	0.3986 *	0.1497 ns	0.0280 ns	0.2206 ns	0.1246 ns	0.0941 ns	-0.0038 ns	-0.0550 ns	0.2444 *
Shrubs/bushes (%)	-0.1124 ns	0.0588 ns	-0.1574 ns	-0.1694 ns	-0.2708 *	0.0888 ns	0.0598 ns	-0.1717 ns	0.1301 ns	0.1245 ns
Trees (%)	0.0537 ns	0.0309 ns	-0.2170 ns	-0.1894 ns	-0.3716 *	-0.1111 ns	-0.1217 ns	-0.0232 ns	0.0641 ns	-0.0965 ns
Dead trees (%)	0.1864 ns	0.2206 ns	0.1223 ns	0.0179 ns	0.0339 ns	-0.0760 ns	-0.0709 ns	0.1218 ns	0.0602 ns	-0.0919 ns

Table 4.3e Spearman rank correlation coefficients and significance levels between variables measured once only and variables measured for one year (N=251) (*, P<0.0001; ns, not significant)

	Turbidity	Colour	Total-N	Total-P	Chl *a*	Phaeo phytin
Area	-0.0947 ns	-0.0397 ns	0.2458 *	-0.0754 ns	0.1008 ns	-0.0155 ns
Shoreline	0.0035 ns	-0.1034 ns	0.1394 ns	-0.1275 ns	0.0342 ns	-0.0189 ns
Vegetation cover	-0.2688 *	0.3710 *	0.1604 ns	0.2609 *	-0.1419 ns	-0.0004 ns
Vegetation types	-0.0666 ns	-0.0811 ns	0.0536 ns	-0.1120 ns	0.0965 ns	0.0202 ns
Buffer width	-0.0362 ns	-0.0765 ns	0.0297 ns	-0.2271 ns	0.0118 ns	-0.0274 ns
Percent buffered	0.0233 ns	-0.1040 ns	0.0003 ns	-0.2373 ns	0.0191 ns	-0.0190 ns
Drains	0.1193 ns	-0.2328 ns	-0.1359 ns	-0.0494 ns	0.0493 ns	0.0334 ns
Buffer pristine	-0.1122 ns	-0.0209 ns	0.0476 ns	-0.1723 ns	-0.0081 ns	-0.0615 ns
Disturbance	0.0312 ns	0.0215 ns	-0.0164 ns	0.1811 ns	-0.0611 ns	0.0450 ns
Distance to coast	0.0096 ns	0.3052 *	0.1719 ns	0.1536 ns	-0.1120 ns	0.0468 ns
Permanence	0.2135 *	-0.4536 *	-0.2626 *	-0.3408 *	0.3629 *	0.0784 ns
Open water (ha)	0.0536 ns	-0.2298 ns	0.1120 ns	-0.2009 ns	0.1782 ns	-0.0101 ns
Grasses (ha)	-0.0555 ns	0.1467 ns	0.1864 ns	0.1694 ns	-0.0498 ns	0.0870 ns
Reeds/Rushes (ha)	-0.1408 ns	-0.0448 ns	0.1312 ns	-0.1604 ns	0.0146 ns	-0.0055 ns
Samphire (ha)	-0.0175 ns	-0.1573 ns	-0.1526 ns	-0.1716 ns	-0.0424 ns	-0.1112 ns
Shrubs/bushes (ha)	-0.1412 ns	0.0851 ns	0.2130 ns	-0.0377 ns	0.0379 ns	-0.0492 ns
Trees (ha)	-0.1213 ns	0.0807 ns	0.1917 ns	-0.0350 ns	0.0480 ns	0.0219 ns
Dead trees (ha)	0.0314 ns	-0.1212 ns	0.0079 ns	-0.0806 ns	0.1491 ns	-0.0373 ns
Closed water (ha)	-0.1996 ns	0.1352 ns	0.2942 *	0.0328 ns	-0.0020 ns	-0.0047 ns
Grasses (%)	-0.0513 ns	0.2515 *	0.1200 ns	0.2807 *	-0.1167 ns	0.1213 ns
Reeds/rushes (%)	-0.1704 ns	-0.0092 ns	0.0058 ns	-0.1465 ns	-0.0550 ns	-0.0206 ns
Samphire (%)	0.0011 ns	-0.1708 ns	-0.1576 ns	-0.1689 ns	-0.0240 ns	-0.1006 ns
Shrubs/bushes (%)	-0.1781 ns	0.2023 ns	0.1294 ns	0.0508 ns	-0.0391 ns	-0.0427 ns
Trees (%)	-0.0811 ns	0.1344 ns	0.1047 ns	-0.0052 ns	0.0134 ns	0.0248 ns
Dead trees (%)	0.0447 ns	-0.1255 ns	-0.0352 ns	-0.1036 ns	-0.1484 ns	-0.0428 ns



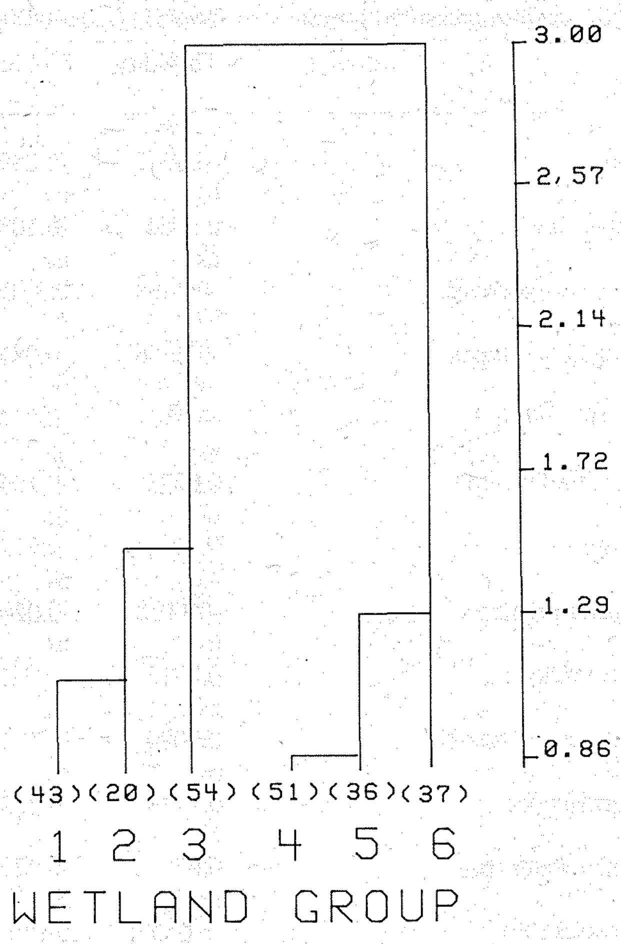


Figure 4.1 Six wetland groupings produced by UPGMA classification of sites on area of each vegetation type (See Appendix 5 for group membership of each study site). Number of wetlands in each group is given in parentheses

Figure 4.2 Six wetland groupings produced by UPGMA classification of wetlands on all environmental variables. Number of wetlands in each group is given in parentheses

pristine vegetation as opposed to semi-cleared or grazed bush, parklands or plantations.

Disturbance level: wetlands were subjectively assigned to a disturbance category, ranging from 1 for pristine sites to 5 for highly disturbed sites. The intention was to combine the effects of factors such as roads, housing and industrial developments, land clearing and agricultural activities that impinged on the wetland.

Number of drains: number of drains entering each wetland.

Wetland geometry: the plan geometry of each wetland was determined according to the classification by Semeniuk (1987: Fig. 4, p. 104). Four types of channels (straight, sinuous, anastomosing, irregular) and five types of basins (linear, elongate, irregular, ovoid, round) were recognised.

Distance to the coast: the distance of each wetland to the coast, or the nearest estuary, was measured from 1:100 000 topographic survey maps.

Derived variables

A number of additional variables were derived by transforming and combining the measured variables. Derived variables were used to quantify additional properties of the wetlands

Table 4.3f Spearman rank correlation coefficients and significance levels between variables measured every survey and variables measured for one year (N=251) (*, P<0.0001; ns, not significant)

	Turbidity	Colour	Total-N	Total-P	Chl *a*	Phaeo-phytin
Depth	0.0879 ns	-0.3814 *	-0.1840 ns	-0.2553 *	0.2962 *	0.0038 ns
Salinity	0.2130 ns	-0.1962 ns	0.1026 ns	-0.1889 ns	0.1646 ns	0.0277 ns
pH	0.2724 *	-0.3825 *	0.0188 ns	-0.1103 ns	0.3429 *	0.1109 ns
Temperature	0.1084 ns	-0.2258 ns	0.0208 ns	-0.1418 ns	0.2743 *	0.0928 ns
DO	0.3126 *	-0.3741 *	-0.0797 ns	-0.1696 ns	0.1849 ns	0.0518 ns
Macrocover	-0.1615 ns	0.1859 ns	0.1302 ns	0.1266 ns	-0.1208 ns	0.0067 ns
Macrobiomass	-0.1344 ns	0.1038 ns	0.0813 ns	0.0698 ns	-0.0786 ns	0.0319 ns
Fish	0.1885 ns	-0.3793 *	-0.3766 *	-0.2844 *	0.1708 ns	-0.0037 ns
Zooplankton	0.0001 ns	0.2706 *	0.4578 *	0.3947 *	0.2926 *	0.2633 *
Wading zone	-0.1019 ns	0.2404 *	0.3555 *	0.2098 ns	-0.0579 ns	0.1289 ns

or to represent the synergistic effects of several measured variables.

Water permanence: an index of the duration of inundation in each wetland was derived from the depth data. Water permanence ranged from zero for wetlands that never held water during the study to a maximum of eight for permanent wetlands that held water in all eight survey periods.

Vegetation diversity: Simpson's Diversity Index was calculated as a measure of habitat heterogeneity:

$\lambda=1/\Sigma p_i^2$

where p_i was the proportion of the i^{th} vegetation type in the wetland. The algorithm combined information on the number of vegetation types and their relative abundance into a standard index for each wetland.

Area of closed water: wetland area was multiplied by the percentage cover of emergent vegetation and divided by 100 to give the area (ha) of closed water.

Area of open water: the area of closed water was subtracted from wetland area to give the area (ha) of open water.

Area cover of vegetation types: area cover (ha) of each of the six vegetation types was derived by multiplying wetland area by the percentage cover of each vegetation type and dividing by 100.

Rainfall

The study area covered parts of the Central Coast and the South Coast Meteorological Districts. Rainfall data for 1990 and 1991 from seven meteorological stations within the study area (Bureau of Meteorology 1990, 1991) were used to calculate average rainfall each year. The stations were Gingin, Lancelin and Perth Bureau (Central Coast District) and Mandurah, Pinjarra, Waroona and Bunbury (South Coast District). The number of wetlands that were dry when sampled was recorded for each survey period as an indication of the effect of rainfall patterns on potential habitat availability.

4.2.2 Data analysis

Inter-dependencies within the environmental variables

Inter-dependencies within the environmental variables were investigated using Spearman rank correlations. Mean values for each

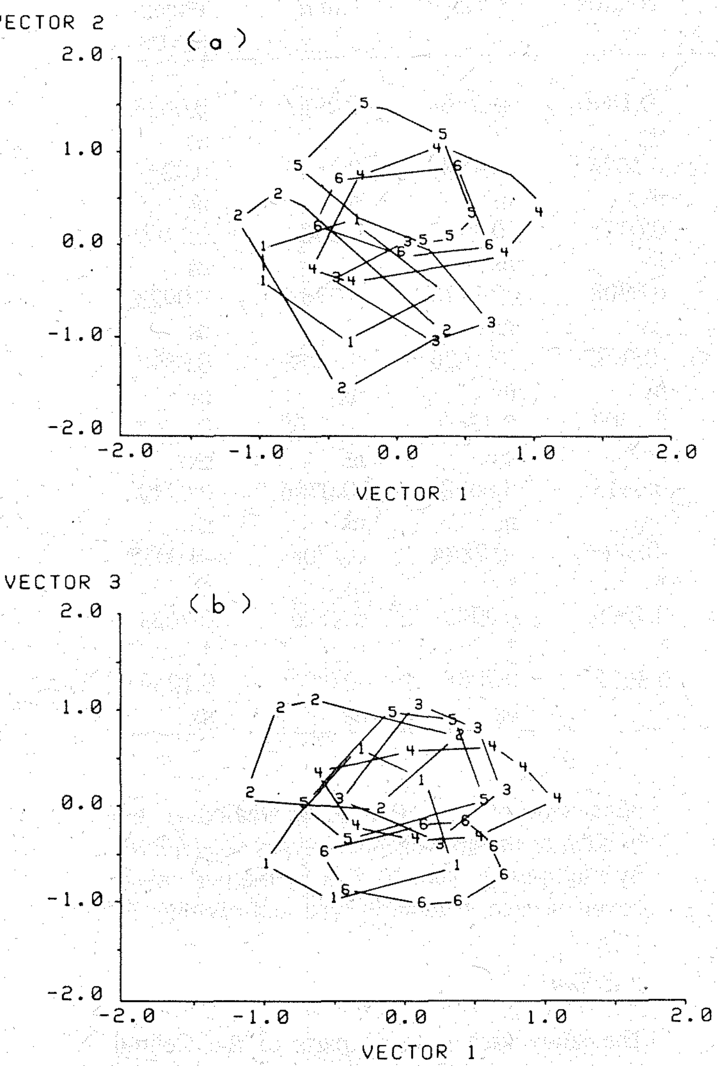


Figure 4.3 UPGMA classification groups superimposed on ordination of wetlands by SSH on environmental variables for (a) Vector 1 by Vector 2 and (b) Vector 1 by Vector 3

Table 4.4 Average rainfall (mm) in Central Coast and South Coast Districts during 1990 and 1991 and long-term averages

Year	District	Long-term average	District average	Decile	Description
1990	Central	849	737	3	Below average
	South	909	819	3	Below average
1991	Central	849	946	8	Above average
	South	909	896	5	Average

Table 4.5 Rainfall totals (mm) for selected stations within the study area

District	Station	Long-term average	1990 total	1991 total
Central	Gingin	749	628	783
	Lancelin	635	665	716
	Perth	869	786	949
South	Mandurah	884	805	1075
	Pinjarra	956	849	1049
	Waroona	1028	878	1168
	Bunbury	871	571	797

wetland were used to compare variables that were measured repeatedly with variables measured on one occasion. Approximations to Bonferroni corrections (*sensu* Sachs 1984) were applied to reduce the chance of Type I errors because of multiple comparisons. Because of the large size of the data set correlations were regarded as significant if $P<0.0001$.

Wetland classification on emergent vegetation

Structure of the emergent vegetation within each wetland was classified two ways. Firstly, wetlands were classified into nine vegetation complexes using pre-defined criteria based on the percentage cover of the six vegetation types in each wetland (Table 4.2). Secondly, sites were classified into groups using an agglomerative hierarchical fusion technique, Unweighted Pair Group Arithmetic Averaging (UPGMA), from the PATN analysis package (Belbin 1991). The classification was based on area of each vegetation type in each wetland. Prior to classification, dissimilarity between pairs of sites was determined using the Bray-Curtis association measure. The distribution of dissimilarity measures was checked for normality and under-estimated measures were re-calculated using the shortest path method in the TRNA module of PATN. Space distortion in the classifications was controlled with a Beta value of -0.25, which causes contraction (Belbin 1991).

Group statistics, using the GSTA option in PATN, were calculated to interpret the

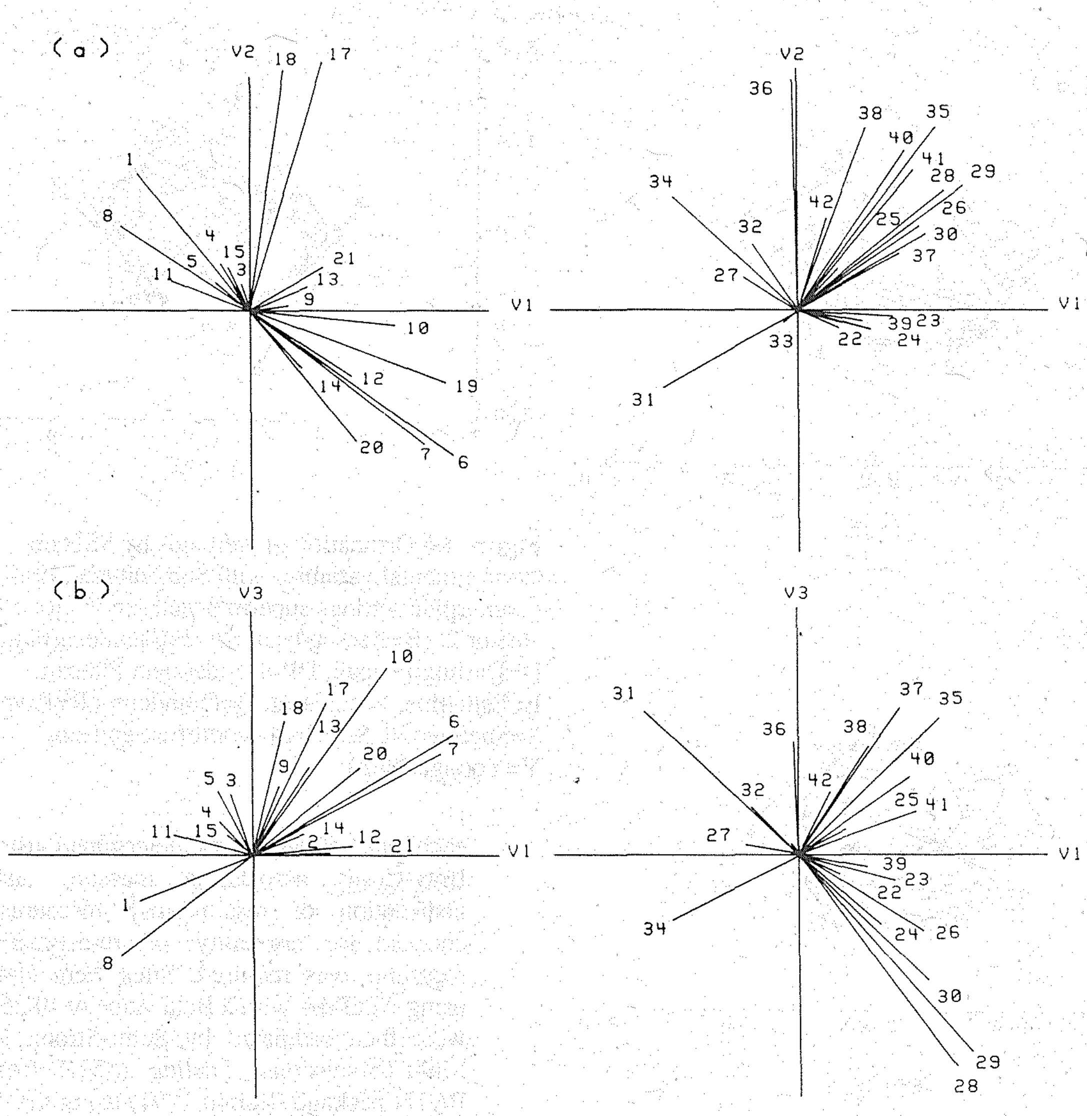
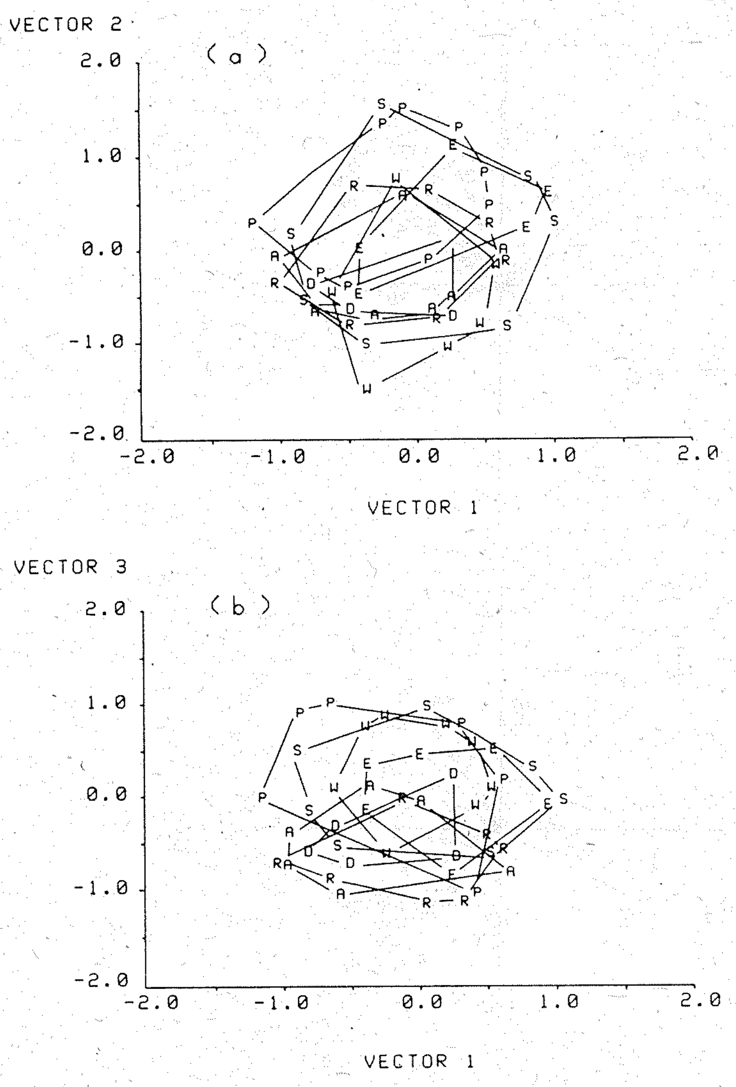


Figure 4.4 Environmental gradients in SSH ordination of wetlands on environmental variables: (a) Vector 1 by Vector 2 (Vector 3 perpendicular to the page) and (b) Vector 1 by Vector 3 (Vector 2 perpendicular to the page). Length of gradient corresponds to the strength of the correlation and numbers correspond to environmental variables listed in Table 4.10

vegetation groupings defined by the UPGMA classification. Kruskal-Wallis tests were used to examine whether differences in area of each of the six vegetation types between the UPGMA groupings were significant.

Division of Environmental Variables into Classes

To investigate the environmental conditions present at the study sites, and for subsequent analyses in which waterbird usage of wetlands was assessed with respect to environmental characteristics (Chapter 5), each variable was divided into classes. As far as possible, boundaries of each class were selected to provide (1) classes that are widely recognised (e.g. for Salinity we used very fresh, fresh, brackish, saline and hypersaline), and (2) a similar number of wetlands in each class.



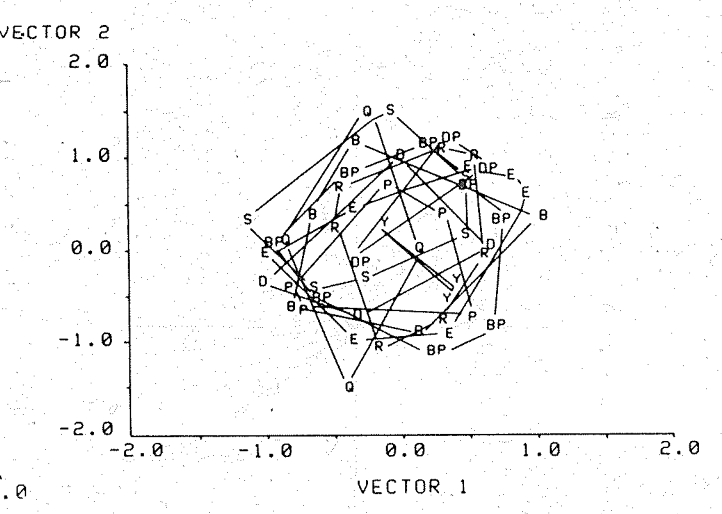


Figure 4.6 Ordination of wetlands by SSH on environmental variables with Semeniuk's (1988) geomorphic settings superimposed for Vector 1 by Vector 2. (B=Bassendean, BP=Bassendean/Pinjarra, D=Darling Plateau, DP=Dandaragan Plateau, E=Estuarine, P=Pinjarra, Q=Quindalup, R=Riverine, S=Spearwood, SB=Spearwood/Bassendean, Y=Yoongarillup)

Figure 4.5 Ordination of wetlands by SSH on environmental variables with pre-defined wetland types superimposed for (a) Vector 1 by Vector 2 and (b) Vector 1 by Vector 3. (A=artificial, D=drain, E=estuarine lagoon, P=permanent wetland, R=river section, S=seasonal wetland, W=winter-wet area)

Wetland Classification on Environmental Variables

The 251 wetland study sites were classified and ordinated using all measured and derived environmental variables. Mean values were used for variables measured on more than one occasion. Prior to analysis, the distribution of each variable was examined and transformations applied so that distributions approximated normality. Dissimilarity between each pair of sites was determined using the Bray-Curtis association measure and the distribution of dissimilarity measures was checked for normality; no re-estimation of measures was required. Sites were classified using UPGMA with a Beta value of -0.25. Sites were then ordinated by Semi-Strong Hybrid Multi-Dimensional Scaling (SSH) from the PATN package (Belbin 1991) using the default cut-level of 0.9 with 10 random starts. The classification groupings from UPGMA were then superimposed on the SSH ordination plot. The influence of each environmental variable on the ordination was determined by calculating maximum linear correlations within the ordination space after implementing Principal Axis Rotation. Varimax rotation was used to maximise the variance on each axis. Significant differences in each environmental variable between the groups of wetlands produced by UPGMA classification were tested by one-way analysis of variance. Prior to analysis, the distribution of each variable was examined and transformations applied so that distributions approximated normality. Tukey's studentized range tests (HSD) were used to locate between-group differences if ANOVAs were significant.

Table 4.6 Results of Kruskal-Wallis tests of the amount of each of the six vegetation types in the classification groups. Significance levels and mean coverage (ha) of the six vegetation types in each classification group are shown and the six UPGMA groups are ordered according to the Kruskall-Wallis tests

Vetetation type	Chi-squared	*P*	Mean cover for each group (shown under Group no.)					
Grasses	97.6	0.0001	5	1	6	4	3	2
			9.65	0.55	3.75	0.39	0.02	0.03
Reeds/rushes	134	0.0001	6	4	5	2	1	3
			36.12	1.07	1.19	0.12	0.07	0.01
Samphire	20.7	0.0009	4	3	2	1	5	6
			0.278	0.001	0.004	0.00	0.00	0.00
Shrubs/bushes	126	0.0001	6	4	5	2	1	3
			10.68	1.88	0.59	0.12	0.05	0.01
Trees	113	0.0001	4	6	5	2	1	3
			1.39	10.83	0.54	0.07	0.02	0.01
Dead trees	33.7	0.0001	4	6	2	5	3	1
			0.44	1.31	0.01	0.02	0.01	0.01

Comparison of wetland classification with pre-defined wetland types

The seven pre-defined wetland types (Chapter 2, Appendix 1) were also superimposed on the SSH ordination to assess how well wetland types could be identified using environmental data.

Comparison of wetland classification on environmental variables with Semeniuk's (1988) geomorphic classification

Using data provided by WAWA, all wetlands were assigned to the geomorphic settings Semeniuk (1988) used to classify wetlands of the Swan Coastal Plain into consanguineous wetland suites. These geomorphic settings were then superimposed on the SSH ordination of wetlands on environmental data and the degree of separation of wetlands in each setting was visually assessed to identify any similarity between classifications based on the two approaches.

4.3 Results

4.3.1 Environmental variables.

Values for each of the 45 environmental variables are presented for each wetland in Appendix 5. Mean values are given for variables measured on more than one occasion. There were many significant correlations among variables (Tables 4.3a-f). For example, area of open and closed water and area of each vegetation type, except samphire, were highly correlated with wetland area. Macrophyte biomass was correlated with macrophyte cover and wading zone was negatively correlated with depth. pH was correlated with DO and chlorophyll *a*, and zooplankton biomass was correlated with total-N, total-P, colour and chlorophyll *a*. Wetland area, number of vegetation types and extent of wetland buffer zone (percentage buffered, buffer width and percentage pristine) were all positively correlated. Wetland permanence was positively correlated with depth, temperature, fish abundance, turbidity and chlorophyll *a* and negatively correlated with macrophyte cover and biomass, zooplankton biomass, wading zone, colour, total-N and total-P.

4.3.2 Rainfall

In 1990 the Central Coastal and South Coastal Districts both reported below average rainfall, with district averages in the third decile (Table 4.4). The seven selected stations, with the exception of Lancelin, reported rainfall totals below the long-term averages (Table 4.5). In

1991 the Central Coastal District reported above average rainfall, with a district average in the eighth decile and the South Coastal District reported average rainfall, with the district average in the fifth decile (Table 4.4). The seven selected stations, with the exception of Bunbury, reported rainfall totals above long-term averages (Table 4.5). Generally, rainfall for the study area was below average in 1990 but above average in 1991.

This was reflected in the number of wetlands that were dry on each sampling trip during Scopewest. Between April 1990 and January 1991, wetlands were reported as dry during 232 surveys compared with 199 surveys between April 1991 and January 1992; 97 and 130 sites were dry in April 1990 and 1991 respectively, 23 and 3 sites were dry in July 1990 and 1991 respectively, 9 and 8 sites were dry in October 1990 and 1991 respectively. The greatest difference occurred in January with 103 and 58 sites dry in 1991 and 1992, respectively.

4.3.3 Wetland classification on emergent vegetation

Classification of wetlands on emergent vegetation by UPGMA produced six groups (Figure 4.1, Appendix 5). There were highly significant differences in the cover of each vegetation type between the groups (Table 4.6). The major division in the classification separated sites with a relatively high cover of grasses, reeds/rushes, shrubs/bushes and trees (Groups 4-6) from sites with a low cover or absence of all vegetation types (Groups 1-3). Group 4 contained wetlands with low but even cover of all vegetation types, Group 5 wetlands had high coverage of grasses, with reeds/rushes, shrubs/bushes and trees also present. Group 6 contained wetlands with extensive cover of reeds/rushes and moderately high cover of grasses, shrubs/bushes and trees. Wetlands containing samphire were restricted to Groups 2-4 while Groups 4 and 6 contained the highest cover of dead trees.

4.3.4 Division of environmental variables into classes

The number of wetlands in each class of each environmental variable are listed in Table 4.7 and the maximum and minimum values for variable are listed in Appendix 5. Generally, variables exhibited large ranges across the 251 wetlands. For instance, salinity ranged from 0.03 to 153.2 ppt TDS, pH from 3.04 to 11.03, DO from 5.5 to 200% saturation, temperature from 3.6 to 44.8°C, turbidity from 0 to 360 NTU, colour from 0 to 46 000 TCU, total-P from 0 to 50 mg l^{-1} and chlorophyll *a* from 0 to 1.97 mg l^{-1}. The number of sites in each class showed that the distributions of some environmental variables were highly skewed (Table 4.7). For example, the majority of wetlands had a low salinity (<1.0ppt TDS), no aquatic macrophyte, no fish, no samphire or dead trees, no buffer strip and <1 ha of emergent vegetation.

4.3.5 Wetland classification on environmental variables

Classification of wetlands on environmental variables produced six groups (Figure 4.2). Wetland membership of the groups is shown in Table 4.8. The majority of environmental variables demonstrated significant differences between UPGMA groups (Table 4.9). Ordination gave an optimum solution of four dimensions with a stress of 0.1089. Superimposing the six groups from the UPGMA classification on the SSH ordination resulted in a relatively poor separation of site groupings in ordination space, although Groups 1-3 tended to separate from 4-6 on Vector 1 and Vector 2 (Figure 4.3).

Calculating maximum linear correlations showed that with the exception of chlorophyll *a*, phaeophytin and percentage cover of samphire, all environmental variables were significantly correlated with wetland position in ordination space (Figure 4.4). Coefficients were >0.9 for macrophyte cover, area, percentage buffered, buffer width, and area of closed water (Table 4.10). Some variables were correlated in the same direction in ordination space (Figure 4.4), which suggested inter-dependencies in the data. For example, depth (1) and permanence (34) had the same alignment on Vector 1 by Vector 2 (Figure 4.4a,b) and Vector 1 by Vector 3 of the ordination (Figure 4.4c,d). The same applied to area (17), shoreline (18) and area of open water (36).

4.3.6 Comparison of wetland classification with pre-defined wetland types

When the seven pre-defined wetland types were superimposed on the ordination of wetlands on all environmental data, they were poorly separated in ordination space (Figure 4.5). Drains, river sections and artificial wetlands showed some separation from

Table 4.7 Number of surveys when values of environmental variables fell into the various classes recognized for each environmental variable

Variable	Classes 1	2	3	4	5	6	7	8	9
Depth (m)	0-0.3	0.3-0.5	0.5-1.0	>1.0					
	274	236	510	552					
Salinity (ppt)	<1	1-3	3-10	10-25	>25				
	983	295	207	63	23				
pH	<5.5	5.5-6.5	6.5-7.5	7.5-8.5	8.5-9.5	>9.5			
	51	90	594	510	247	78			
Temp (°C)	<16	15-20	20-25	>25					
	426	516	360	265					
DO (% sat.)	0-50	50-75	75-100	100-150	>150				
	196	300	546	422	104				
Macrophyte cover (%)	0	0-10	10-50	>50					
	1057	149	135	230					
Macrophyte	0	0-20	20-100	>100					
biomass (g dry wt m^{-2})	1057	205	190	116					
Fish abundance	0	1	2	>2					
	918	361	187	105					
Zooplankton (g dry wt)	<0.001	0.001-0.01	0.01-0.1	>0.1					
	287	234	444	472					
Wading zone (m)	0	0-10	10-100	>100					
	403	612	427	130					
Turbidity (NTU)	0-2.5	2.5-5.0	5.0-10.0	>10					
	419	137	106	91					
Colour (TCU)	0-50	50-100	100-300	>300					
	234	148	208	165					
Total-N (mg l^{-1})	0-0.6	0.6-1.5	1.5-2.5	>2.5					
	78	217	201	258					
Total-P (mg l^{-1})	0-0.015	0.015-0.03	0.03-0.1	>0.1					
	172	92	198	293					
Chl *a* (mg l^{-1})	0-0.003	0.003-0.01	0.01-0.03	>0.03					
	221	265	141	126					
Phaeophytin (mg l^{-1})	0-0.0015	0.0015-0.003	0.003-0.006	>0.006					
	347	129	131	146					
Area (ha)	0-1.0	1-10	10-50	>50					
	59	120	46	26					
Shoreline (m)	<500	500-1000	1000-3000	>3000					
	61	48	103	29					
Vegetation cover (%)	<10	10-25	25-75	>75					
	41	59	66	85					
Grasses cover (%)	0	0-25	>25						
	79	125	47						
Reeds/rushes cover (%)	0	0-25	>25						
	62	145	44						
Samphire cover (%)	0	>0							
	234	17							
Shrubs/bushes cover (%)	0	0-25	>25						
	52	168	31						
Trees cover (%)	0	0-25	>25						
	92	127	31						
Dead trees cover (%)	0	>0							
	184	67							

Table 4.7 (cont'd)

Variable	Classes								
	1	2	3	4	5	6	7	8	9
Vegetation types	0-1	2-3	4	5-6					
	28	110	78	35					
Islands (p/a)	0	1							
	206	45							
Percent buffered	0	0-45	45-90	>90					
	124	31	63	33					
Buffer width (m)	0	0-20	20-100	>100					
	124	41	48	38					
Buffer pristine (%)	0	0-50	>50						
	202	21	28						
Disturbance (#)	1-2	3	4	5					
	31	41	61	118					
Drains (#)	0	1	>2						
	125	97	29						
Geometry type	Elongate	Irregular	Linear	Ovoid	Round	Sinuous	Straight		
	23	62	31	58	44	16	17		
Distance	<1	1-5	5-20	>20					
to coast (km)	18	57	133	43					
Permanence (#)	0-4	5-7	8						
	17	130	104						
Closed water (ha)	<1.0	1.0-10	>10						
	122	89	40						
Open water (ha)	0	0-1.0	1.0-10	>10					
	33	97	83	38					
Grasses cover (ha)	0	0-1	1-5	>5					
	79	127	27	18					
Reeds/rushes cover (ha)	0	0-1	1-5	>5					
	62	125	39	25					
Samphire cover (ha)	0	>0							
	234	17							
Shrubs/bushes cover (ha)	0	0-0.5	0.5-2.0	>2.0					
	52	127	35	37					
Trees cover (ha)	0	0-0.5	0.5-2.0	>2.0					
	92	88	36	35					
Dead trees cover (ha)	0	>0							
	184	67							
Vegetation complex	1	2	3	4	5	6	7	8	9
	40	30	20	18	28	25	41	38	11
Vegetation	1	2	3	4	5	6			
UPGMA groups	35	71	16	71	16	26			

permanent, seasonal and winter-wet areas, however, on Vector 1 by Vector 3.

4.3.7 Comparison of wetland classification on environmental variables with Semeniuk's (1988) geomorphic classification

The wetlands studied during Scopewest were situated on eleven of the 14 geomorphic settings identified by Semeniuk (1988); Bassendean Dunes (*N*=32), Bassendean-Pinjarra transition (*N*=59), Darling Plateau (*N*=9), Dandaragan Plateau (*N*=3), Estuaries (*N*=30), Pinjarra Plain (*N*=29), Quindalup Dunes (*N*=5), Coastal Plain Rivers (*N*=38), Spearwood Dunes (*N*=22), Spearwood/ Bassendean interface, (*N*=18) and Yoongarillup Plain (*N*=3) (Appendix 5). Hurstview Lake, Karakin Lake and Namming

Table 4.8 Wetland composition of the six sub-groups produced by UPGMA classification of wetlands on environmental data.

GROUP: 1	**43 Wetlands**									
ABER	BALP	BEL	CARE	CARI	COD2	COPO	CORX	CRAG	CRAM	CURT
DUCK	FOLM	FREE	GINN	GOLD	GOYA	HEND	HOPE	HYDE	JULI	KARD
LIMA	LMOG	MANL	MAYC	MCDO	MOGU	MUSS	PERR	PINR	ROBE	ROCK
RONS	ROSA	SCEW	SWAN	THOM	USWA	WEEB	WILD	WRIG	WSWR	
GROUP: 2	**20 Wetlands**									
AUST	BALL	BARL	BEEL	BLAC	BLYT	DEEP	DILS	GIN3	HERD	HOLM
HURS	JAME	JAND	LAKS	MANR	MONG	PUNC	ROGE	WALL		
GROUP: 3	**54 Wetlands**									
AIRD	BALD	BAMD	BAMW	BEES	BRO2	CAMP	CANC	CARR	COD1	COO1
COO2	COR1	COR2	CULC	EVER	FIS1	FIS2	FIS3	FISS	FORL	FORT
GIB1	GIB2	GIN2	GIN4	GIN5	GINE	GOSS	HAR1	JOHN	KARW	KING
LAKE	LEED	MANS	MIL1	MIL2	MIL3	MILS	MONI	MUCR	NICO	NROS
OLDB	PAU1	PEHA	SERD	STOK	TAWA	THOS	WHIT	WIGI	YOUN	
GROUP: 4	**51 Wetlands**									
ADEN	ALCO	ALFR	ASHF	BEEN	BIGC	BLAL	BLUE	BODK	BOGG	CANW
CARS	CLAR	COOG	COR3	DEVI	EAST	FIS4	FOOT	GIBB	GIN1	GOEG
GREE	GREY	GWEL	HAR2	HEBB	JOO1	KEMS	KEOG	MARY	MATH	MAYW
MEAR	MOOR	MTBR	NICM	NICS	NINE	PARR	PELI	PINE	SAND	SCEE
STAR	TALB	TANG	WART	WCOR	WILS	YUND				
GROUP: 5	**36 Wetlands**									
AIPS	BAML	BARS	BENG	BIBR	BOOG	CARA	CHAS	CHIT	CLIS	COOO
ELLE	FORR	GNAL	GNAR	GOOL	JOO2	JOON	KARA	KEMP	KOGO	LOCH
MARI	MCLA	MEAL	NAMM	NEER	NGIB	NLAK	NOWE	PEPP	PIPI	SPEC
THOL	WANN	YANG								
GROUP: 6	**37 Wetlands**									
ALEX	AMIE	BAYS	BULL	CANF	CLIB	COOC	COOS	COWA	CREA	DIAM
EAGL	FOLP	FREM	GANS	GANY	GIBA	GINJ	GINL	GLOV	GOBB	GOOD
GUNG	HAZE	KAWI	KENT	LANC	MARA	MARR	MAYF	NOON	PINB	RIVD
RIVF	WATE	WILC	YOND							

Lake were outside the extent of mapping and were not allocated to a geomorphic setting. Wetlands in each geomorphic setting demonstrated no observable pattern of separation in ordination space when superimposed on Vector 1 by Vector 2 (Figure 4.6). The same applied with other SSH vectors.

4.4 Discussion

4.4.1 Inter-dependencies and processes in environmental data

The analyses demonstrated many significant correlations among environmental variables, indicating inter-dependencies in the data. Some inter-dependencies were between measured variables and variables derived from them. For instance, wetland area was correlated with area of each vegetation type after percentage cover had been converted to area of cover; area of open and closed water were similarly correlated with wetland area, although wetland area was not correlated with percentage cover of vegetation (i.e. large wetlands often had a low percentage cover of emergent vegetation and small wetlands often had a high percentage cover). Other inter-dependencies were between

Table 4.9 Analysis of differences in environmental variables between the six UPGMA groups. Transformations are presented in parentheses. Tukey's HSD tests were used to locate significantly different groups; groups that were not significantly different are underlined. For Kruskal-Wallis tests, groups are ranked in descending order. F/Chi-squared values, significance levels and group means are presented for each variable (*, P<0.05; **, P<0.01; ***, P<0.001; ns, not significant)

Environmental variable	F/Chi-value	Significance level	Group order and group mean										
Anova							Tukey's HSD						
Area (log)	92.71	***	5 115.7	>	2 40.8	>	4 9.1	>	6 2.6	>	3 2.4	>	1 1.4
Vegetation cover (arcsine)	21.97	***	3 0.71	>	2 0.58	>	4 0.54	>	5 0.52	>	6 0.24	>	1 0.13
Open water (log)	39.24	***	5 79.4	>	2 18.8	>	4 5.0	>	6 2.2	>	1 1.3	>	3 0.5
Closed water (log)	88.98	***	5 36.3	>	2 21.9	>	4 4.0	>	3 2.0	>	6 0.5	>	1 0.1
Grasses cover (ha) (log)	15.74	***	5 4.7	>	2 1.7	>	3 1.5	>	4 0.5	>	1 0.1	>	6 0.1
Reed/rush cover (ha) (log)	33.17	***	5 18.0	>	2 16.1	>	4 1.4	>	3 0.3	>	6 0.2	>	1 0.1
Samphire cover (ha) (log)	8.24	***	4 0.39	>	6 0.01	>	1 0.0	>	3 0.0	>	5 0.0	>	2 0.0
Shrub/bush cover (ha) (log)	30.95	***	5 8.2	>	2 2.6	>	4 1.4	>	3 0.3	>	6 0.1	>	1 0.1
Tree cover (ha) (log)	31.87	***	5 8.7	>	2 1.7	>	4 0.8	>	6 0.3	>	3 0.1	>	1 0.1
Dead tree cover (ha) (log)	5.38	***	5 1.2	>	2 0.5	>	4 0.1	>	6 0.1	>	3 0.1	>	1 0.1
Grasses cover (%) (arcsine)	27.29	***	3 0.50	>	5 0.10	>	2 0.09	>	4 0.09	>	1 0.04	>	6 0.02
Reed/rush cover (%) (arcsine)	4.95	***	2 0.24	>	5 0.18	>	4 0.15	>	6 0.10	>	3 0.09	>	1 0.05

Table 4.9 (cont'd)

Environmental variable	F/Chi-value	Significance level	Group order and group mean
Samphire cover (%) (arcsine)	6.21	***	4 > 6 > 1 > 5 > 2 > 3 0.08 0.01 0.01 0.0 0.0 0.0
Shrub/bush cover (%) (arcsine)	2.94	*	5 > 4 > 2 > 3 > 6 > 1
Tree cover (%) (arcsine)	2.31	*	2 > 4 > 5 > 6 > 3 > 1 0.16 0.13 0.13 0.09 0.06 0.04
Dead tree cover (%) (arcsine)	2.21	ns	
Simpsons Diversity Index	17.03	***	4 > 6 > 5 > 2 > 3 > 1 2.23 2.14 1.92 1.81 1.45 1.25
Turbidity (log)	5.91	***	1 > 6 > 5 > 2 > 4 > 3 7.6 6.8 4.7 4.9 3.4 5.5
Colour (log)	10.74	***	3 > 4 > 2 > 6 > 5 > 1 429 632 388 217 133 109
Total-N (log)	4.65	***	5 > 3 > 4 > 2 > 1 > 6 3.13 2.80 2.77 2.78 2.34 1.81
Total-P	1.73	ns	
Chl *a*	0.61	ns	
Phaeophytin	0.54	ns	
Permanence (log)	14.84	***	6 > 1 > 5 > 4 > 2 > 3 7.7 7.3 6.9 6.1 5.7 5.0
Depth (log)	9.73	***	6 > 5 > 1 > 2 > 4 > 3 1.22 1.04 0.89 1.19 0.62 0.37
Salinity (log)	7.52	***	4 > 6 > 1 > 2 > 5 > 3 4.62 2.60 2.27 2.39 2.37 0.57

Table 4.9 (cont'd)

Environmental variable	F/Chi-value	Significance level	Group order and group mean					
pH	0.63	ns						
Temperature	4.51	***	1 >	5 >	4 >	6 >	2 >	3
			19.7	19.3	19.0	18.7	18.4	17.8
Dissolved oxygen (% sat)	3.37	***	1 >	4 >	5 >	3 >	6 >	2
			98.6	93.6	88.2	87.7	83.9	76.4
Macrophyte cover (%) (arcsine)	17.05	***	3 >	4 >	5 >	1 >	6 >	2
			34.5	24.1	15.3	5.4	2.5	1.7
Macrophyte biomass (log)	18.58	***	3 >	4 >	5 >	1 >	6 >	2
			7.44	6.59	4.83	1.69	1.76	0.44
Fish abundance (log)	19.37	***	6 >	1 >	5 >	4 >	2 >	3
			1.06	0.93	0.71	0.46	0.39	0.17
Zooplankton biomass	4.06	***	2 >	5 >	4 >	3 >	1 >	6
			0.77	0.24	0.22	0.20	0.14	0.08
Wading zone (log)	12.00	***	4 >	3 >	5 >	2 >	1 >	6
			35.3	32.3	50.9	26.6	12.5	3.9
Shoreline (log)	43.27	***	5 >	2 >	4 >	6 >	1 >	3
			4036	2273	1263	781	744	674
Vegetation types	22.74	***	4 >	5 >	6 >	2 >	3 >	1
			4.0	3.6	3.6	3.6	2.5	2.0
Buffer width (log)	189.22	***	5 >	4 >	6 >	3 >	1 >	2
			62.4	59.9	48.6	0.0	0.0	0.0
Percent buffered (arcsine)	58.91	***	6 >	5 >	4 >	3 >	1 >	2
			0.65	0.65	0.53	0.0	0.0	0.0
Buffer pristine (%) (arcsine)	6.21	***	6 >	4 >	5 >	2 >	1 >	3
			0.21	0.17	0.19	0.0	0.0	0.0
Disturbance	25.76	***	1 >	3 >	2 >	6 >	4 >	5
			4.9	4.7	4.4	3.5	3.5	3.3
Drains (log)	2.88	*	5 >	1 >	4 >	6 >	2 >	3
			0.97	0.88	0.71	0.54	0.70	0.42

Table 4.9 (cont'd)

Environmental variable	F/Chi-value	Significance level	Group order and group mean										
Distance to coast	5.11	***	2 15.7	>	3 12.7	>	6 11.7	>	5 12.0	>	1 13.2	>	4 7.3
Kruskal-Wallis													
Islands	11.47	*	1 0.33	>	5 0.26	>	2 0.20	>	6 0.14	>	3 0.13	>	4 0.08
Vegetation complexes (ranked)	29.74	***	3 6.7	>	6 5.3	>	1 5.2	>	4 4.6	>	2 4.6	>	5 4.3
UPGMA vegetation groups (ranked)	112.68	***	1 4.6	>	3 4.4	>	6 3.9	>	4 3.3	>	2 2.6	>	5 1.7

functionally related variables. For example, area and shoreline were highly correlated because large wetlands must have a long shoreline. Larger wetlands tended to have a large number of vegetation types. Chlorophyll *a* and phaeophytin levels were positively correlated because phaeophytin is a degradation product of chlorophyll *a*.

Relationships between some variables were process-related. Highly coloured wetlands tended to have high nutrient levels because colour reduces penetration of photosynthetically active light and, therefore, limits growth of the algae that normally utilise the nutrients (Wrigley *et al.* 1988; Davis *et al.* 1993). The correlation between pH, DO and chlorophyll *a* was related to the presence of algal blooms in eutrophic wetlands; as phytoplankton activity increases more carbon dioxide is consumed, the amount of DO increases and pH tends to increase. There was an inverse relationship between pH and colour because colour is due to humic and fulvic acids, which have low pH (Davis *et al.* 1993).

Zooplankton biomass was correlated with nutrient levels, chlorophyll *a* and phaeophytin levels, indicating that eutrophic wetlands support high invertebrate biomass (Hanson and Peters 1984; Rasmussen and Kalff 1987; Growns *et al.* 1992). The high biomass of zooplankton in some coloured wetlands may have been in part related to prey detectability, whereby feeding efficiency of fish and waterbirds decreased in coloured waters. A similar effect has been reported for fish-eating birds from Swedish lakes (Eriksson 1985).

Previous studies in which many environmental variables were measured employed techniques such as factor analysis to reduce the number of variables (Green and Vascotto 1978; Gauch 1982; Boulton and Lake 1990). These techniques derive factors that summarise the information contained in several inter-dependent variables into one new

Table 4.10 Correlation coefficients for environmental variables in SSH ordination space (*, $P<0.001$; ns, not significant). Numbers refer to labels in Figure 4.3

No.	Environmental variable	Correlation coefficient	Significance level
1	Depth	0.6430	*
2	Salinity	0.3977	*
3	pH	0.5498	*
4	Temperature	0.5293	*
5	DO	0.6722	*
6	Macrocover	0.9340	*
7	Macrobiomass	0.8996	*
8	Fish abundance	0.6111	*
9	Zooplankton	0.2915	*
10	Wading zone	0.7036	*
11	Turbidity	0.3718	*
12	Colour	0.4867	*
13	Total-N	0.3671	*
14	Total-P	0.4366	*
15	Chl *a*	0.1667	ns
16	Phaeophytin	0.1082	ns
17	Area	0.9606	*
18	Shoreline	0.8799	*
19	Vegetation cover	0.8439	*
20	Grasses (%)	0.6402	*
21	Reeds/rushes (%)	0.3935	*
22	Samphire (%)	0.1571	ns
23	Shrubs/bushes (%)	0.4454	*
24	Trees (%)	0.4929	*
25	Dead trees (%)	0.2402	*
26	Vegetation types	0.5830	*
27	Islands	0.2273	*
28	Percent buffered	0.9443	*
29	Buffer width	0.9534	*
30	Buffer pristine	0.6852	*
31	Disturbance	0.6738	*
32	Drains	0.3129	*
33	Distance to coast	0.2300	*
34	Permanence	0.7391	*
35	Closed water (ha)	0.9261	*
36	Open water (ha)	0.8920	*
37	Grasses (ha)	0.6385	*
38	Reeds/rushes (ha)	0.7473	*
39	Samphire (ha)	0.2409	*
40	Shrubs/bushes (ha)	0.7181	*
41	Trees (ha)	0.6596	*
42	Dead trees (ha)	0.3907	*

variable. The approach has disadvantages, however, in that the new variable often explains less variation than the original variables and the meaning of the new variable is not always apparent, especially when it is derived from several seemingly unrelated variables. Most importantly for wetland managers, the new variable is a pseudo-variable that cannot be manipulated in the field, whereas the original variables represent real habitat attributes that a manager can change. For these reasons factor analysis was not used.

4.4.2 Wetland classifications

Classification of wetlands using all derived and measured environmental variables produced relatively well separated groups and demonstrated a range of environmental gradients between the groups. The variables that appeared to have most influence on the classification were associated with wetland area, amount of submerged macrophyte and extent of buffer vegetation.

There was minimal separation of the seven pre-defined wetland types in the ordination of wetlands by environmental variables. This suggests that there is either a high degree of overlap in environmental conditions between the seven types or the environmental data used in the ordination do not adequately describe the physical, chemical and morphological characteristics of the seven wetland types. The former explanation is most likely.

Semeniuk (1988) identified 14 geomorphic settings that she sub-divided into 42 consanguineous wetland suites. Wetlands in Scopewest were allocated to the geomorphic settings rather than the consanguineous wetland suites because of the relatively small number of wetlands (251) compared with the high number of consanguineous wetland suites (42), which would have resulted in small sample sizes in many suites. There was no detectable separation of geomorphic settings in the ordination of wetlands by environmental variables. The lack of concordance between the Scopewest classification and the higher level of the Semeniuk (1988) classification reflects differences in the types of data used. Each classification may be equally appropriate for its expected use but they appear to have limited applicability to other purposes.

5 Waterbird Usage of Swan Coastal Plain Wetlands in Relation to Environmental Characteristics

5.1 Introduction

Data presented in Chapters 3 and 4 on waterbird usage and environmental characteristics of Swan Coastal Plain wetlands are combined and analysed in this chapter to determine how waterbird use is influenced by environmental characteristics. The specific aims (see Chapter 2) were:

(1) to identify the characteristics (e.g. vegetation structure, water quality) that make a wetland a good or poor example of its type in terms of waterbird usage

(2) to predict the effect of changes in a wetland, particularly with regard to water depth, on its use by and value for waterbirds.

Waterbird use of wetlands can be associated with many variables. For instance, number of waterbird species in a wetland has been shown to be related to complexity of vegetation structure (Sillen and Solbreck 1977; Gibbs *et al.* 1991; Halse *et al.* 1993) and breeding success is higher if there is suitable vegetation cover (Higgins *et al.* 1992). Numerous studies have shown that wetland size and shoreline complexity influence waterbird usage of wetlands (Patterson 1976; Sillen and Solbreck 1977; Nilsson and Nilsson 1978; Dwyer *et al.* 1979; Mack and Flake 1980; Godin and Joyner 1981; Ambrose and Fazio 1989; Gibbs *et al.* 1991; Genard and Lescourret 1992). Similarly, waterbird use of wetlands is affected by shoreline gradient (Joyner 1980; Abensperg -Traun and Dickman 1989; Barbera *et al.* 1990; Genard and Lescourret 1992). Food supply is another important determinant of waterbird usage. Some species of waterbirds prefer habitat dominated by submerged aquatic macrophytes (Knight 1965; Courcelles and Bedard 1979) and utilise the plant material as a food source (Frith *et al.* 1969; Halse 1985). Invertebrate biomass and diversity (Danell and Sjoberg 1977; Street 1977; Joyner 1980; Murkin and Kadlec 1986; Giles 1990; Euliss *et al.* 1991) and the abundance of fish (Eriksson 1984; Kersten *et al.* 1991) also influence waterbird usage. Quality and quantity of water are important. Nutrient status (Patterson 1976; Nilsson 1978; Nilsson and Nilsson 1978; Murphy *et al.* 1984; Swanson *et al.* 1988; Barbera *et al.* 1990), pH (Eriksson 1984, 1987; Goodsell 1990; Parker *et al.* 1992) and salinity (Missen and Timms 1974; Halse 1987; Goodsell 1990; Moorman *et al.* 1991; Halse *et al.* 1993) affect waterbird usage, as do water depth (Broome and Jarman 1983) and changes in water level (Fleskes and Klaas 1991; Post and Seals 1991).

Waterbird use of wetlands in relation to environmental characteristics was examined by (1) classifying wetlands into groups with similar waterbird communities and comparing their environmental characteristics, (2) determining classes of environmental variables with which each species was associated, (3) estimating the importance of different types of wetland for populations of, and breeding by, certain common waterbird species, and (4) modelling relationships between waterbird usage and environmental characteristics of wetlands. Models are useful for managers if close relationships exist between dependent and independent variables because they show which environmental variables have most influence on waterbirds.

5.2 Methods

5.2.1 Classification and ordination of waterbird data

Using waterbird data, wetlands were classified by UPGMA and ordinated by SSH. Initially, data from each year of Scopewest were treated separately, but clearer patterns were evident when the two years were combined. Only results from analysis of combined years are presented. Analyses were performed on presence/absence and abundance data, using the mean abundance of each species at each wetland. When calculating means, an abundance value of zero was used for sites that were dry. Sites that contained two or fewer species and species that occurred on only one occasion were omitted from the analyses. Abundance data were square-root transformed and dissimilarity between each pair of wetlands was calculated using the Bray-Curtis association measure. The distribution of dissimilarity measures was checked for normality and prior to clustering the under-estimated measures were re-calculated using the shortest path method. Ordinations and classification were implemented using program options outlined in Chapter 4. Ordinations of presence/absence and abundance data were compared using Procrustes Rotation. Classifications were compared by calculating group fidelity, which was the percentage of sites that belonged to the same UPGMA group in both classifications.

To compare results of classifications and ordinations within each dataset the groups produced by UPGMA were superimposed on the ordination scatter plots. Gradients in species richness, waterbird abundance, number of breeding species and number of clutches and broods within the ordination space were calculated. Differences in these parameters between UPGMA groups at the three-group level were examined by one-way ANOVA. Square root and log(x+1) transformations were applied to achieve homoscedasticity of sample variances, as determined using Cochran's C test. The influence of each waterbird species (N=61) on the ordinations was determined by calculating maximum linear correlations within the ordination space. This was performed on the combined abundance dataset.

5.2.2 Waterbird usage in relation to environmental variables

The importance of environmental characteristics of the wetlands in determining waterbird usage was examined by calculating maximum linear correlations for each variable in the SSH ordination space of the abundance dataset. Direction and strength of these gradients were compared to gradients in waterbird community parameters (species richness, waterbird abundance, number of breeding species and breeding activity) in the same ordination space. Prior to calculating correlations between waterbird parameters and vegetation complexes or UPGMA vegetation groups (see Chapter 4), the complexes and groups were ranked in order of species preference using Chi-squared contingency table analysis (Zar 1974). The complex and group that were preferred by most species were ranked 1 (Table 5.1).

The significance of differences in each environmental variable between the groups of wetlands produced by UPGMA classification of the abundance dataset were tested by one-way analysis of variance. Tukey's studentized range tests (HSD) were used to locate between-group differences if ANOVAs were significant.

The similarity of wetland classifications produced using waterbird abundance and environmental variables was examined by, firstly, superimposing the six groups of wetlands produced by UPGMA classification of environmental data on the SSH ordination of sites by waterbirds and, secondly, superimposing the three groups produced by UPGMA classification of waterbirds on the SSH ordination by environmental data. The two SSH ordinations of wetlands, on waterbird data and on environmental variables, were compared using Procrustes Rotation.

5.2.3 Waterbird usage in relation to pre-defined wetland types

To determine whether the seven pre-defined wetland types (*viz.* artificial wetlands, drains, estuarine lagoons, permanent wetlands, river sections, seasonal wetlands, winter-wet areas) were utilised by different communities of waterbirds the wetland types were superimposed on the SSH ordinations of wetlands on waterbird presence/absence and abundance. It was expected that the seven wetland types would be separated in ordination space if different communities of waterbirds were utilising different wetland types.

5.2.4 Waterbird usage in relation to Semeniuk's (1988) geomorphic classification

To determine whether the geomorphic settings used by Semeniuk (1988) to classify wetlands (see Chapter 4 and Appendix 5) were utilised by different communities of waterbirds the settings were superimposed on the SSH ordinations of wetlands on waterbird presence/absence and abundance.

5.2.5 Waterbird species preferences for classes of environmental variables

The preferences of each species of waterbird for classes within each environmental variable (Table 4.7) were examined using Chi-squared contingency table analysis on presence/absence data. Deviation of the observed from the expected frequency (i.e. the preference of a species for some class(es) within a variable) was taken as significant if P<0.05. For tests that were significant, the preferred class within each environmental variable was determined as the class with the highest cell contribution to the Chi-squared statistic. Species preferences were calculated for variables that were measured only once by reducing species occurrence data to presence/absence at each site (N=251). For variables that were measured four times between October 1990 and July 1991, only species occurrence data from those survey periods were used (N=1004). For variables measured each survey, all species occurrence data were used (N=2008).

5.2.6 Breeding species preferences for classes of environmental variables

Chi-squared contingency table analysis was used to examine preferences of breeding species for classes within each environmental variable, using the same approach as section 5.2.4. Breeding species preferences among variables measured each survey were calculated using species occurrence and matching environmental data from the breeding season each year (*viz.* July, October 1990/91 and July, October 1991, January 1992) (N=1255); January 1992 was included in this analysis because a considerable amount of breeding was observed during that survey period (see Chapter 3). Breeding species preferences among variables measured for one year were calculated using periods for which breeding data were available (October 1990 and July 1991)(N=502). For variables measured only once, species breeding data were reduced to presence/absence of breeding at each site (N=251).

5.2.7 Comparison of waterbird usage of permanent and seasonal wetlands

Permanent and seasonal wetlands were classified and ordinated using waterbird abundance data and UPGMA and SSH. The pre-defined wetland types and the derived UPGMA wetland groups were superimposed on SSH ordination space; it was expected that permanent and seasonal wetlands would be separated in ordination space and in the UPGMA classification if they were utilised by different waterbird communities. Summer and autumn data were omitted from the abundance dataset because seasonal wetlands were dry at these times and, therefore, did not hold waterbirds.

Differences between permanent and seasonal wetlands, and between wetland groups produced by the UPGMA classification, in species richness, waterbird abundance, number of breeding species and breeding activity were compared using ANOVAs. Square-root and log(x+1) transformations were used to obtain homoscedasticity of sample variances. Tukey's studentized range tests (HSD) were used to locate significant between-sample differences. Gradients in these community parameters in the ordination space were determined by calculating maximum linear correlations. Significance of differences in environmental variables between wetland groups produced by UPGMA classification were examined using Kruskal-Wallis tests.

5.2.8 Assessment of the value of seasonal and ephemeral wetlands for waterbirds

The Swan Coastal Plain contains numerous small seasonal and ephemeral wetlands. A dominant and easily recognised subset of these wetlands are winter-wet areas (see Chapter 2). On an individual basis, winter-wet areas usually support few waterbirds. However, because they are abundant, it seemed desirable to assess the overall value of winter-wet areas, and seasonal wetlands, on a regional scale.

Wetlands on the Swan Coastal Plain were classified into seven types by Semeniuk (1987), *viz.* lakes, sumplands, damplands, floodplains, palusplains, rivers and creeks. These wetland types have been mapped on the Swan Coastal Plain and their areas calculated by WAWA. In consultation with Dr C. Semeniuk, the Semeniuk (1987) classsification was related to the pre-defined wetland types used in Scopewest and the total areas of permanent and seasonal wetlands and winter-wet areas on the coastal plain were estimated. Total population sizes of selected common species in October 1990 and October 1991 were determined for each wetland type by extrapolating results of the Scopewest study. Total breeding activity of the selected species over the two years was also extrapolated for each wetland type. Drains, river sections and estuarine lagoons comprised a relatively small proportion of wetland area, held few individuals of the selected species and were not mapped adequately enough by WAWA to allow meaningful extrapolations. Population estimates for each species on each wetland type were obtained by multiplying the total number of birds counted in spring of each year by the proportion that was surveyed of the total area of the wetland type on the Swan Coastal Plain.

As an indication of the accuracy of population estimates for the selected species, estimates from Scopewest were compared with estimates made for Gingin and Bunbury regions during Annual Waterfowl Counts in south-western Australia from 1988-91 (Halse *et al.* 1990;

1992; unpubl. data). The Gingin and Bunbury regions covered the Swan Coastal Plain and some adjacent areas (see Figure 1 in Halse *et al.* 1990).

5.2.9 Modelling waterbird usage of Swan Coastal Plain wetlands

Multiple discriminant analysis (MDA) and linear regression were used to model waterbird usage of Swan Coastal Plain wetlands. Both techniques look for relationships between waterbird use and environmental variables and are useful for wetland managers because they identify key environmental variables that influence waterbird usage. MDA used environmental variables to discriminate between groups of wetlands produced by UPGMA classification on waterbird data. If wetlands were allocated to the correct waterbird-based group by MDA, it suggests there was a close relationship between environmental parameters and waterbird usage.

Linear regression used environmental variables to account for variation in species richness between wetlands. If close relationships existed between waterbirds and environmental variables, then a high percentage of variation in species richness should be explained by regression. Prior to analysis, environmental variables and species richness were log-transformed.

5.3 Results

5.3.1 Classification and ordination of waterbird data

Classification and ordination of the combined dataset for the two years was performed with 241 wetlands and 61 species: 10 wetlands provided insufficient waterbird data and 18 species occurred on too few occasions for the analyses. UPGMA classification on presence/absence data produced nine sub-groups and three major groups (Figure 5.1), whereas abundance data produced eight sub-groups and three major groups (Figure 5.2). The subjective selection of three and not four major groups in the abundance classification avoided the division of Group 1 (109 wetlands) into two uneven sized groups (19 and 90 wetlands) containing similar wetlands that had a high degree of overlap in ordination space and were relatively poor in terms of waterbird usage. Wetland membership of the abundance-based groups is shown in Table 5.2. When the datasets were ordinated by

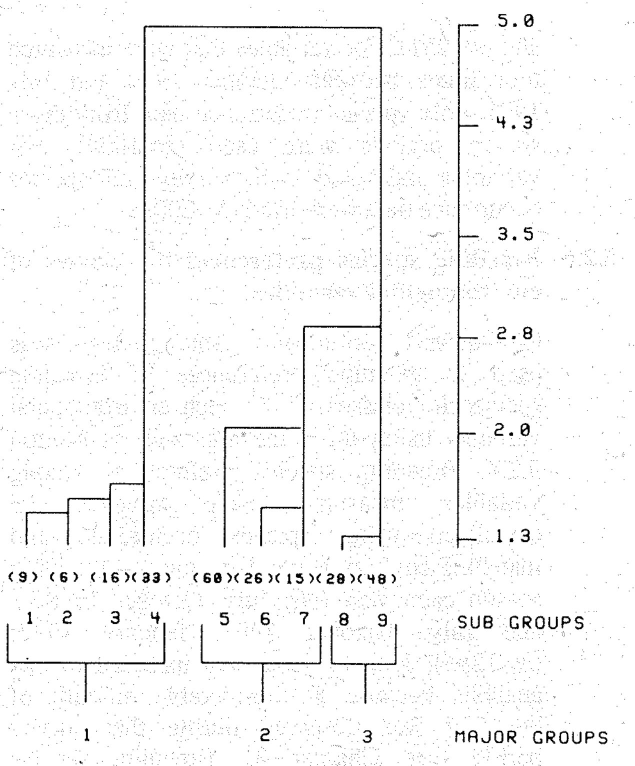


Figure 5.1 UPGMA classification of wetlands (N=241) by waterbirds (N=61) using presence/absence data. Number of wetlands in each group are presented in parentheses

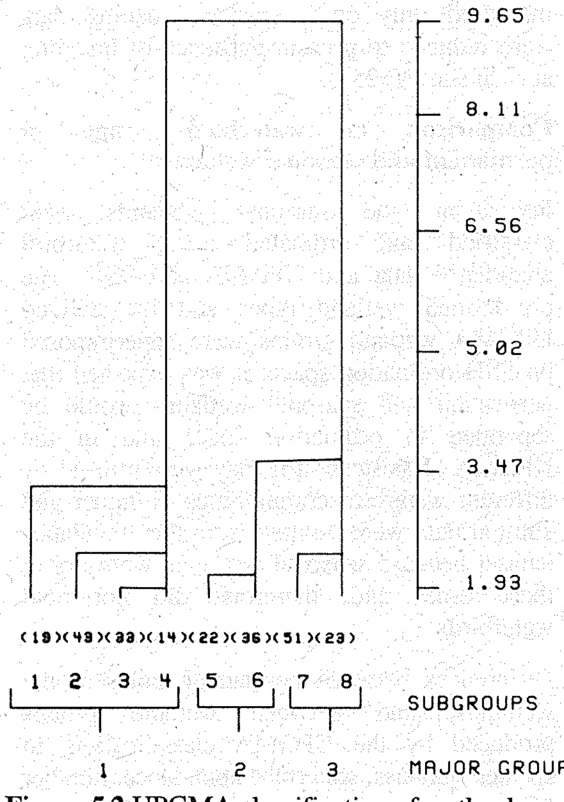


Figure 5.2 UPGMA classification of wetlands (N=241) by waterbirds (N=61) using abundance data (square root transformed). Number of wetlands in each group are presented in parentheses. Refer to Table 5.2 for group membership of each wetland

SSH, optimum solutions were obtained using four dimensions for both presence/absence and abundance data. Stress levels were 0.1489 and 0.1331, respectively. Stress levels below 0.15 are considered acceptable (Belbin 1991). Comparison of the two SSH ordinations by Procrustes Rotation, on unstandardized datasets, gave a Root Mean Square Residual of 0.719; this value ranges from 0 for identical datasets to 1 for no similarity. Group fidelity analysis demonstrated that 63% of wetlands classified to the same UPGMA group in both classifications. When UPGMA groups were superimposed on SSH ordinations for presence/absence (Figure 5.3) and abundance datasets (Figure 5.4), there was relatively good separation of groups in ordination space at the three-group level. Because better separation was obtained with the abundance dataset, subsequent analyses were based on waterbird abundance.

Number of species, abundance of waterbirds, number of breeding species and breeding activity at each wetland (all log(x+1) transformed) showed significant gradients in ordination space of the SSH ordination on abundance data with correlation coefficients of 0.893, 0.969, 0.677 and 0.682, respectively (Figure 5.5). In all cases highest values occurred in wetlands classed as Group 3 in the UPGMA classification and lowest values in Group 1 wetlands (Table 5.3).

The influence of each waterbird species on the ordination was examined by calculating maximum linear correlations within the ordination space (Table 5.4). All species, with the exception of the Freckled Duck, showed significant correlations. Gradients for the twenty most strongly correlated species are illustrated in Figure 5.6. These species were usually abundant and gradients for the majority ran in the same direction as the species richness and waterbird abundance gradients.

5.3.2 Waterbird usage in relation to environmental variables

Correlation coefficients for the 45 environmental variables in the species ordination space are presented in Table 5.5. The strongest gradients in the ordination space are illustrated in Figure 5.7. All variables, with the exception of Disturbance and Simpson's diversity index were significantly correlated within ordination space. Variables describing wetland area (area, length of shoreline, area of open water, area of closed water), water regime (depth, permanence), water quality (pH, chl *a*, total-N), emergent vegetation characteristics (ranked UPGMA vegetation groups, areas of grasses, reeds/rushes, shrubs/bushes and trees), width of wading zone and fish abundance had the highest correlation coefficients. Gradients for environmental variables related to wetland area and water permanence were in the same direction as species richness and number of waterbirds. Gradients for emergent vegetation characteristics and, to a lesser extent, water quality parameters were in the same direction in ordination space as number of breeding species and breeding activity (cf. Figures 5.5 and 5.7).

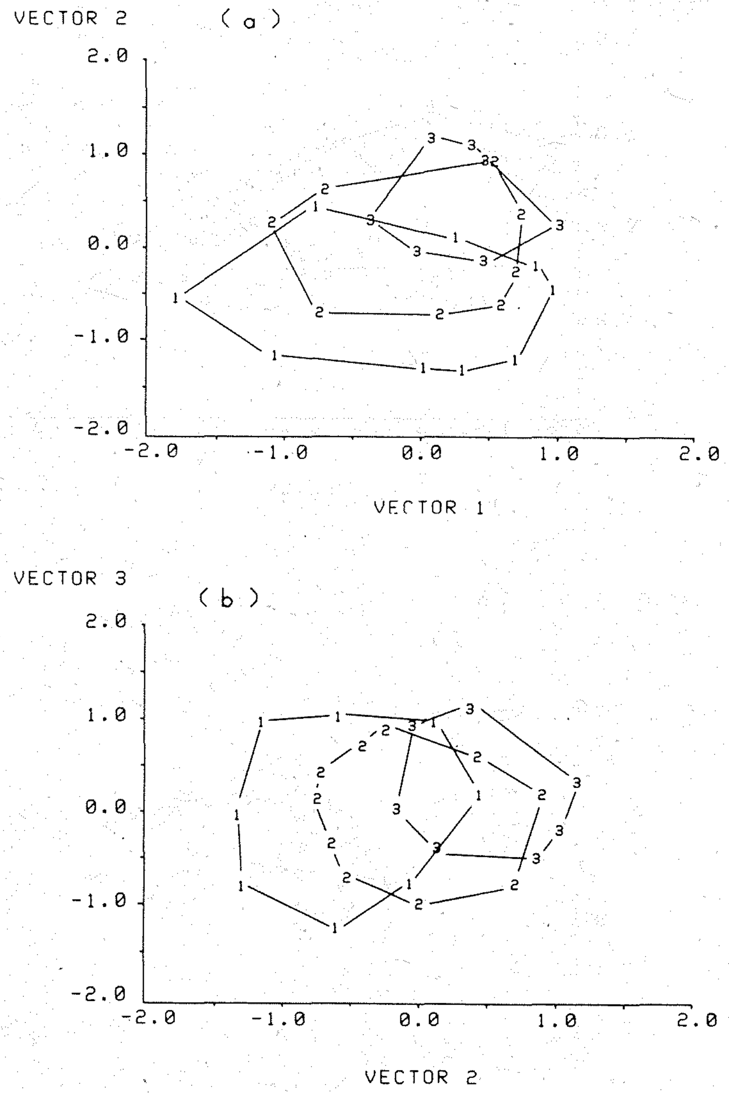


Figure 5.3 SSH ordination of wetlands (N=241) by waterbirds (N=61), with UPGMA groups superimposed on presence/absence data for (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3

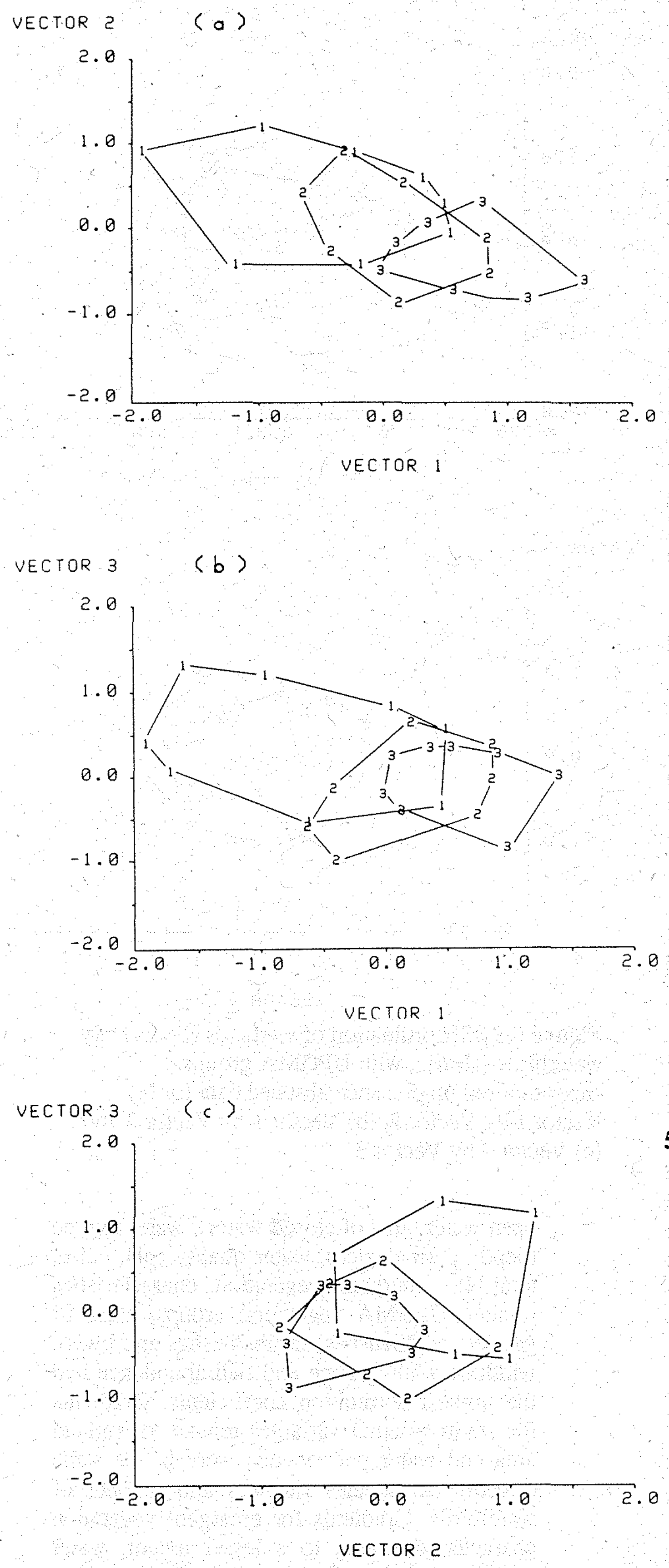


Figure 5.4 SSH ordination of wetlands (N=241) by waterbirds (N=61), with UPGMA groups superimposed on abundance data (square root transformed) for (a) Vector 1 by Vector 2 (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3

The majority of variables demonstrated significant differences between the three major groups identified by UPGMA analysis of the abundance dataset (Table 5.6). Variables describing wetland size (area, length of shoreline, area of open water, area of closed water), water regime (depth, permanence), vegetation characteristics (number of vegetation types, buffer width, areas of reeds/rushes, shrubs/bushes, trees and dead trees) and productivity (DO, pH, chl *a*) were significantly higher in Group 3 than Group 1, although many environmental variables did not differ significantly between Groups 1 and 2 or between Groups 2 and 3 (Table 5.6). The notable exceptions to the above trend were colour (wetlands in Group 1 were significantly more coloured than Group 3) and ranked UPGMA vegetation groups (Group 1 contained more wetlands with highly ranked (least preferred) vegetation types than Group 3).

There was minimal separation of wetland groups in ordination space when the six groups of wetlands produced by UPGMA of environmental data were superimposed on the SSH ordination of wetlands on waterbird abundance (Figure 5.8a) or when the three groups of wetlands produced by UPGMA of wetlands on waterbirds were superimposed on the SSH ordination of environmental data (Figure 5.8b). Procrustes rotation of the SSH ordinations of environmental on waterbird abundance data gave a Root Mean Square Residual of 0.931, indicating little similarity between the ordinations.

5.3.3 Waterbird usage in relation to pre-defined wetland types

There were few differences in waterbird communities of the seven pre-defined wetland types. Superimposing them on SSH ordinations of waterbird presence/absence (Figure 5.9) and abundance (Figure 5.10) showed extensive overlap between all groups although, in the abundance ordination there was a tendency for drains and river sections to position at the Group 1 end of the ordination and artificial wetlands and estuarine lagoons to lie in the Group 2 region. Other wetland types were scattered in a longitudinal array across ordination space.

5.3.4 Waterbird usage in relation to Semeniuk's (1988) geomorphic classification

There was little differentiation in waterbird communities of the eleven geomorphic settings

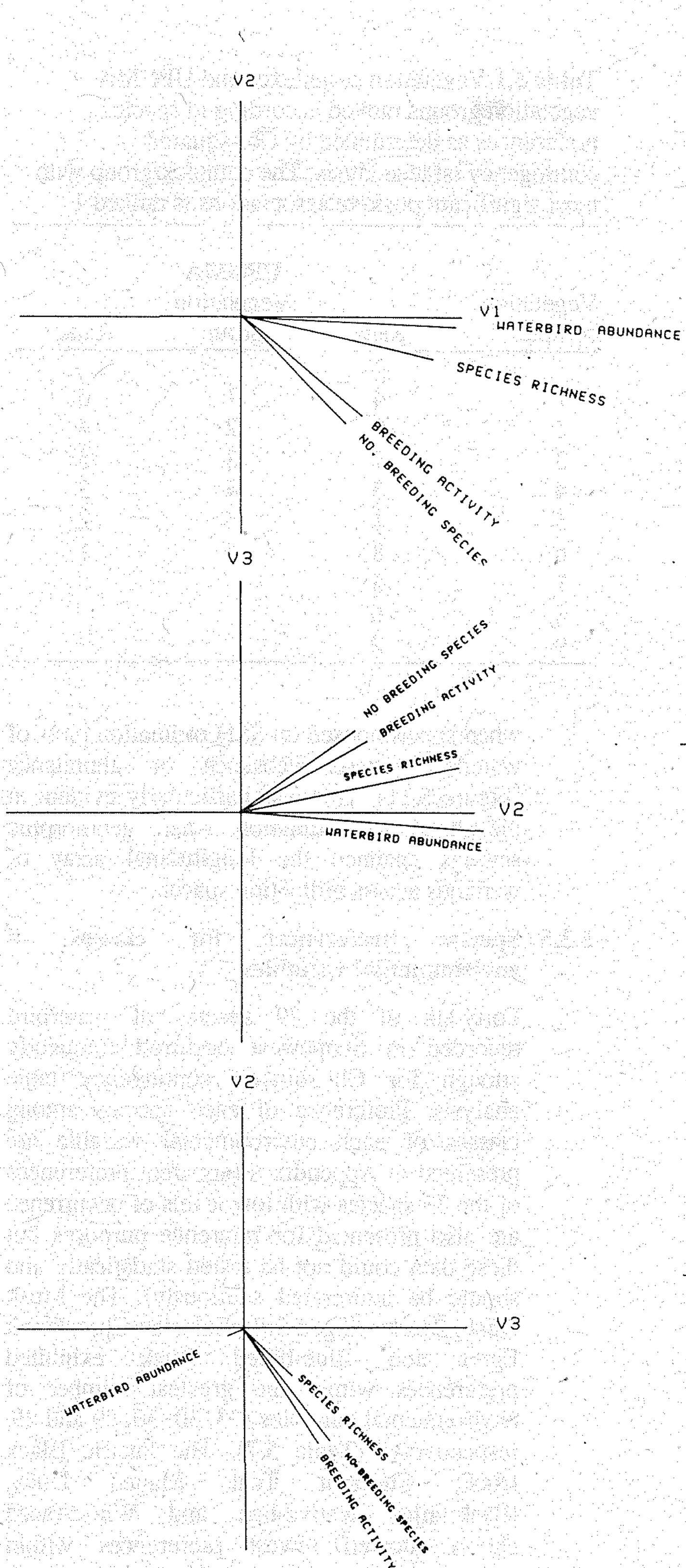


Figure 5.5 Direction and strength of maximum linear correlations of waterbird community descriptors in SSH ordination of waterbirds for Vectors 1, 2 and 3. (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3. In each instance the vector not shown runs perpendicular to the page

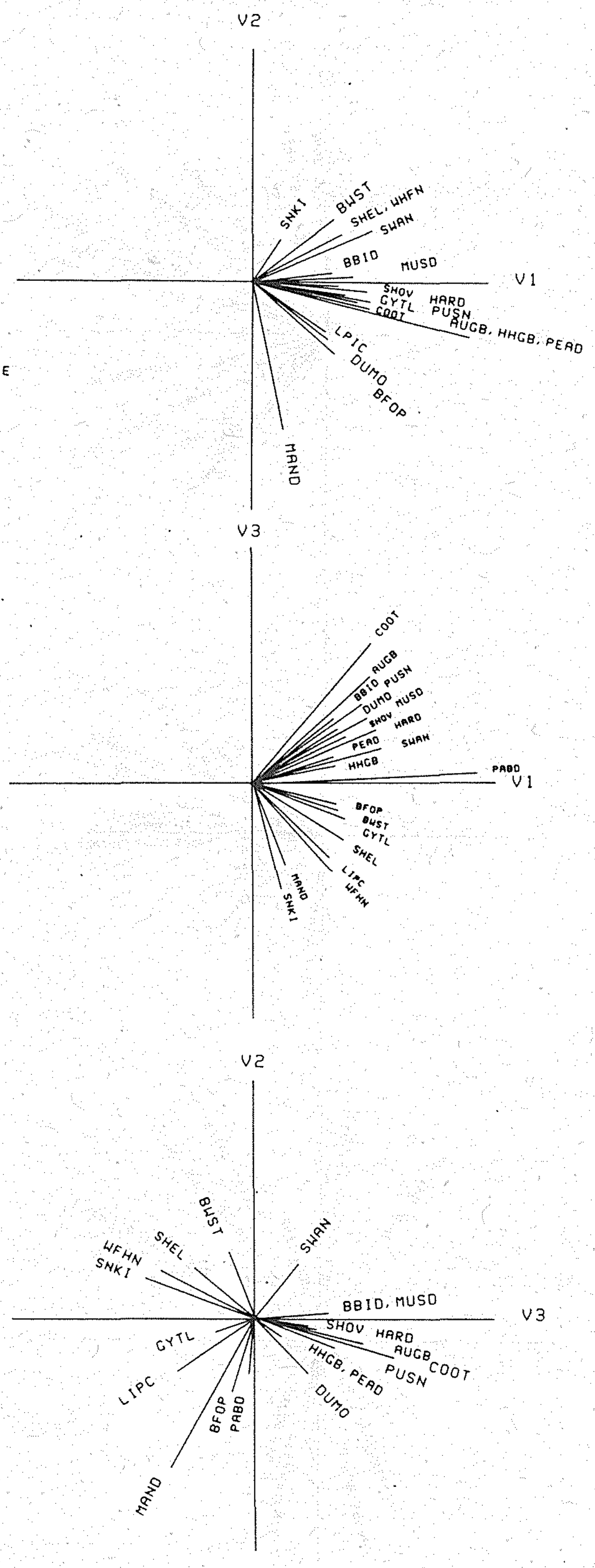


Figure 5.6 Direction and strength of maximum linear correlations of the highest ranking waterbird species in SSH ordination of waterbirds for Vectors 1, 2 and 3. (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3. In each instance the third vector is not shown, but runs perpendicular to the page. Refer to Table 5.4 for correlation coefficients of all species

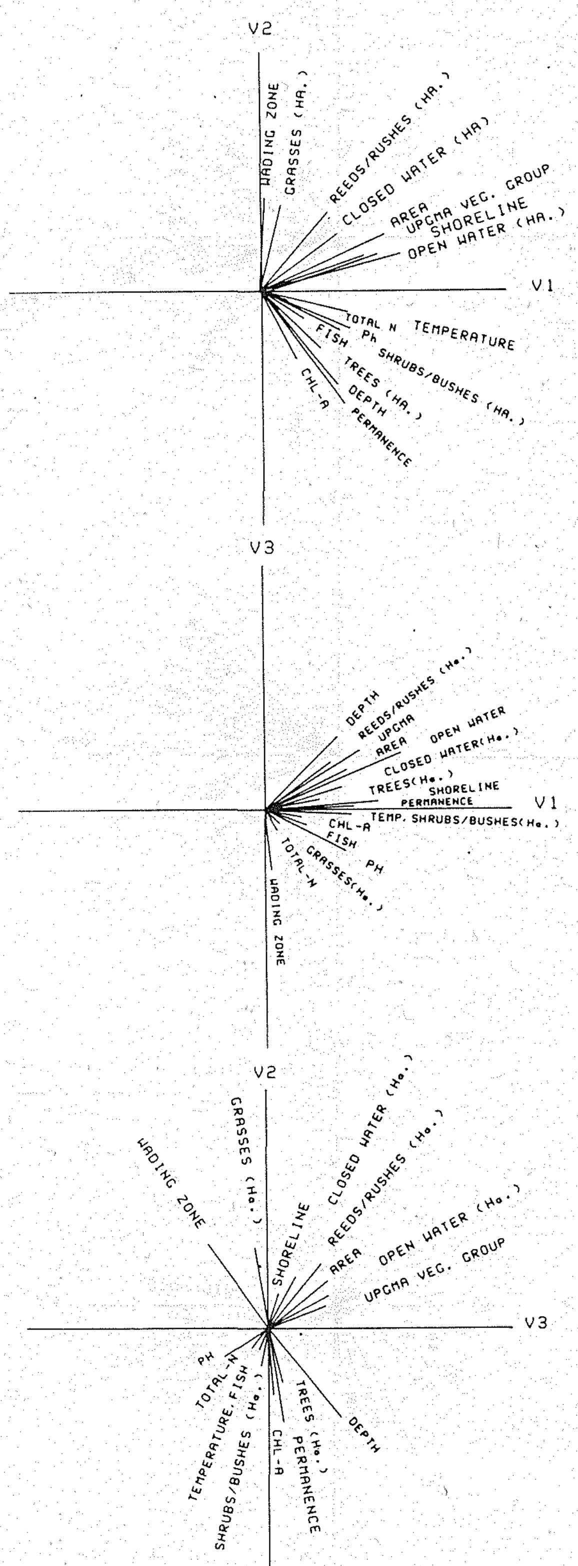


Figure 5.7 Direction and strength of maximum linear correlations of the highest ranking environmental variables in SSH ordination of waterbirds for Vectors 1, 2 and 3. (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3. In each instance the third vector is not shown, but runs perpendicular to the page. Refer to Table 5.5 for correlation coefficients of all variables

Table 5.1 Vegetation complexes and UPGMA vegetation groups ranked according to species preferences as determined by Chi-squared contingency table analysis. The complex/group with most significant positive associations is ranked 1

Vegetation complex	Rank	UPGMA Vegetation group	Rank
1	4	1	6
2	9	2	4
3	7	3	5
4	3	4	3
5	1	5	2
6	8	6	1
7	5		
8	6		
9	2		

when superimposed on SSH ordination plots of waterbird presence/absence or abundance (Figure 5.11). This was particularly evident in the abundance ordination, where geomorphic settings spanned the longitudinal array of wetlands across ordination space.

5.3.5 Species preferences for classes of environmental variables

Forty-six of the 79 species of waterbird recorded in Scopewest occurred frequently enough for Chi-squared contingency table analysis. Preference of each species among classes of each environmental variable are presented in Appendix 6 (apparent preferences of the 33 species with low levels of occurrence are also presented for reference purposes but these data could not be tested statistically and should be interpreted cautiously). The Musk Duck, Black-winged Stilt, Eurasian Coot, Great Egret and Blue-billed Duck exhibited preferences within the greatest number of environmental variables (33, 30, 30, 29 and 29, respectively) (Table 5.7). The Pacific Black Duck, Chestnut Teal, Maned Duck, Black-tailed Native-hen and White-faced Heron showed fewest preferences within environmental variables (8, 10, 13, 14 and 15, respectively).

Environmental variables within which the largest number of species demonstrated preferences were: area of open water (43), pH (42), UPGMA vegetation groups (42), wetland area (41), area of closed water (41), length of shoreline (40), width of wading zone (39),

Table 5.2 Wetland composition of the eight sub-groups produced by UPGMA classification of the combined two years dataset of waterbird abundance using a square-root transformation (refer to Appendix 1 for full wetland names)

GROUP: 1 19 Wetlands										
ABER	CARI	CARR	COOC	COO2	CREA	GLOV	HEBB	MANS	MANR	MATH
MAYF	RIVD	SAND	SCEE	USWA	WHIT	WILD	YOUN			
GROUP: 2 43 Wetlands										
AIRD	BEES	CAMP	COOS	DEVI	FISS	FIS2	FIS3	FIS4	GINE	GINJ
GIN1	GIN2	GOSS	GREE	HAR1	HAR2	JAND	JOHN	JULI	KARW	LAKE
LANC	LEED	LMOG	MIL1	MIL3	MOGU	MOOR	NICS	NOON	PAU1	PELI
ROBE	SERD	STOK	SWAN	TANG	THOM	THOS	WALL	WIGI	WILS	
GROUP: 3 33 Wetlands										
AMIE	AUST	BAMD	CLIB	CLIS	COD1	COD2	COO1	COWA	CRAG	CRAM
CULC	DIAM	EAGL	ELLE	FOLP	GIB1	GINL	GNAL	GOEG	GOOD	GUNG
HEND	KAWI	MARR	MAYW	MEAR	MUCR	NINE	OLDB	PINR	TAWA	WSWR
GROUP: 4 14 Wetlands										
BALL	CARE	FREM	GIBA	GIN5	GNAR	GOBB	MILS	MONI	NEER	NICM
PINE	TALB	YOND								
GROUP: 5 22 Wetlands										
ADEN	ALEX	ASHF	BODK	BULL	CORX	CURT	DILS	GANS	GANY	GOLD
HOLM	KENT	KING	MIL2	MTBR	MUSS	PINB	ROCK	RONS	STAR	WATE
GROUP: 6 36 Wetlands										
AIPS	BALD	BAMW	BLAC	BOGG	BOOG	BRO2	CARS	COR1	COR2	COR3
DEEP	DUCK	EVER	FIS1	FOLM	FORT	GIB2	GINN	GIN3	GIN4	GOYA
GREY	KARA	KARD	KEMS	KEOG	LAKS	MARA	NROS	PEPP	RIVF	ROGE
ROSA	SCEW	WILC								
GROUP: 7 51 Wetlands										
ALCO	BALP	BARS	BAYS	BEEN	BELM	BENG	BIGC	BLUE	BLYT	CANC
CANF	CANW	CARA	CHAS	COOG	COPO	EAST	FORL	FREE	GIBB	GOOL
GWEL	HAZE	HOPE	HYDE	JAME	JOON	JOO1	JOO2	KEMP	LIMA	LOCH
MANL	MARI	MARY	MAYC	MCDO	NGIB	NICO	NLAK	NOWE	PARR	PEHA
PIPI	PUNC	SPEC	WART	WCOR	WEEB	WRIG				
GROUP: 8 23 Wetlands										
ALFR	BAML	BARL	BEEL	BIBR	BLAL	CHIT	CLAR	COOO	FOOT	FORR
HERD	HURS	KOGO	MCLA	MEAL	MONG	NAMM	PERR	THOL	WANN	YANG
YUND										

season (39), depth (38), salinity (36), area of reeds/rushes (34), area of shrubs/bushes (32) and temperature (32) (Table 5.8). Thirty-eight species demonstrated a preference for wetlands with a shoreline >3000 m, 36 species preferred wetlands with an area >50 ha, an open water area 10 ha or a closed water area >10 ha, 32 species preferred pH range 8.5-9.5, 28 species preferred UPGMA vegetation group number 6, 27 species preferred wetlands with >2 ha cover of shrubs/bushes, 23 species preferred >5 ha cover of reeds/rushes and 25 species preferred wetlands >1 m deep. Fewest number of significant preferences were for percentage cover of vegetation and presence/absence of islands (5 and 6 species, respectively).

5.3.6 Breeding species preferences for classes of environmental variables

Seventeen of the 39 species of waterbird that were recorded breeding in Scopewest were sufficiently common for Chi-squared contingency table analysis. Preference of each species for classes of each environmental variable are presented in Appendix 7. The Black Swan, Eurasian Coot, Musk Duck, Purple Swamphen and Blue-billed Duck showed the most preferences (22, 18, 17, 15 and 14, respectively) (Table 5.9). The Australian Shelduck, Maned Duck, Yellow-billed Spoonbill, White-faced Heron

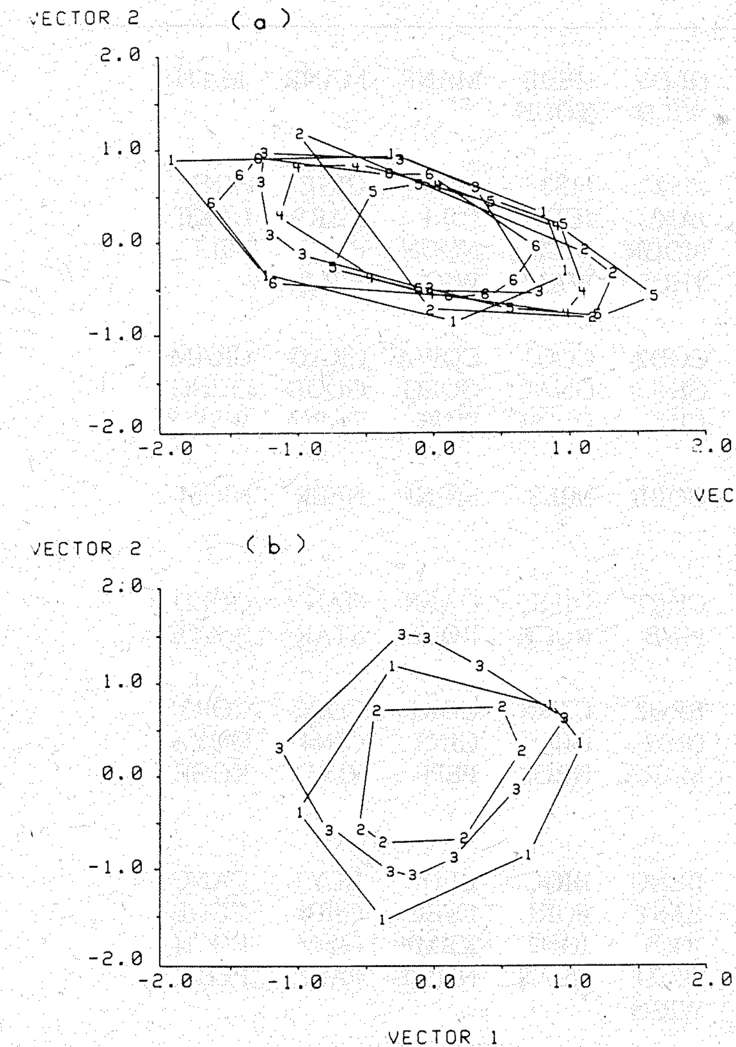


Figure 5.8 UPGMA classification groups superimposed on SSH ordinations of (a) UPGMA of environmental data on SSH of waterbird data and (b) UPGMA of waterbird data on SSH of environmental data

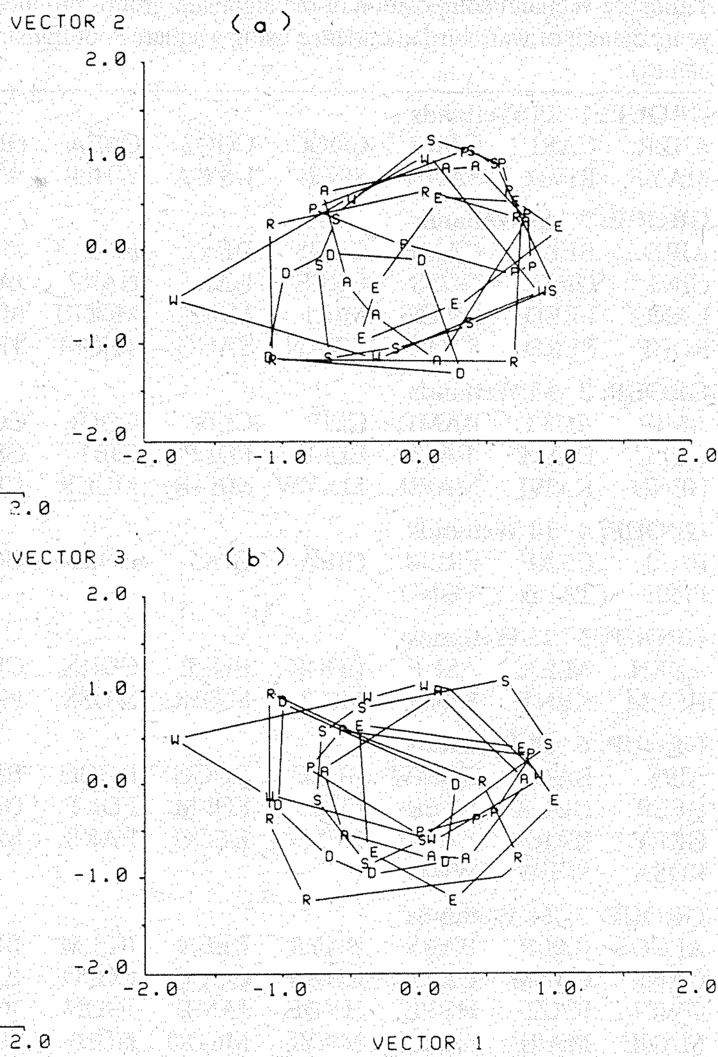


Figure 5.9 Seven pre-defined wetland types superimposed on SSH ordination of waterbird presence/absence data for (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3 (A=artificial wetlands, D=drains, E=estuarine lagoons, P=permanent wetlands, R=river sections, S=seasonal wetlands and W=winter-wets)

and Hardhead showed fewest preferences (0, 2, 3, 4 and 4, respectively).

Environmental variables for which the largest number of species demonstrated preferences were: temperature (11), depth (9), percentage of trees (8), fish abundance (8), wetland area (7), area of open water (7), number of drains (7) and area of trees (7) (Table 5.10). Few classes within any environmental variable demonstrated a high number of significant preferences but eight species preferred high fish abundance, seven preferred large wetlands, large number of drains or large area of open water, six preferred large areas of trees or deep wetlands and five preferred presence of islands, large area of reeds/rushes or shrubs/bushes.

5.3.7 Comparison of waterbird usage of permanent and seasonal wetlands

Permanent (*N*=40) and seasonal (*N*=75) wetlands were ordinated by SSH using waterbird abundance and the wetland types (permanent and seasonal) were superimposed on the SSH ordination. There was no separation of wetland types in ordination space (Figure 5.12). Classification of the sites by UPGMA produced three overlapping groups of wetlands (Figure 5.13).

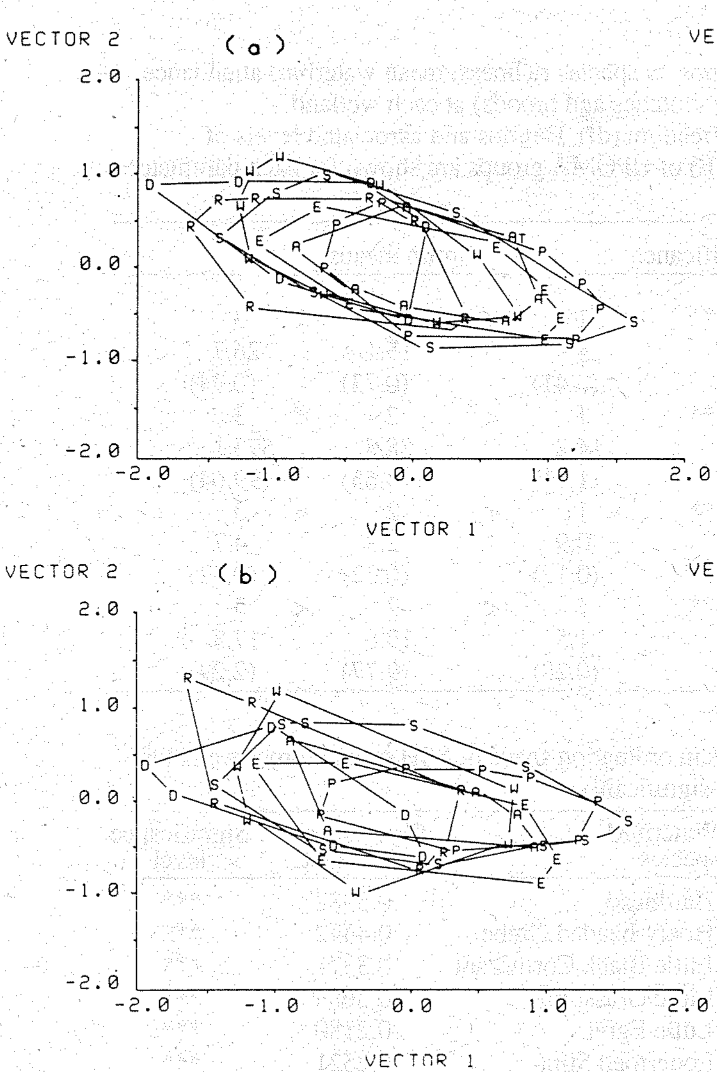


Figure 5.10 Seven pre-defined wetland types superimposed on SSH ordination of waterbird abundance data (square root transformed) for (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3 (A=artificial wetlands, D=drains, E=estuarine lagoons, P=permanent wetlands, R=river sections, S=seasonal wetlands and W=winter-wets)

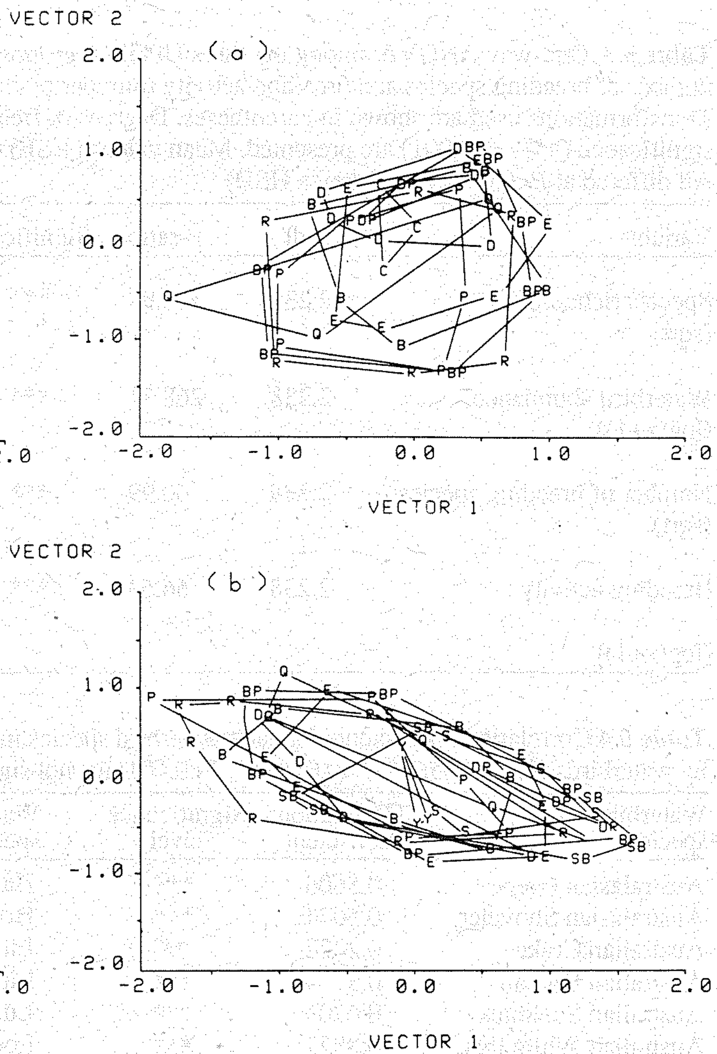


Figure 5.11 Eleven geomorphic settings superimposed on Vector 1 by Vector 2 SSH ordination of waterbird data using (a) presence/ absence and (b) abundance (square root transformed). Refer to Appendix 5 for suite membership of each wetland. Overlap between groups was equally pronounced on vectors that are not presented

There were no significant differences in waterbird abundance, number of breeding species or breeding activity between permanent and seasonal wetlands although there was a difference in species richness. More species occurred on permanent than seasonal wetlands (Table 5.11). In spite of their lower species richness, 12 species were recorded on seasonal wetlands that did not occur on permanent wetlands. Two species were recorded on permanent, but not on seasonal, wetlands. All 14 species mentioned above occurred infrequently, however, and may not have been restricted to one wetland type.

Among the groups derived from the UPGMA classification of permanent and seasonal wetlands, species richness and waterbird abundance were highest in Group 3 and lowest in Group 1 (Table 5.11). Number of breeding species and breeding activity were higher in Groups 3 and 2 than Group 1. ANOVA results were supported by significant (P<0.001) correlation coefficients for gradients of species richness (r=0.94), waterbird abundance (r=0.96), number of breeding species (r=0.68) and breeding activity (r=0.63) in SSH ordination space, with the gradients running from low values in Group 1 to high values in Group 3 (Figure 5.14).

Table 5.3 One-way ANOVA among the three UPGMA groups on species richness, mean waterbird abundance, number of breeding species and breeding activity (number of clutches and broods) at each wetland. Transformations used are shown in parentheses. Degrees of freedom (df), F-ratios and associated levels of significance (***, $P<0.001$) are presented. Mean values ($\pm$ SE) of UPGMA groups are shown for each parameter. All differed at $P<0.05$ level (Tukey's HSD)

Variable	df	F-ratio	Significance	Group means				
Species richness	2,238	188.98	***	1	<	2	<	3
(sqrt)				8.8		15.1		26.7
				(0.41)		(0.73)		(0.94)
Waterbird abundance	2,238	268.31	***	1	<	2	<	3
(log(x+1))				14.2		88.8		573.1
				(1.11)		(14.65)		(99.64)
Number of breeding species	2,238	60.99	***	1	<	2	<	3
(sqrt)				0.9		2.3		4.7
				(0.12)		(0.32)		(0.37)
Breeding activity	2,238	66.63	***	1	<	2	<	3
				1.5		19.6		17.8
(log(x+1))				(0.28)		(9.77)		(2.29)

Table 5.4 Correlation coefficients for each waterbird species in ordination space of SSH ordination of wetlands by waterbirds (*, $P<0.05$; **, $P<0.01$; ***, $P<0.001$; ns, not significant)

Waterbird species	Correlation coefficient	Significance level	Waterbird species	Correlation coefficient	Significance level
Australasian Grebe	0.5606	***	Hardhead	0.5382	***
Australasian Shoveler	0.5074	***	Hoary-headed Grebe	0.4492	***
Australian Crake	0.2022	**	Little Black Cormorant	0.3371	***
Australian Pelican	0.3794	***	Little Grassbird	0.3684	***
Australian Shelduck	0.6204	***	Little Egret	0.2180	***
Australian White Ibis	0.3822	***	Long-toed Stint	0.2521	***
Banded Lapwing	0.1450	*	Little Pied Cormorant	0.4083	***
Banded Stilt	0.2748	***	Marsh Harrier	0.3848	***
Black Swan	0.5932	***	Maned Duck	0.6184	***
Buff-banded Rail	0.1896	**	Marsh Sandpiper	0.1441	*
Blue-billed Duck	0.4414	***	Musk Duck	0.4963	***
Black-fronted Plover	0.4790	***	Pacific Black Duck	0.7936	***
Black-tailed Native-hen	0.2133	***	Pacific Heron	0.2105	***
Black-winged Stilt	0.5710	***	Pink-eared Duck	0.4671	***
Caspian Tern	0.2187	***	Pied Cormorant	0.1744	**
Chestnut Teal	0.2544	***	Pied Oystercatcher	0.2019	**
Common Sandpiper	0.1803	**	Purple Swamphen	0.4718	***
Eurasian Coot	0.6775	***	Red-capped Plover	0.3496	***
Crested Tern	0.1724	**	Red-necked Stint	0.3272	***
Clamorous Reed-Warbler	0.3832	***	Red-kneed Dotterel	0.2826	***
Curlew Sandpiper	0.3329	***	Red-necked Avocet	0.3791	***
Darter	0.2598	***	Rufous Night Heron	0.1978	**
Dusky Moorhen	0.4170	***	Sharp-tailed Sandpiper	0.3318	***
Exotic Duck	0.3665	***	Silver Gull	0.3580	***
Freckled Duck	0.1112	ns	Straw-necked Ibis	0.4156	***
Greenshank	0.4047	***	Spotless Crake	0.2399	***
Great Crested Grebe	0.2751	***	White-faced Heron	0.5278	***
Glossy Ibis	0.2208	***	Whiskered Tern	0.1670	**
Great Cormorant	0.2146	***	Wood Sandpiper	0.2444	***
Great Egret	0.3643	***	Yellow-billed Spoonbill	0.3825	***
Grey Teal	0.6924	***			

Table 5.5 Correlation coefficients for each environmental variable in ordination space of SSH ordination of wetlands by waterbirds (*, *P*<0.05; **, *P*<0.01; ***, *P*<0.001; ns, not significant)

Variable	Correlation Coefficient	Significance level
Depth	0.5140	***
Salinity	0.2454	***
pH	0.3491	***
Temperature	0.3809	***
DO	0.2788	***
Macrocover	0.2723	***
Macrobiomass	0.1936	**
Fish abundance	0.4185	***
Zooplankton	0.1811	**
Wading zone	0.5174	***
Turbidity	0.1979	**
Colour	0.2050	**
Total-N	0.3491	***
Total-P	0.1644	**
Chl *a*	0.3269	***
Phaeophytin	0.1986	**
Area	0.6419	***
Shoreline	0.5253	***
Vegetation cover	0.2159	***
Grasses (%)	0.3553	***
Reeds/rushes (%)	0.1895	**
Samphire (%)	0.1882	**
Shrubs/bushes (%)	0.1395	*
Trees (%)	0.2078	***
Dead trees (%)	0.2063	***
Vegetation types	0.2063	***
Islands	0.2512	***
Percent buffered	0.1855	**
Buffer width	0.2114	***
Buffer pristine	0.1609	*
Disturbance	0.0703	ns
Drains	0.2870	***
Distance to coast	0.3211	***
Permanence	0.5485	***
Closed water (ha)	0.4951	***
Open water (ha)	0.6246	***
Grasses (ha)	0.4054	***
Reeds/rushes (ha)	0.4222	***
Samphire (ha)	0.1944	**
Shrubs/bushes (ha)	0.3285	***
Trees (ha)	0.3173	***
Dead trees (ha)	0.3020	***
Simpson's diversity	0.1166	ns
Vegetation complexes	0.2401	***
Veg. UPGMA groups	0.4425	***

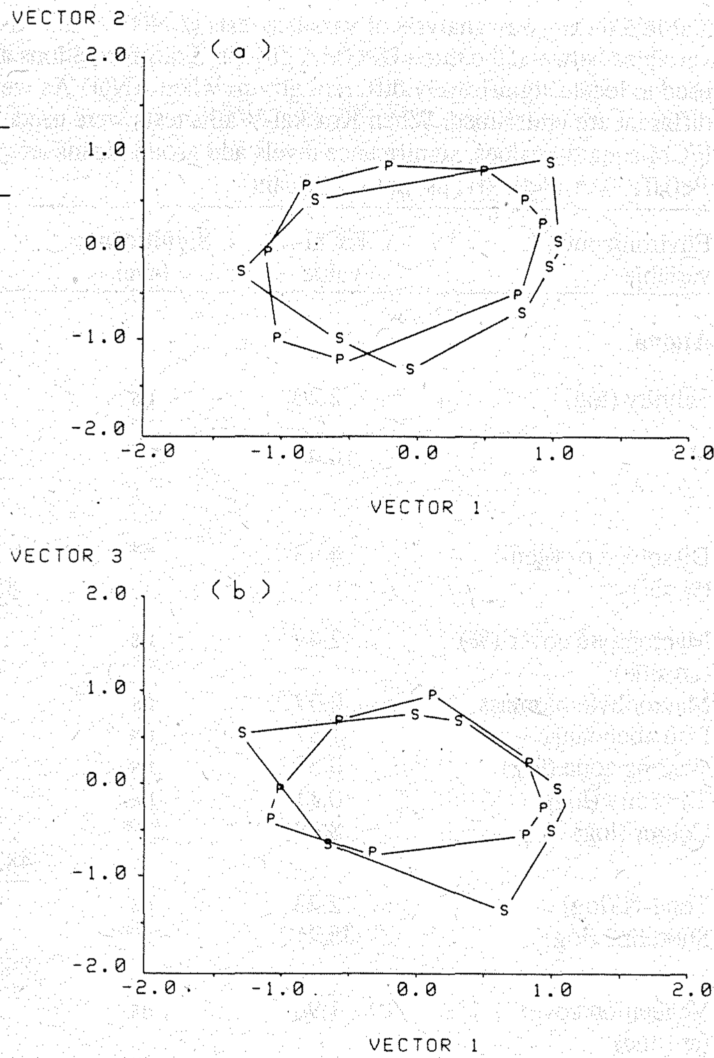


Figure 5.12 SSH ordination of permanent (P, N=40) and seasonal (S, N=75) wetlands by waterbirds using abundance data (square root transformed) with wetland types superimposed for (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3

Waterbird usage was associated with environmental variables by calculating maximum linear correlation gradients of the environmental variables in the waterbird ordination space. All variables, with the exception of macrophyte biomass, number of vegetation types and Simpson's diversity index were significantly correlated within ordination space (Table 5.12). Variables describing wetland area (area, length of shoreline, area of open water, area of closed water), water regime (depth, permanence), water quality (pH, DO), emergent vegetation (ranked UPGMA vegetation groups), width of wading zone, fish abundance and disturbance (number of drains

Table 5.6 One-way analysis of variance tests (ANOVA and Kruskal-Wallis) of differences in environmental variables between the three UPGMA groups. Transformations are presented in parentheses. Tukey's HSD was used to locate significantly different groups when ANOVAs were significant; groups that were not significantly different are underlined. When Kruskal-Wallis tests were used, groups were ranked in ascending order. F/Chi-squared values, significance levels and group means are presented for each variable (*, *P*<0.05; **, *P*<0.01; ***, *P*<0.001; ns, not significant)

Environmental variable	F/Chi-value	Significance level	Group order and group mean				
Anova					**Tukey's HSD**		
Salinity (log)	2.20	ns					
pH	16.40	***	1	<	2	<	3
			7.31		7.53		8.09
Dissolved oxygen (% sat)	4.93	**	1	<	2	<	3
			85.8		88.2		96.5
Macrophyte cover (%) (arcsine)	2.49	ns					
Macrophyte biomass	0.37	ns					
Fish abundance	1.87	ns					
Wading zone (log)	0.58	ns					
Turbidity (log)	0.11	ns					
Colour (log)	8.49	***	1	>	2	>	3
			483.0		260.5		149.8
Total-N (log)	2.23	ns					
Shoreline (log)	35.41	***	1	<	2	<	3
			898.4		1149.5		2562.6
Vegetation cover (arcsine)	1.94	ns					
Grasses cover (%) (arcsine)	2.81	ns					
Reed/rush cover (%) (arcsine)	1.25	ns					
Shrub/bush cover (%) (arcsine)	1.02	ns					
Tree cover (%) (arcsine)	1.16	ns					
Vegetation types	5.11	**	1	<	2	<	3
			2.95		3.12		3.55
Islands	3.43	*	1	<	2	<	3
			0.12		0.19		0.27
Percent buffered	2.80	ns					
Buffer width	3.68	*	2	<	1	<	3
			19.6		26.2		43.4
Buffer pristine (%)	0.10	ns					
Disturbance	2.00	ns					
Drains (log)	12.65	***	1	<	2	<	3
			0.50		0.52		1.12
Distance to coast	2.58	ns					
Simpson's diversity index	1.89	ns					

Table 5.6 (cont'd)

Environmental variable	F/Chi-value	Significance level	Group order and group mean				
Kruskal-Wallis							
Depth	29.19	***	1	<	2	<	3
			0.59		0.66		1.26
Temperature	23.31	***	1	<	2	<	3
			18.4		18.4		19.7
Zooplankton	3.01	ns					
Total-P	1.65	ns					
Chl *a*	23.22	***	1	<	2	<	3
			0.016		0.035		0.041
Phaeophytin	2.85	ns					
Area	73.00	***	1	<	2	<	3
			6.77		10.62		59.08
Permanence	19.40	***	1	<	2	<	3
			5.9		6.4		7.1
Closed water	34.71	***	1	<	2	<	3
			3.55		3.34		19.90
Open water	58.89	***	1	<	2	<	3
			3.22		7.28		39.19
Grasses cover (ha)	3.00	ns					
Reed/rush cover (ha)	31.40	***	1	<	2	<	3
			1.75		0.66		11.03
Samphire cover (%)	0.61	ns					
Samphire cover (ha)	0.55	ns					
Shrub/bush cover (ha)	22.65	***	1	<	2	<	3
			0.91		0.88		3.79
Tree cover (ha)	16.13	***	1	<	2	<	3
			0.47		0.77		4.04
Dead tree cover (%)	6.08	*	1	<	2	<	3
			0.4		0.5		1.7
Dead tree cover (ha)	11.79	**	1	<	2	<	3
			0.02		0.04		0.84
Vegetation complexes	11.06	**	3	<	2	<	1
			4.45		5.36		5.63
UPGMA vegetation groups	34.18	***	3	<	2	<	1
			2.78		3.82		4.04

and disturbance level) exhibited the highest correlation coefficients. Gradients for species richness and number of waterbirds were in the same direction as environmental variables for wetland area, primary productivity, emergent vegetation complexes (inverse of ranked preferences) and water permanence on Vector 1 by Vector 2 (cf. Figures 5.14 and 5.15). Gradients for number of breeding species and breeding activity were in the same direction in Vector 1 by Vector 3 ordination space as emergent vegetation characteristics, depth, permanence and wetland primary productivity (cf. Figures 5.14 and 5.15).

The majority of variables with gradients that were significantly correlated in ordination space demonstrated differences between UPGMA groups (Table 5.13). Variables describing wetland size (area, length of shoreline, area of open water, area of closed water), water regime (depth, permanence) and wetland productivity (DO, pH, chl *a*) all had higher values in Group 3 wetlands than Group 1. Water colour and ranked UPGMA vegetation groups demonstrated the opposite trend, with Group 1 wetlands having higher values than Group 3.

Table 5.7 Waterbird species with highest and lowest number of significant associations with classes of environmental variables (*N*=46), as determined by Chi-squared contingency table analysis

Species	Number of associations
Musk Duck	33
Black-winged Stilt	30
Eurasian Coot	30
Blue-billed Duck	29
Great Egret	29
Great Cormorant	28
Purple Swamphen	28
Red-necked avocet	28
Australian Pelican	27
Hoary-headed Grebe	27
Little Black Cormorant	27
Australian White Ibis	27
I	I
I	I
I	I
Banded Stilt	20
Hardhead	20
Australian Shelduck	19
Pacific Heon	18
Red-capped Plover	18
Australasian Grebe	17
Spotless Crake	16
White-faced Heron	15
Black-tailed Native-hen	14
Maned Duck	13
Chestnust Teal	10
Pacific Black Duck	8

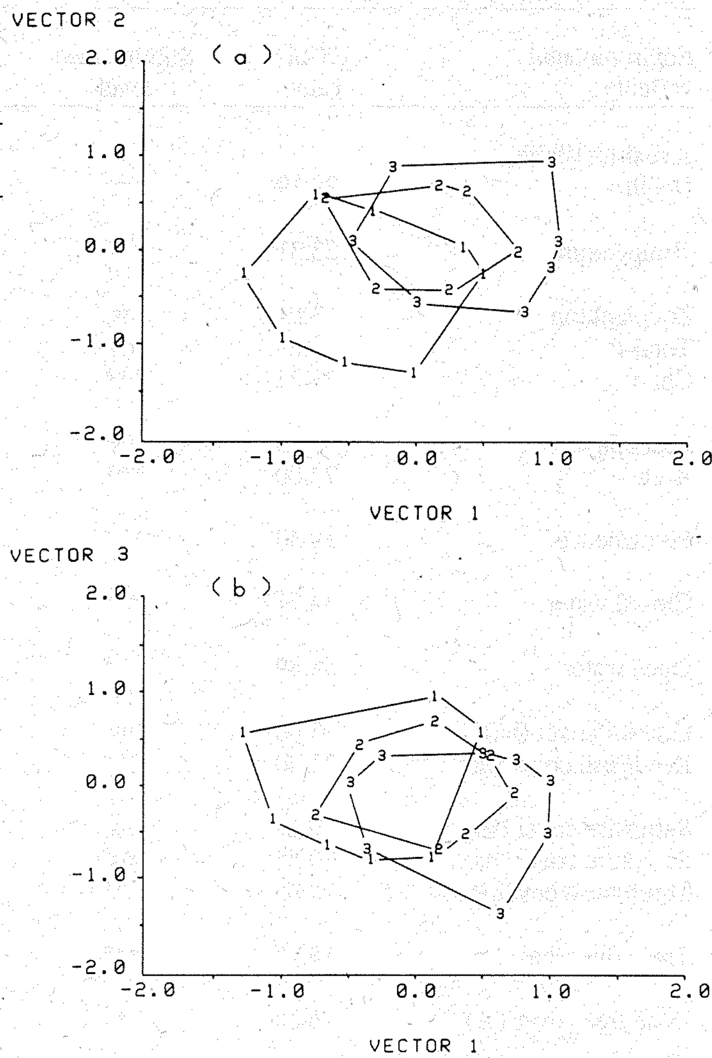


Figure 5.13 SSH ordination of permanent (P, N=40) and seasonal (S, N=75) wetlands by waterbirds (N=61) using abundance data (square root transformed) with UPGMA groups superimposed for (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3

5.3.8 Assessment of the value of seasonal and ephemeral wetlands for waterbirds

The total area of wetlands on the Swan Coastal Plain, classified according to Semeniuk (1987), is given in Table 5.14. Palusplains, defined as seasonally waterlogged flats, occupy most area but do not correspond with any wetland types surveyed in Scopewest. Damplands and floodplains, which together conservatively correspond to winter-wet areas, occupy the second largest area (32 097 ha). Scopewest's seasonal wetlands correspond to sumplands (17 083 ha).

The combined areas of permanent wetlands (including artificial wetlands), seasonal wetlands and winter-wet areas surveyed during Scopewest were 2488.7 ha, 2638.9 ha and 475.9 ha, respectively (Appendix 5). This represented 33% of permanent sites, 16% of seasonal wetlands and 1.5% of winter-wet areas on the Swan Coastal Plain. Using these percentages to extrapolate numbers of birds counted during surveys in October 1990 and October 1991 to population estimates for the Swan Coastal Plain showed that approximately 74% of numbers and 86% of breeding activity of Grey Teal and 57% of numbers and 55% of breeding activity of Pacific Black Duck occurred on winter-wet areas (Table 5.15).

Population estimates for Grey Teal on the Swan Coastal Plain (70 700 and 54 200, Table 5.15 were at the upper end of estimates from

Table 5.8 Number of waterbird species showing preference for each class of environmental variable, as determined by Chi-squared contingency table analysis ($P<0.05$). See text for methods of calculation. (Geometry types: EL, elongate; IR, iregular; LI, linear; OV, ovoid; RO, round; SI, sinuous; ST, straight)

Environmental variable	Classes 1	2	3	4	5	6	7	8	9	Total preferences
Depth	0-0.3	0.3-0.5	0.5-1.0	>1.0						
	5	2	6	25						38
Salinity	<1	1-3	3-10	10-25	>25					
	8	2	13	5	8					36
pH	<5.5	5.5-6.5	6.5-7.5	7.5-8.5	8.5-9.5	>9.5				
	0	1	1	0	32	8				42
Temperature	<15	15-20	20-25	>25						
	0	6	1	25						32
D.O.	0-50	50-75	75-100	100-150	>150					
	3	0	0	14	7					24
Macrophyte	0	0-10	10-50	>50						
cover	7	8	1	5						21
Macrophyte	0	0-20	20-100	>100						
biomass	8	0	0	11						19
Fish	absent	present	common	abundant						
	6	1	1	7						15
Zooplankton	<0.001	0.001-0.01	0.01-0.1	>0.1						
	1	7	0	17						25
Wading	0	0-10	10-100	>100						
zone	15	2	3	19						39
Season	winter	spring	summer	autumn						
	4	17	17	1						39
Turbidity	0-2.5	2.5-5.0	5-10	>10						
	0	3	8	1						12
Colour	0-50	50-100	100-300	>300						
	5	11	2	0						18
Total-N	0-0.6	0.6-1.5	1.5-2.5	>2.5						
	0	5	0	17						22
Total-P	0-0.015	0.015-0.03	0.03-0.1	>0.1						
	0	9	1	5						15
Chl *a*	0-0.003	0.003-0.01	0.01-0.03	>0.03						
	0	0	4	18						22
Phaeophytin	0-0.0015	0.0015-0.003	0.003-0.006	>0.006						
	1	0	0	13						14
Area	<1.0	1.0-10	10-50	>50						
	2	0	3	36						41
Shoreline	<500	500-1000	1000-3000	>3000						
	2	0	0	38						40
Vegetation	<10	10-25	25-75	>75						
cover	0	3	1	1						5
Grasses	0	0-25	>25							
cover (%)	11	3	2							16
Reeds/rushes	0	0-25	>25							
cover (%)	0	10	7							17
Samphire	absent	present								
cover (%)	3	7								10
Shrubs/bushes	0	0-25	>25							
cover (%)	0	8	6							14
Trees	0	0-25	>25							
cover (%)	0	20	1							21
Dead trees	absent	present								
cover (%)	0	12								12

Table 5.8 (cont'd)

Environmental variable	1	2	3	4	Classes 5	6	7	8	9	Total preferences
Vegetation	0-1	2-3	4	5-6						
types	0	0	7	3						10
Islands	absent	present								
	0	6								6
Buffer	0	0-20	20-100	>100						
width	1	8	3	6						18
Percent	0	0-45	45-90	>90						
buffered	1	14	5	1						21
Buffer	0	0-50	>50							
pristine	2	9	0							11
Disturbance	1-2	3	4	5						
	1	4	7	0						12
Drains	0	1	>1							
	1	4	10							15
Geometry	EL	IR	LI	OV	RO	SI	ST			
type	0	1	0	17	7	0	0			25
Distance	<1	1-5	5-20	>20						
to coast	3	9	1	3						16
Permanence	permanent	seasonal	ephemeral							
	16	5	0							21
Closed	<1	1-10	>10							
water area	0	5	36							41
Open	0	0-1	1-10	>10						
water area	2	1	4	36						43
Grasses	0	0-1	1-5	>5						
cover (ha)	0	0	5	9						14
Reeds/rushes	0	0-1	1-5	>5						
cover (ha)	0	1	10	23						34
Samphire	absent	present								
cover (ha)	4	9								13
Shrubs/bushes	0	0-0.5	0.5-2.0	>2.0						
cover (ha)	0	0	5	27						32
Trees	0	0-0.5	0.5-2.0	>2.0						
cover (ha)	0	2	0	25						27
Dead trees	absent	present								
cover (ha)	1	13								14
Vegetation	1	2	3	4	5	6	7	8	9	
complexes	0	0	0	1	4	0	2	3	4	14
Vegetation	1	2	3	4	5	6				
UPGMA groups	0	2	0	6	6	28				42

Annual Waterfowl Counts for the same area (7 877 - 59 812, Table 5.16). Estimates for Pacific Black Duck (51 400 and 26 600, Table 5.15) were within the range of estimates from Annual Waterfowl Counts (8476 - 91 468, Table 5.16) (Halse *et al.* 1990, 1992a, unpubl. data).

5.3.9 Modelling waterbird usage of Swan Coastal Plain wetlands

Multiple discriminant analysis of environmental variables was able to predict waterbird usage of some wetlands quite well, with 88% of wetlands being correctly allocated to Group 1, 44% to Group 2 and 77% to Group 3 of the UPGMA classification. Almost all incorrectly assigned Group 2 wetlands were put in Group 1 by MDA (55%); for the other groups the error was evenly distributed.

Linear regression on environmental variables explained a moderate amount of variation in species richness between wetlands. The optimum solution for percentage of variation explained versus number of environmental

Table 5.9 Breeding waterbird species ranked by number of significant associations with environmental variables (N=45), as determined by Chi-squared contingency table analysis

Species	Number of associations
Black Swan	22
Eurasian Coot	18
Musk Duck	17
Purple Swamphen	15
Blue-billed Duck	14
Pacific Black Duck	13
Dusky Moorhen	10
Pink-eared Duck	10
Australasian Grebe	9
Little Pied Cormorant	9
Grey Teal	6
Darter	5
Hardhead	4
White-faced Heron	4
Yellow-billed Spoonbill	3
Maned Duck	2
Australian Shelduck	0

variables was achieved with a five variable model, which explained 57% of variation in species richness between wetlands.[1]

Adding an additional 16 variables to the regression equation increased the explained variation in species richness by only 4.0%. Log(wetland area) provided the best regression with a single variable and explained 44% of species richness[2] (Figure 5.16).

Regression analysis explained little of the variation (20-30%) in abundance of individual species of waterbird at each wetland.

5.4 Discussion

5.4.1 Wetland classifications

In terms of waterbird use, three groups of wetlands were recognized. Although there was considerable overlap between the groups, Group 1 comprised wetlands with low species richness, low waterbird abundance, low numbers of breeding species and little breeding activity. Group 3 showed the converse, comprising wetlands with high species richness, high waterbird abundance, high numbers of breeding species and a lot of breeding. Wetlands in Group 2 occupied an intermediate position.

Surprisingly there was little differentiation between waterbird communities utilising the seven pre-defined wetland types. Within each wetland type there were wetlands that were good, intermediate and poor in terms of waterbird usage. To reflect waterbird use the seven pre-defined types probably needed to be divided into 21 sub-types.

Semeniuk's (1987,1988) classifications have been widely used in south-western Australia by WAWA for wetland management (WAWRC, 1987; Froend and van der Moezel 1991) without their relationship to biological values being tested. The value of these classifications would be greater if several different biological groups recognized the wetland categories proposed by Semeniuk than if no plant or animal recognized the boundaries of the classifications. Davis *et al.* (1993) showed that wetlands in similar geomorphic settings supported similar invertebrate communities, which suggests invertebrates recognize at least some of the boundaries in Semeniuk's classifications. Scopewest, however, found no relation between waterbird communities and Semeniuk's geomorphic settings.

The purpose of wetland classification is to define categories of wetlands, about which generalisations can be made in terms of various attributes (e.g. faunistic, floristic, geomorphic or environmental data). The number of groups produced during the classification process is subjective and is often left to the discretion of the investigator. As a result, the numbers of groups defined in Australian classification schemes have varied from three (this study) to 42 (Semeniuk 1988). Pressey and Bedward (1991a,b) and Bedward *et al.* (1992) recently used homogeneity analysis to determine optimum number of groups for a classification. The technique plots changes in within-group homogeneity against number of groups. The number of groups is optimal when further subdivision results in minimal increases in homogeneity within groups. Pressey and Bedward (1991a) reported an optimum of

1 Species richness = -17.1 + 10.4 log(area) -3.3 log(reed/rush cover (ha)) + 12.9 log(depth) + 2.4 pH + 9.1 log(total-N)
2 Species richness = 7.06 + 10.72 log (wetland area)

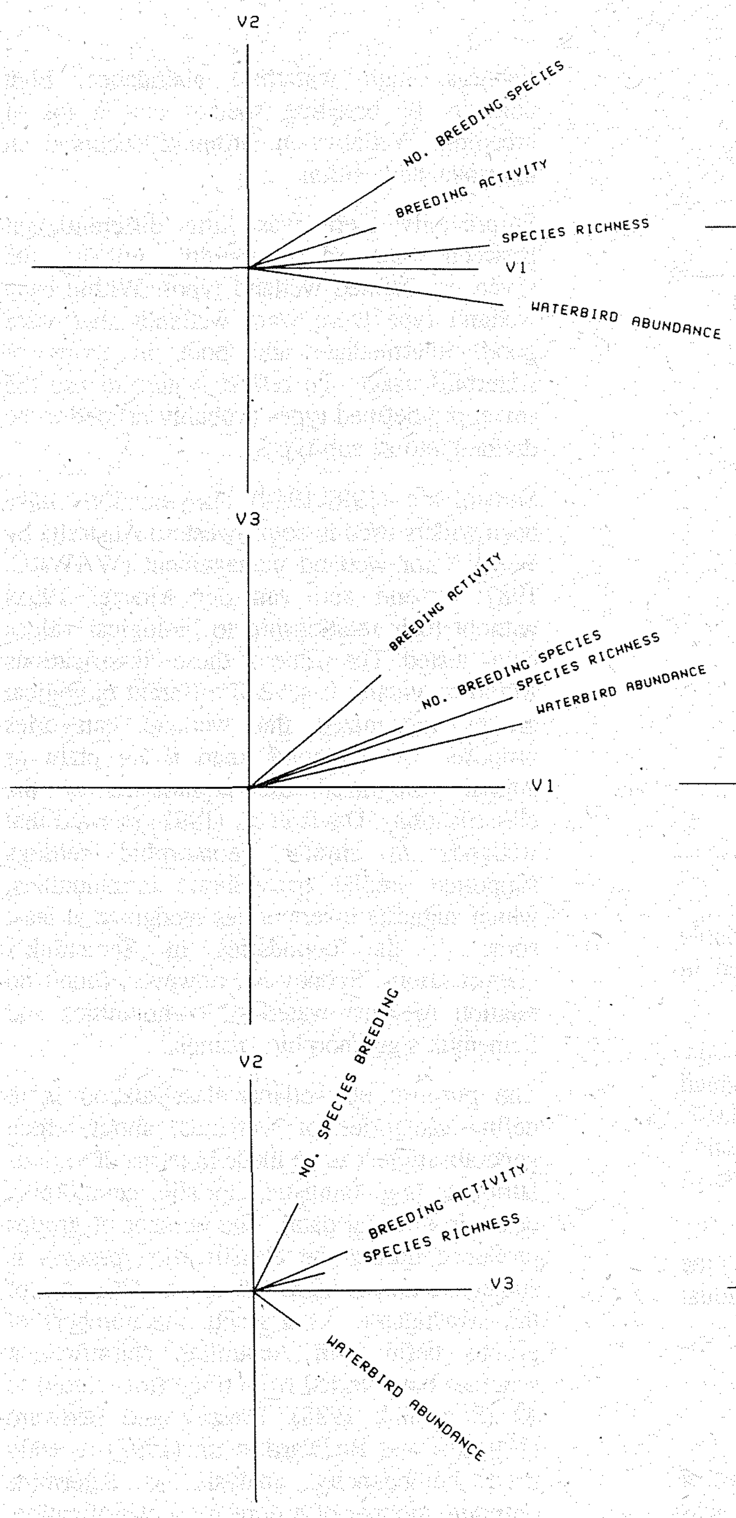


Figure 5.14 Direction and strength of maximum linear correlations of waterbird community descriptors in SSH ordination of permanent and seasonal wetlands for Vectors 1, 2 and 3. (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3. In each instance the third vector is not shown, but runs perpendicular to the page

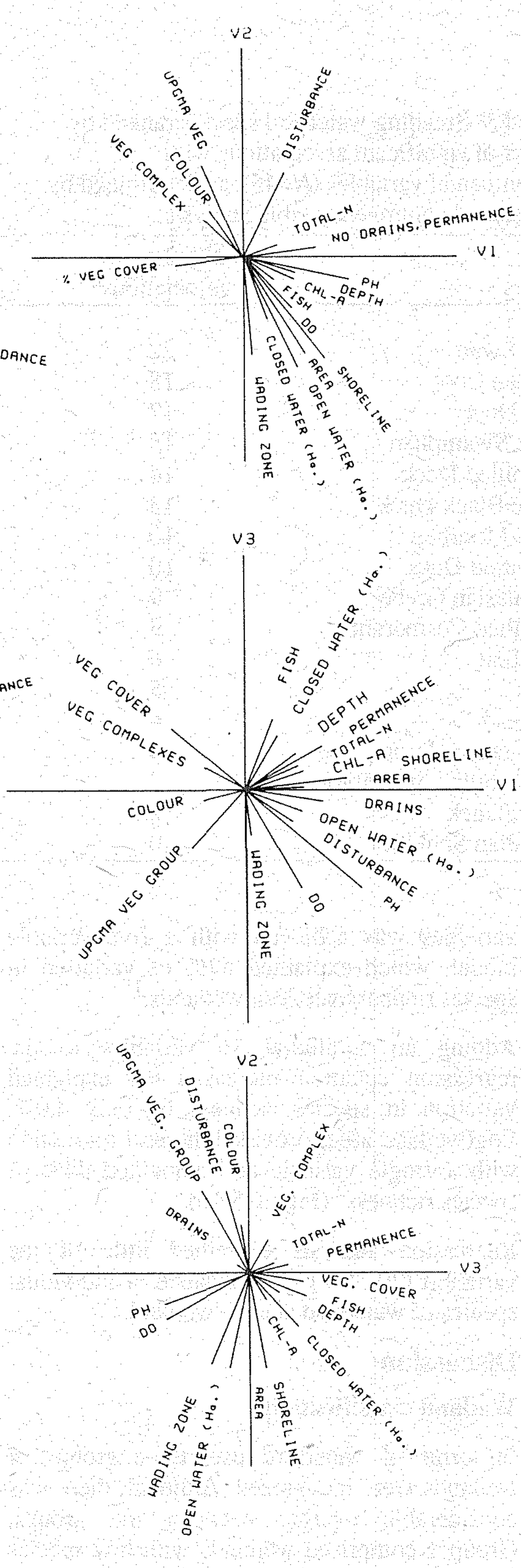


Figure 5.15 Direction and strength of maximum linear correlations of the highest ranking environmental variables in SSH ordination of permanent and seasonal for Vector 1, 2 and 3. (a) Vector 1 by Vector 2, (b) Vector 1 by Vector 3 and (c) Vector 2 by Vector 3. In each instance the third vector is not shown, but runs perpendicular to the page. Refer to Table 5.12 for correlation coefficients of all variables.

Table 5.10 Number of breeding waterbird species showing preference for each class of environmental variable, as determined by Chi-squared contingency table analysis (P<0.05). See text for methods of calculation. (Geometry types: EL, elongate; IR, iregular; LI, linear; OV, ovoid; RO, round; SI, sinuous; ST, straight)

Environmental variable	Classes 1	2	3	4	5	6	7	8	9	Total Prefer-ences
Depth	0-<0.3	0.3-0.5	0.5-1.0	>1.0						
	0	0	3	6						9
Salinity	<1	1-3	3-10	10-25	>25					
	1	0	1	0	0					2
pH	<5.5	5.5-6.5	6.5-7.5	7.5-8.5	8.5-9.5	>9.5				
	0	1	0	0	0	5				6
Temperature	<14	15-20	20-25	>25						
	0	4	3	4						11
D.O.	0-50	50-75	75-100	100-150	>150					
	3	0	0	0	2					5
Macrophyte	0	0-10	10-50	>50						
cover	0	0	0	2						2
Macrophyte	0	0-20	20-100	>100						
biomass	0	0	2	1						3
Fish	absent	present	common	abundant						
abundance	0	0	3	5						8
Wading	0	0-10	10-100	>100						
zone	4	0	0	0						4
Zooplankton	<0.001	0.001-0.01	0.01-0.1	>0.1						
	1	0	0	1						2
Turbidity	0-2.5	2.5-5.0	5-10	>10						
	1	0	0	0						1
Colour	0-50	50-100	100-300	>300						
	0	0	0	0						0
Total-N	0-0.6	0.6-1.5	1.5-2.5	>2.5						
	0	0	0	0						0
Total-P	0-0.015	0.015-0.03	0.03-0.1	>0.1						
	1	0	0	0						1
Chl *a*	0-0.003	0.003-0.01	0.01-0.03	>0.03						
	0	0	0	0						0
Phaeophytin	0-0.0015	0.0015-0.003	0.003-0.006	>0.006						
	0	0	0	4						4
Area	<1.0	1.0-10	10-50	>50						
	0	0	2	5						7
Shoreline	<500	500-1000	1000-3000	>3000						
	1	0	0	4						5
Vegetation	<10	10-25	25-75	>75						
cover	0	0	0	0						0
Grasses	0	0-25	>25							
cover (%)	1	1	0							2
Reeds/rushes	0	0-25	>25							
cover (%)	0	0	2							2
Samphire	absent	present								
cover (%)	1	0								1
Shrubs/bushes	0	0-25	>25							
cover (%)	0	2	2							4
Trees	0	0-25	>25							
cover (%)	0	6	2							8
Dead trees	absent	present								
cover (%)	0	0								0
Vegetation	0-1	2-3	4	5-6						
types	0	0	0	2						2
Islands	absent	present								
	0	5								5

Table 5.10 (cont'd)

Environmental variable	Classes 1	2	3	4	5	6	7	8	9	Total Preferences
Buffer	0	0-20	20-100	>100						
width	0	1	0	0						1
Percent	0	0-45	45-90	>90						
buffered	0	0	0	0						0
Buffer	0	0-50	>50							
pristine	1	2	0							3
Disturbance	1-2	3	4	5						
	0	0	1	1						2
Drains	0	1	>1							
	0	0	7							7
Geometry	EL	IR	LI	OV	RO	SI	ST			
type	1	0	0	2	0	0	0			3
Distance	<1	1-5	5-20	>20						
to coast	0	4	1	0						5
Permanence	ephemeral	seasonal	permanent							
	0	1	2							3
Closed	<1	1-10	>10							
water area	0	0	4							4
Open	0	0-1	1-10	>10						
water area	0	0	2	5						7
Grasses	0	0-1	1-5	>5						
cover (ha)	0	0	0	1						1
Reeds/rushes	0	0-1	1-5	>5						
cover (ha)	0	0	3	2						5
Samphire	absent	present								
cover (ha)	0	0								0
Shrubs/bushes	0	0-0.5	0.5-2.0	>2.0						
cover (ha)	0	0	1	4						5
Trees	0	0-0.5	0.5-2.0	>2.0						
cover (ha)	0	1	0	6						7
Dead trees	absent	present								
cover (ha)	0	3								3
Vegetation	1	2	3	4	5	6	7	8	9	
complexes	0	0	0	2	2	0	0	1	0	5
Vegetation	1	2	3	4	5	6				
UPGMA groups	0	0	0	2	1	3				**6**

approximately 20 groups for the classification of 432 wetlands on 98 native plant taxa. They compared coarse (few groups) and fine-scale (many groups) classifications and noted that "at a relatively coarse scale, homogeneity rises rapidly as the main discontinuities in the data are delineated ..... This rise in homogeneity is followed by an elbow in the curve ..... and a subsequent more gradual rise in homogeneity as the major ..... groups are subdivided with progressively finer scale".

Precision and accuracy are also major considerations in the classification process (Pressey and Bedward 1991a). Precision relates to the narrowness with which a class can be described (its homogeneity) and accuracy is the percentage of points sampled on the ground at which the classification is correct. Precision and accuracy may be inversely related, whereby an attempt at fine-scale classification that is not supported by an appropriate amount of field effort can produce classes that are not a reliable basis for conservation or management. Scopewest produced a coarse-scale classification of wetlands on waterbirds. A finer scale classification could be developed, perhaps by sub-dividing the pre-defined wetland types, although accuracy may decrease. Lack of time and appropriate computer programs prevented homogeneity analysis of the Scopewest classifications.

5.4.2 Environmental variables affecting waterbird usage

Wetland size, water depth, vegetation structure and primary productivity of wetlands appeared

Table 5.11 One-way ANOVAs of between -UPGMA group (1, 2, 3) and between -wetland type (permanent and seasonal) differences in waterbird community descriptors. Transformations used are indicated in parenthesis. Tukey's HSD were used to find groups that were significantly different when ANOVAs were significant. F-values, significance levels and group means (± S.E.) are presented for each descriptor (*, $P<0.05$; **, $P<0.01$; ***, $P<0.001$; ns, not significant)

Anova			Tukey's HSD				
Wetland types							
Species richness	F=6.07	*	Permanent 17.4 (1.10)	>	Seasonal 13.8 (0.88)		
Waterbird abundance	F=1.82	ns					
Number of breeding species	F=0.89	ns					
Breeding activity (sqrt)	F=0.77	ns					
UPGMA groups							
Species richness	F=56.07	***	3 21.6 (0.95)	>	2 15.3 (0.91)	>	1 9.5 (0.63)
Waterbird abundance (log (x+1))	F=116.33	***	3 498.4 (93.7)	>	2 70.1 (9.51)	>	1 20.8 (3.31)
Number of breeding species (sqrt)	F=27.10	***	2 4.5 (0.54)	>	3 3.7 (0.41)	>	1 1.1 (0.20)
Breeding activity (log (x+1))	F=17.67	***	3 8.3 (3.2)	>	2 3.0 (0.6)	>	1 0.6 (0.2)

to have most influence on waterbird communities in wetlands of the Swan Coastal Plain. In all cases there was a positive relationship between the variables and waterbird use of wetlands. This is similar to results of other studies. Gibbs *et al.* (1991) found that usage of wetlands by non-game waterbirds in Maine increased with area of a wetland and shoreline complexity, both of which are aspects of wetland size. Wetland area was the factor with greatest influence on duck species richness on taiga ponds in Alaska (Murphy *et al.* 1984). Wetland area and habitat complexity explained more of the variation in species richness of waterbirds in lakes around Stockholm, Sweden, than any other variable (Sillen and Solbreck 1977).

The positive relationship between waterbird usage and wetland depth in Scopewest may have partly reflected the correlation between wetland area and depth. However, Broome and Jarman (1983) showed that wetlands with an array of water depths carry higher numbers of waterbird species and individuals and it is intuitively likely that deeper wetlands would support more species than shallow wetlands because diving birds cannot use shallow water. Boshoff *et al.* (1991a,b) reported positive associations between abundance and water depth for some diving and surface waterbirds but negative associations for some dabbling species.

The vegetation variable that most consistently influenced waterbird use on the Swan Coastal Plain was UPGMA vegetation groups. Essentially, this measured the amount of emergent vegetation and the relationship showed that waterbird usage increased with the amount of vegetation and diversity of structure. Broome and Jarman (1983) also found wetlands with an array of vegetation associations carried higher numbers of

Table 5.12 Correlation coefficients for each environmental variable in ordination space of SSH ordination of permanent and seasonal wetlands on waterbird abundance (*, *P*<0.05; **, *P*<0.01; ***, *P*<0.001; ns, not significant)

Variable	Correlation coefficient	Significance level
Depth	0.3713	***
Salinity	0.3474	***
Ph	0.5766	***
Temperature	0.3067	**
DO	0.4519	***
Macrocover	0.2322	*
Macrobiomass	0.1114	ns
Fish abundance	0.4686	***
Zooplankton	0.2441	**
Wading zone	0.4363	***
Turbidity	0.2733	**
Colour	0.2328	*
Total-N	0.3566	***
Total-P	0.2547	**
Chl *a*	0.2578	**
Phaeophytin	0.2244	*
Area	0.4966	***
Shoreline	0.5890	***
Vegetation cover	0.3815	***
Grasses (%)	0.2158	*
Reeds/rushes (%)	0.3689	***
Samphire (%)	0.2015	*
Shrubs/bushes (%)	0.2909	**
Trees (%)	0.3913	***
Dead trees (%)	0.2493	**
Vegetation types	0.1807	ns
Islands	0.2175	*
Percent buffered	0.3350	***
Buffer width	0.2456	**
Buffer pristine	0.3371	***
Disturbance	0.4064	***
Drains	0.3889	***
Distance to coast	0.3599	***
Permanence	0.4372	***
Simpson's diversity index	0.1417	ns
Closed water area	0.3803	***
Open water area	0.4692	***
Grasses (ha)	0.2869	**
Reeds/rushes (ha)	0.3335	***
Samphire (ha)	0.2020	*
Shrubs/bushes (ha)	0.3310	***
Trees (ha)	0.3298	***
Dead trees (ha)	0.2763	**
Ranked vegetation complexes	0.4046	***
Ranked UPGMA groups	0.4967	***

Table 5.13 Kruskal-Wallis tests of whether there were significant differences among UPGMA groups for values of environmental variables. Group rankings are shown when tests were significant (*, *P*<0.05; **, *P*<0.01; ***, *P*<0.001; ns, not significant)

Environmental variable	Chi-squared value	Significance level	Group ranking
Depth	18.04	***	2 < 1 < 3
Salinity	9.71	**	1 < 2 < 3
Ph	27.08	***	1 < 2 < 3
Temperature	7.83	*	2 < 1 < 3
DO	13.54	**	1 < 2 < 3
Macrocover	3.56	ns	
Macrobiomass	2.24	ns	
Fish abundance	9.19	*	2 < 1 < 3
Zooplankton	2.03	ns	
Wading zone	0.68	ns	
Turbidity	11.39	**	1 < 2 < 3
Colour	18.61	***	3 < 2 < 1
Total-N	4.08	ns	
Total-P	3.05	ns	
Chl *a*	14.23	***	1 < 2 < 3
Phaeophytin	7.80	*	1 < 2 < 3
Area	32.49	***	1 < 2 < 3
Shoreline	32.75	***	2 < 1 < 3
Vegetation cover	7.02	*	3 < 2 < 1
Grasses (%)	2.79	ns	
Reeds/rushes (%)	3.38	ns	
Samphire (%)	1.18	ns	
Shrubs/bushes (%)	6.32	*	3 < 2 < 1
Trees (%)	4.54	ns	
Dead trees (%)	9.67	**	2 < 1 < 3
Vegetation types	6.72	*	2 < 1 < 3
Islands	6.13	*	1 < 2 < 3
Percent buffered	11.45	**	2 < 3 < 1
Buffer width	5.73	ns	
Buffer pristine	4.31	ns	
Disturbance	3.98	ns	
Drains	7.91	*	1 < 2 < 3
Distance to coast	1.53	ns	
Permanence	13.67	**	2 < 1 < 3
Simpson's diversity	0.95	ns	
Closed water area	18.06	***	2 < 1 < 3
Open water area	31.43	***	1 < 2 < 3
Grasses (ha)	6.27	*	2 < 1 < 3
Reeds/rushes (ha)	10.04	**	2 < 1 < 3
Samphire (ha)	1.18	ns	
Shrubs/bushes (ha)	4.33	ns	
Trees (ha)	1.63	ns	
Dead trees (ha)	13.54	**	2 < 1 < 3
Rank veg. comlexes	5.49	ns	
Rank UPGMA groups	12.12	**	3 < 2 < 1

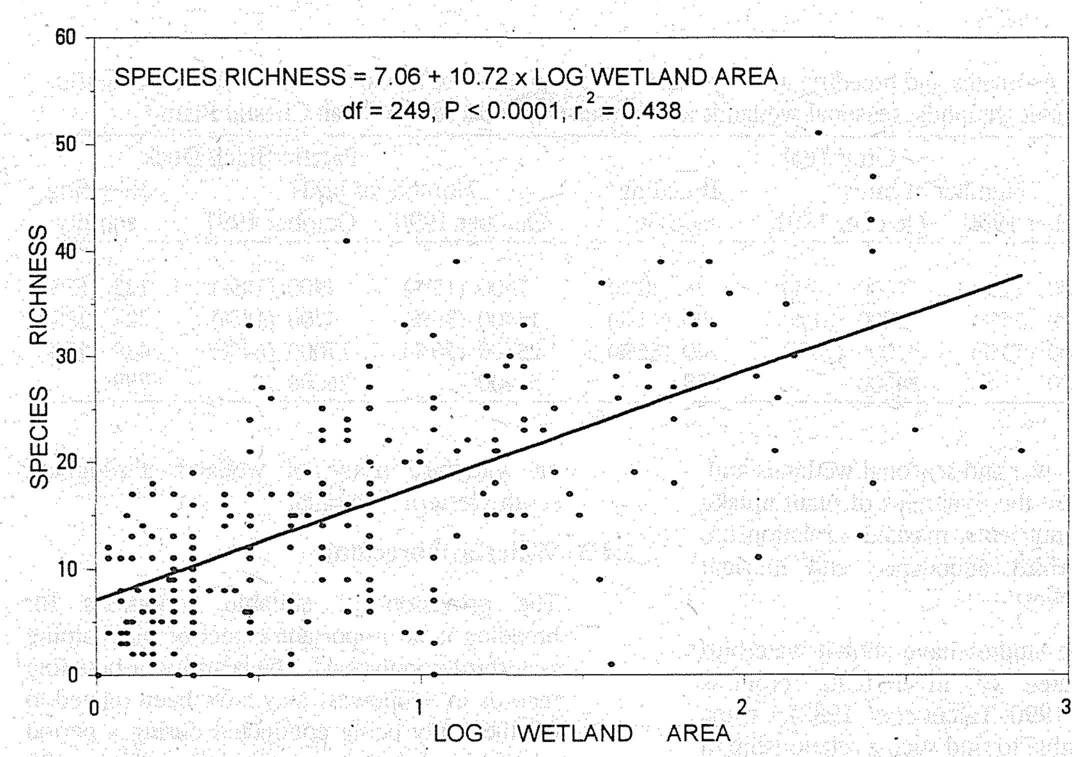


Figure 5.16 Regression of logarithm of wetland area against species richness at each wetland

waterbird species and individuals and Halse *et al.* (1993) noted most species were associated with wetlands with higher structural complexity of vegetation. Vegetation structure is particularly important for nesting birds. Higgins *et al.* (1992) observed reduced predation at nest sites with good vegetation cover and Fleskes and Klaas (1991) found that nesting sites were selected by hens on the basis of nesting-cover quality.

The proportion of a wetland that was vegetated did not appear to have much effect on waterbird usage on the Swan Coastal Plain but Gibbs *et al.* (1991) reported that highest species richness on wetlands in North America occurred at intermediate vegetation cover (33-66%) as opposed to closed or open wetlands. Preferences for intermediate levels of vegetation would probably not have been detected by Scopewest analyses.

Primary productivity was another factor influencing waterbird use of wetlands in Scopewest. Many studies have found highest abundances of waterbirds on wetlands with highest trophic status, as determined principally by nutrient levels (Nilsson 1978; Nilsson and Nilsson 1978; Murphy *et al.* 1984; Boshoff *et al.* 1991a). On the Swan Coastal Plain waterbird usage was not affected by nutrient levels but was greatest in wetlands with high pH and high levels of chlorophyll *a* and dissolved oxygen. These variables, which are inter-dependent, reflect high levels of primary productivity. Briggs (1980) found no relationship between waterbird use of wetlands and nutrient levels in northern New South Wales and Halse *et al.* (1993) did not find a consistent pattern of waterbird use and phoshorus levels in south-western Australia, so it is not surprising no relationship was found in Scopewest. It is possible, however, that the concentrating effects of evaporation on nutrient

Table 5.14 Total area and percentage total area on the Swan Coastal Plain of Semeniuk's (1987) wetland categories, as mapped by WAWA

Landform geometry	Category	Total wetland area (ha)	% of total
Basin	Lake	7546	4.5
	Sumpland	17083	10.2
	Dampland	23057	13.8
Flat	Floodplain	9040	5.4
	Palusplain	96475	57.5
Channel	Rivers	1168	0.7
	Estuaries	13270	7.9

Table 5.15 Population estimates and breeding activity (number of clutches and broods) of Grey Teal and Pacific Black Duck on permanent wetlands, seasonal wetlands and winter-wet areas on the Swan Coastal Plain

Wetland type	Grey Teal Number of birds October 1990	Grey Teal Number of birds October 1991	Grey Teal Breeding activity	Pacific Black Duck Number of birds October 1990	Pacific Black Duck Number of birds October 1991	Pacific Black Duck Breeding activity
Permanent	1200 (2%)	2000 (4%)	28 (3%)	7500 (15%)	4900 (18%)	133 (17%)
Seasonal	17900 (25%)	11200 (21%)	90 (11%)	18400 (36%)	4700 (18%)	227 (28%)
Winter-wet	51600 (73%)	41000 (76%)	740 (86%)	25500 (50%)	17000 (64%)	439 (55%)
Total	70700	54200	858	51400	26606	799

levels in winter-wet and seasonal wetlands and, to a lesser extent the dynamics of plant uptake and release of nutrients, masked a relationship between waterbird abundance and nutrient levels in Scopewest.

Although some studies have shown waterbird usage is related to invertebrate biomass (Barbera *et al.* 1990; Talent *et al.* 1982), Crome (1986) was unable to find such a relationship in eastern Australia and none was found on the Swan Coastal Plain. This may have been a result of very high biomass per unit volume in drying wetlands masking the relationship. In spite of high invertebrate biomass, wetlands that were drying out were unlikely to attract large numbers, or many species, of waterbird because they were usually small, always shallow and usually had no inundated vegetation.

Waterbird usage of wetlands on the Swan Coastal Plain was inversely correlated with water colour. This may reflect a preference of waterbirds for clear wetlands which tended to have high levels of primary (algae and macrophyte) and secondary productivity, whereas coloured wetlands generally were not productive. Eriksson (1984, 1985), however, observed feeding success of "pursuit divers" on fish in lakes was greatest in the clearest water and Boshoff *et al.* (1991a,b) recorded a positive relationship between water transparency and abundance of waterfowl. They postulated this was owing to increased feeding efficiency and increased macrophyte growth (food supply) in clear water. The same processes may have resulted in waterbirds avoiding highly coloured wetlands, which have low transparency, on the Swan Coastal Plain.

Although waterbird communities on the coastal plain showed little response to salinity, it was a water quality variable within which many species showed preferences. Halse *et al.* (1993) found it was the variable with most influence on waterbird usage of wetlands throughout south-western Australia.

5.4.3 Waterbird breeding

The provision of suitable conditions for breeding is an important aspect of maintaining waterbird populations. The scarcity of breeding records in Scopewest may have been related to (1) the study being conducted during a period when little breeding occurred (see Chapter 3), (2) the reluctance of observers to disturb breeding birds because of the risk of causing breeding failure, and (3) the difficulty in observing breeding birds, which are naturally secretive while incubating or rearing young. Even so, preferences among classes of some variables were evident and perhaps wetland managers can use these data to promote breeding of individual species in particular wetlands.

5.4.4 Permanent, seasonal and winter-wet areas

Ordination and classification showed no difference in communities of waterbirds using permanent and seasonal wetlands in winter and spring. Species richness was higher on permanent wetlands, perhaps owing to the regular occurrence at permanent wetlands of species that are less mobile and tend to be resident on a wetland, such as Blue-billed Duck, Musk Duck, Dusky Moorhen, Purple Swamphen and Little Grassbird. Community structure of the two wetland types was the same when they contained water, which suggests that water depth *per se* does not exert much influence on waterbirds when depth is >1 m (Halse 1987; Ambrose and Fazio 1989). Most seasonal wetlands hold approximately 1 m of water in October but dry by the end of January.

Permanent wetlands are important as drought refugia in summer and autumn, however. Ford (1958) showed high concentrations of

Table 5.16 Population estimates of Grey Teal and Pacific Black Duck in the Gingin and Bunbury regions made during Annual Waterfowl Counts 1988-1991 (Halse *et al.* 1990, 1992a, unpubl. data)

Survey period	Population estimate Grey Teal	Pacific Black Duck
November 1988	7877	8476
March 1989	35706	27193
November 1989	43230	58597
March 1990	13179	90981
November 1990	43547	41887
March 1991	59812	91468

waterfowl on four permanent wetlands in the Perth area during summer and Gentilli and Bekle (1983) suggested there is a seasonally swinging migratory system of Grey Teal between inland breeding areas and "over-summering" refuges on Perth wetlands. Halse *et al.* (1990) showed there is a general movement in south-western Australia into permanent wetlands in summer. The importance of particular wetlands as drought-refuges varies annually but the coastal plain is used consistently. Peel/Harvey Estuary is one of the most important coastal wetlands in this respect (Jaensch and Vervest 1988; Halse *et al.* 1990, 1992a, unpubl. data).

On a regional scale seasonal wetlands supported about twice as much breeding activity as permanent wetlands for Grey Teal and Pacific Black Duck. Winter-wet areas supported more breeding activity than permanent and seasonal wetlands combined. This pattern is likely to apply to many of the common species on the Swan Coastal Plain and shows that, while they may not be important individually, maintenance of certain common waterbird populations is dependent on the continued existence of winter-wet areas. Extrapolations of the number of Grey Teal and Pacific Black Duck in different wetland types further highlighted the importance of winter-wet areas. Although these species congregate on permanent wetlands and estuaries in summer, winter-wet areas supported the bulk of both populations in spring (Table 5.15).

5.4.5 Modelling

Discriminant analysis has been used successfully to predict stream invertebrate communities from physical and chemical parameters (Wright *et al.* 1984; Ormerod and Edwards 1987; Storey *et al.* 1990). Genard and Lescourret (1992) used discriminant barycentric analysis to predict presence of Teal in different habitats. Environmental data collected during Scopewest did not allow particularly good discrimination between wetland groups defined by UPGMA classification on waterbird abundance. This was not unexpected, however, since the three groups to which wetlands were being allocated were not completely separated in ordination space.

Similarly, regression analysis on environmental variables was not particularly successful in explaining variation in species richness on wetlands of the coastal plain. Wetland size was the factor with most effect on species richness and explained 44% of the variation. Gibbs *et al.* (1991) explained 37% of variation in species richness using the logarithm of wetland area, while Murphy *et al.* (1984) accounted for 47% of variation in duck species richness and Sillen and Solbreck (1977) explained 55% of bird species richness using area.

Multiple regression using five variables explained 57% of variation in species richness in Scopewest. By comparison, Guillet and Crowe (1985) explained 69% of variance in regional numbers of waterbird species in Africa using stepwise multiple regression. Abundance and length of rivers and the amount of lake shoreline were important factors in Guillet and Crowe's (1985) analysis. Murphy *et al.*'s (1984) study was exceptional in explaining 94% of variation in species richness of waterfowl populations in taiga ponds. The area studied by Murphy *et al.* (1984) was underlain by continuous permafrost, which may have resulted in simplified biological relationships and, hence, more predictability. Wetland area, and nitrite, ammonia and phosphate levels were the most important variables in their analysis.

Several possible reasons exist for the low predictive success and low variation explained in the Scopewest modelling:

(1) waterbirds respond to variables that were not monitored in Scopewest

(2) levels of many parameters measured in Scopewest were always above the threshold that evokes a waterbird response

(3) waterbird use of wetlands is influenced by social behaviour. Joyner (1980) and Godin and

Joyner (1981) showed birds will use a wetland because of the presence of other birds

(4) waterbirds are very mobile and may briefly visit many wetlands in the one day, which introduces a stochastic element into data collection

(5) much waterbird use of wetlands, such as nesting by colonially breeding species, is influenced by wetland history. Guillet and Crowe (1985) attributed unexplained variance in modelling waterbird species richness in Africa to historical factors.

6 Movements

6.1 Introduction

Waterbirds are highly mobile and some species of shorebird migrate between the North and South Hemisphere each year. Even species confined to Australia sometimes move considerable distances. Carrick (1962) reported that a Straw-necked Ibis banded at Gingin, on the northern edge of the Swan Coastal Plain, was found almost 3000 km away in Arnhem Land seven months later. A Grey Teal banded in Perth in 1954 was found two years later in New South Wales, almost 3000 km from the banding site (T.L. Riggert and D.R. Munro unpubl. data).

Within south-western Australia there are seasonal movements of waterbirds in response to rainfall and water levels. During winter and spring many birds use seasonal or ephemeral wetlands (Chapter 5). In summer birds become concentrated on permanent wetlands (Halse *et al.* 1990). Gentilli and Bekle (1983) proposed that as well as moving from seasonal to permanent wetlands many Grey Teal move from inland areas to the coastal plain and this probably applies to other species. Many Pacific Black Duck banded in autumn on the coastal plain between 1952 and 1976 were subsequently recovered inland (T.L. Riggert and D.R. Munro unpubl. data).

Nevertheless, it is likely that some birds spend their entire annual cycle on the Swan Coastal Plain. This study was primarily concerned with studying the patterns of movement of birds that remained on the coastal plain, especially the extent to which they used different types of wetland. A secondary objective was to study the amount of movement between the coastal plain and other parts of the State. Birds were colour-marked with unique combinations of colour and code so that the movements of individual birds could be tracked.

6.2 Methods

Adult and juvenile ducks were colour-marked using nasal saddles (Sudgen and Poston 1968; Davey and Fullager 1985) engraved with a two-character alphanumeric code. Most ducks were caught by cannon-netting at sites in the Perth metropolitan area but in autumn of 1991 some birds were caught in rural areas using cannon nets and walk-in traps. Banding sites are listed in Appendix 8. Bread or grain was used to lure ducks in front of nets or into traps. In rural areas nets were covered with chaff to make them less conspicuous.

Ducks were aged, sexed and fitted with an Australian Bird and Bat Banding Scheme (ABBBS) leg band. The coloured nasal saddles (mostly white or yellow with black lettering) were attached to the nares with a length of nylon fishing line.

Nestling wading birds were colour-marked using wing tags (Blackman 1973; Maddock 1989). Nestlings were caught on the nest, aged and yellow or blue tags with a two character alphanumeric code and black or white lettering were attached with stainless steel wire through the patagium on each wing (Anon. 1991). ABBBS leg bands were also fitted. It was often necessary to use ladders to reach nests. Banding sites are listed in Appendix 8.

Resightings of colour-marked birds, with location and date of the sighting, were obtained during Scopewest surveys, during annual waterfowl counts in south-western Australia (Halse *et al.* 1992a) and from members of the public. Distance and direction moved between initial banding and first resighting were calculated (Zar 1989). Number of resightings (including multiple resightings) in each of the seven pre-defined Scopewest wetland types were determined and spatial and temporal patterns of resightings were examined for birds that were seen frequently.

6.3 Results

Totals of 1024 ducks and 811 large wading birds were banded (Table 6.1). Rate of resighting was highest for Pacific Black Duck (139%), followed by Yellow-billed Spoonbill (45%), Great Egret (24%) and the two species of ibis (7%). There was a strong correlation between proportion of sightings on the Swan Coastal Plain and the rate of resighting (Table 6.2, r_s=0.97, P<0.05), which suggested resighting rate reflected amount of time marked birds spent in urban areas.

Ninety-six per cent of Pacific Black Ducks were resighted in permanent or artificial wetlands (Table 6.2). Almost half the resightings of Yellow-billed Spoonbills were from permanent wetlands; Great Egrets resightings were spread more evenly among wetland types. Straw-necked Ibis were sighted

Table 6.1 Number of birds of each species colour-marked and resighted 1990-92. Banding locations are given in Appendix 8

Species	No. marked	No. of resightings	No. of individuals resighted
Pacific Black Duck	997	1388	499
Grey Teal	5		
Australian Shelduck	21		
Maned Duck	1		
Great Egret	188	45	32
Australian White Ibis	71	5	5
Straw-necked Ibis	470	33	27
Yellow-billed Spoonbill	74	33	26
White-faced Heron	7		
Rufous Night Heron	4		

Table 6.2 Number of resightings of colour-marked birds of each species in different wetland types 1990-92. A = artificial wetlands, P = permanent wetlands, S = seasonal wetlands, R = river sections, D = drains, E = estuarine lagoons, W = winter-wet areas, C = outside Swan Coastal Plain

Species	A	P	S	R	D	E	W	C
Pacific Black Duck	603	733	20	25		5		2
Great Egret	9	12	7	3		6	1	7
Australian White Ibis		1	2	1				1
Straw-necked Ibis		6	1	3		1	9	13
Yellow-billed Spoonbill	1	16	6	1		6	2	1

most frequently outside the Swan Coastal Plain or in winter-wet areas.

Few colour-marked birds moved long distances. A Pacific Black Duck resighted at Jerdacuttup Lake on the South Coast was the only duck known to have moved >400 km; 88% of Pacific Black Duck were first resighted <50 km from where they were banded (Table 6.3). Although one-third of the colour-marked Great Egret moved 151-400 km, the only recorded movement out of the south-western corner of Western Australia was a bird seen at Gascoyne Junction. Yellow-billed Spoonbill mostly moved short distances. One bird was seen near Esperance but 96% moved <150 km. Straw-necked Ibis moved intermediate distances; 63% of first resightings were 51-150 km from banding sites but one bird moved 2070 km to Broome within seven months of being banded as a nestling. Distances moved by the five Australian White Ibis that were resighted varied from 0-364 km.

6.3.1 Movements of individual ducks

Multiple resightings of Pacific Black Duck banded in urban wetlands showed three patterns. A few birds appeared to be resident in the same urban wetland year-round. This pattern was displayed most clearly at Loch McNess. For example, the duck with white nasal saddle ZZ was banded at Loch McNess on 10 April 1990 and had been resighted there 15 times by 26 March 1992. Loch McNess is on the outer fringe of what can be considered urban and, although people feed the ducks regularly, contains extensive secluded areas.

Many ducks were always resighted in the same urban wetland but never seen in late winter/early spring, presumably because they were attempting to breed elsewhere. An example is the duck with white nasal saddle PR, which was banded at Shenton Park Lake on 20 March 1990 and resighted there 11 times during December 1990 to January 1991 and October 1991 to February 1992. The duck with yellow saddle AO is an example of a duck that spent summer in the metropolian area but, perhaps, bred in a rural area, where the probability of being seen was much lower. Yellow AO was banded at Loch McNess on 10 April 1990, resighted 30 km north at rural Blyth's Lake on 14 October 1990 and then seen at Loch McNess during April and July 1991. Another example of a bird that may have bred in a rural wetland is Yellow FR, which was banded at Joondalup Lake on 11 April 1990 and resighted there on 4 May. It was then seen 40 km east in rural Gidgegannup on 31 August and finally resighted at Loch McNess on 5 October.

Other ducks moved widely through the metropolitan area. Some of these birds were seen throughout the year and may have bred in an urban setting. An example is Yellow LH, which was banded at Perth Zoological Gardens, released at Joondalup Lake on 11 April 1990 and resighted at McDougall Park Lake on 10 July, Booragoon Lake on 31 October and Blue Gum Swamp on 8 January and 8 July 1991. Another example is Yellow SR, which was banded at Shenton Park Lake on 27 March 1990 and resighted at Perry Lakes

Table 6.3 Number of birds of each species resighted various distances and directions away from banding site (first resightings only)

Distance (km)	Direction of movement None	North	East	South	West
Pacific Black Duck					
<10	388				
10-50		36	15	38	10
51-150		3		5	
151-400				3	
401-1000				1	
Great Egret					
<10	8				
1-50		1		1	2
51-150		4	1	3	1
151-400		6	2	2	
401-1000		1			
Straw-necked Ibis					
<10	2				
1-50					1
51-150		7	3	7	
151-400		4		1	
401-1000		1			
>1000		1			
Yellow-billed Spoonbill					
<10	11				
1-50		1			1
51-150		7	2	2	1
151-400					
401-1000			1		

on 18 December, Alfred Cove on 20 August 1991, an Attadale backyard on 6 September and Piney Lake on 23 November. White RV, which was banded at Perth Zoological Gardens and released at Joondalup Lake on 4 April 1990, was seen with a brood at Kings Park on 24 October 1991.

There were two resightings of Pacific Black Duck banded in rural wetlands. A bird banded at Lake Clifton in April 1991 was resighted the same month on the Mitchell Freeway Ponds in Perth. A bird banded in a swamp off Cowalla Road, Gingin, in May 1991 was seen near Capel a month later.

6.3.2 Movements of individual wading birds

There were few multiple resightings of large wading birds and no patterns emerged. The Great Egret with yellow wing tag JB was banded at McCarleys Swamp on 14 November 1989 and resighted at Mary Carroll Park in April 1990, Gosnells district in July 1990, Mary Carroll Park in January 1991 and at Vasse River (near the original banding site) in November 1991. The Yellow-billed Spoonbill with yellow wing tag AJ was banded at Barraghup Swamp on 13 October 1989 and resighted at Holmes-Balfour Swamp on 3 January 1990, Warton-Wright Swamp on 5 January and Kogolup Lake on 25 April. The Straw-necked Ibis Yellow OX was banded at Corio Swamp on 29 November 1989 and resighted at Carabooda Lake on 10 March 1990 and Gwelup Lake on 12 October. Most Straw-necked Ibis were resighted in rural areas and Yellow 5Y probably moved in a more typical way. It was banded at McCarleys Swamp on 2 November 1990 and resighted in the Manjimup district on 27 February and 15 March 1991 and at Northcliffe on 9 June.

6.4 Discussion

Few clear patterns emerged from the colour-marking study, although resighting rates were comparable with those obtained elsewhere (Maddock 1991, pers comm.). The lack of resightings during winter/spring made interpretation of Pacific Black Duck data difficult but there appeared to be a group of Pacific Black Duck that were resident in the metropolitan area. More work is required to determine what proportion of ducks belong to this group. The fact there were so few resightings in winter/spring suggests most Pacific Black Duck dispersed to breed on small coastal plain wetlands or on inland wetlands. Extrapolations of survey counts according to area of each wetland type showed that most Pacific Duck Duck remaining on the coastal plain in winter used winter-wet areas (Chapter 5). It was presumed that the inland movement of many Pacific Black Duck banded in the Perth metropolitan area between 1952 and 1976 occurred in winter (T.L. Riggert and D.R. Munro unpubl. data).

The Pacific Black Duck banded between 1952 and 1976 at several rural, as well as urban, sites in south-western Australia appeared more mobile than birds banded in 1990-91. Of birds resighted or recovered away from the banding site, 22% of 1952-76 birds moved >150 km (Table 6.4) compared with 4% of 1990-91 birds. Pacific Black Duck banded in South Australia between 1953 and 1963 also showed more extensive movement than Scopewest birds (Norman 1971). On the above evidence

Table 6.4 Number of Pacific Black Duck banded in south-western Australia (1952-76) moving various distances and directions (T.L. Riggert and D.R. Munro unpubl. data). The large number of birds showing no movement resulted from multiple captures during banding operations; most recoveries were from birds shot by hunters.

Distance (km)	Direction of movement None	North	East	South	West
<10	3308				
1-50		184	143	180	158
51-150		73	22	103	126
151-400		84	51	68	59
401-1000		10	2		4
>1000		10	2		

we tentatively suggest that the Pacific Black Duck population in Perth contains a high proportion of 'urban' birds that are relatively sedentary. However, low observer effort and difficulty distinguishing the small nasal saddles at a distance probably contributed to a lack of sightings of Scopewest birds on inland wetlands or on less accessible wetlands of the coastal plain if they did move and, hence, our data may overemphasise the sedentary nature of the Pacific Black Duck we banded. Regular surveys and trapping showed that at least two colour-marked ducks used the artificial wetlands at the Associated Minerals Consolidated plant near Capel, 200 km south of Perth, and it is likely that colour-marked birds would have been seen on nearby winter-wet areas and seasonal swamps if they had been surveyed. Similarly, two colour-marked ducks were seen on the south coast during aerial surveys, when close observation is difficult, so it is likely that more colour-marked birds occurred in that region.

Wing tags were larger and more visible than nasal saddles. This may be why wading birds were observed in a greater variety of habitats than Pacific Black Duck. Our results are in general agreement with previous work on wading species, which suggested that Straw-necked Ibis and Great Egret are more mobile than Yellow-billed Spoonbill (Marchant and Higgins 1990). Extensive northwards movements of Straw-necked Ibis have been recorded previously (Fuller and Lindgren 1958; Carrick 1962) but there was also a south-eastern dispersal of birds from Corio Swamps and McCarley's Swamp that has not highlighted previously. Few Straw-necked Ibis moved into the metropolitan area compared with other wading species.

7 Breeding Success

7.1 Introduction

Breeding success of birds is usually controlled by level of predation, food availability and weather (Cody 1971; Ford 1989). Predation is the most important factor for most species, accounting for about 80% of breeding failure (Ford 1989).

The extent of losses to predation in waterbirds depends on the number of predators in the vicinity and, to a lesser extent, the amount of vegetation in which nesting sites and broods can be hidden from predators (Higgins *et al.* 1992). The Silver Gull, Australian Raven *Corvus coronoides* and Oblong Tortoise *Chelodina oblonga* are predators of ducklings (CALM files; S.A. Halse pers. obs.) and occur in large numbers in metropolitan wetlands. The European fox also may predate on waterbird clutches and broods (D. James pers. obs.). Many metropolitan wetlands lack dense vegetation, because the surrounding area has been cleared, and nests and broods are exposed. Predation levels would be expected to be higher in these metropolitan wetlands than in less disturbed rural wetlands.

Food availability controls breeding success directly when adults are unable to find enough food to sustain themselves and their young and they abandon the clutch or the young starve (Cody 1971; Ankney and MacInnes 1978). It can also affect breeding success indirectly through the adults spending increased time foraging and less watching for predators (Perrins 1977). Furthermore, young birds that are weak because of food shortage are more likely to die during adverse weather or be caught by predators (Ford 1989). Several studies have shown higher breeding activity in recently flooded wetlands than permanent wetlands and inferred it was the result of greater food availability (Kadlec 1962; Crome 1986).

The aims of this part of the project were to examine breeding success of various species of waterbird in relation to:

(1) metropolitan versus rural wetlands

(2) type of wetland, especially seasonal versus permanent wetlands and wetlands with heavy versus light use by waterbirds.

7.2 Methods

Size of clutch and whether it was being incubated were recorded for many of the nests found during surveys. Size of brood and age of the young were recorded for many of the broods found (Chapter 3).

Data on clutch and brood size were analyzed for species with >20 records of clutch size during incubation or brood size of known-age young. One-way ANOVA was used to test whether brood size decreased with age and, if it did not, data for all broods of the species were lumped for subsequent analyses. Whether clutch size was larger than brood size was examined using *t*-tests.

Breeding success in different habitats was examined by comparing brood sizes only, because of lack of data on clutch size. One-way ANOVA was used to test whether differences existed in brood size between the wetland groups defined by the UPGMA classification (Chapter 5) or between permanent, seasonal and winter-wet areas. Differences in brood size between wetlands in rural areas or in nature reserves and wetlands in urban areas were examined with *t*-tests. Rural was defined as outside the Perth Metropolitan Region.

7.3 Results

There were 243 records of clutch size of incubating birds of 24 different species and 895 records of brood size of known-age young of 29 species. Seven of the 10 species with enough records for analysis had significantly smaller brood than clutch sizes (Figure 7.1), which suggested that either some eggs did not hatch or some young were predated. Except for Maned Duck (P=0.01), there was no evidence of a decrease in brood size with age after hatching.

The brood sizes of Black Swan, Pacific Black Duck and Grey Teal were similar among UPGMA wetland groups (Figure 7.2). Brood sizes of Eurasian Coot were larger in Groups 3 and 3 than Group 1 wetlands. Black Swan and Grey Teal broods were larger in rural areas and nature reserves than in urban wetlands; broods of Pacific Black Duck and Eurasian Coot were the same size in both habitats (Figure 7.2). Only Pacific Black Duck broods showed no difference in size among permanent, seasonal

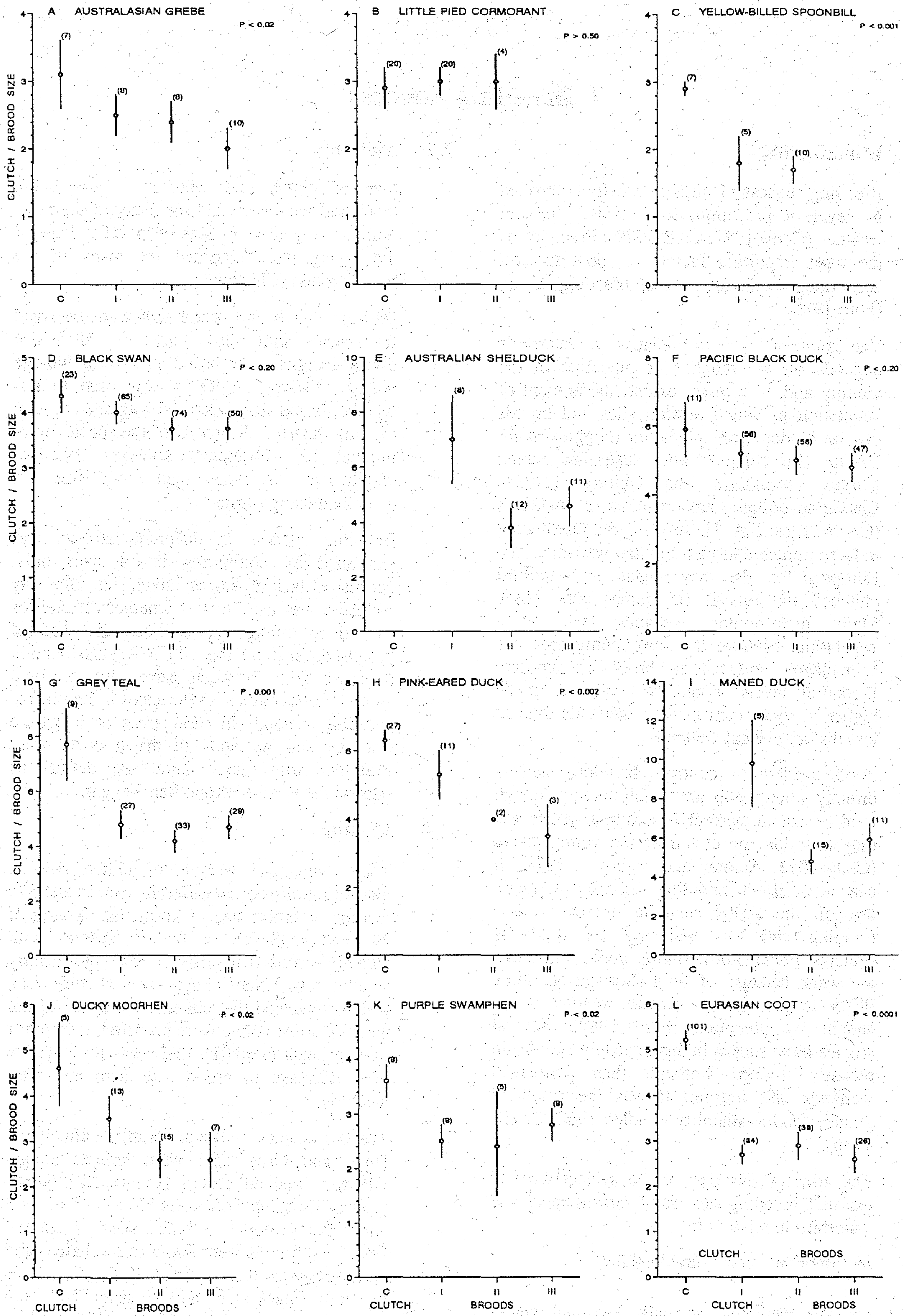


Figure 7.1 Mean (± SE) clutch size and brood sizes of Class I, II and III young for species with >20 records. Sample sizes and significance level of *t*-tests comparing clutch size and brood size are shown

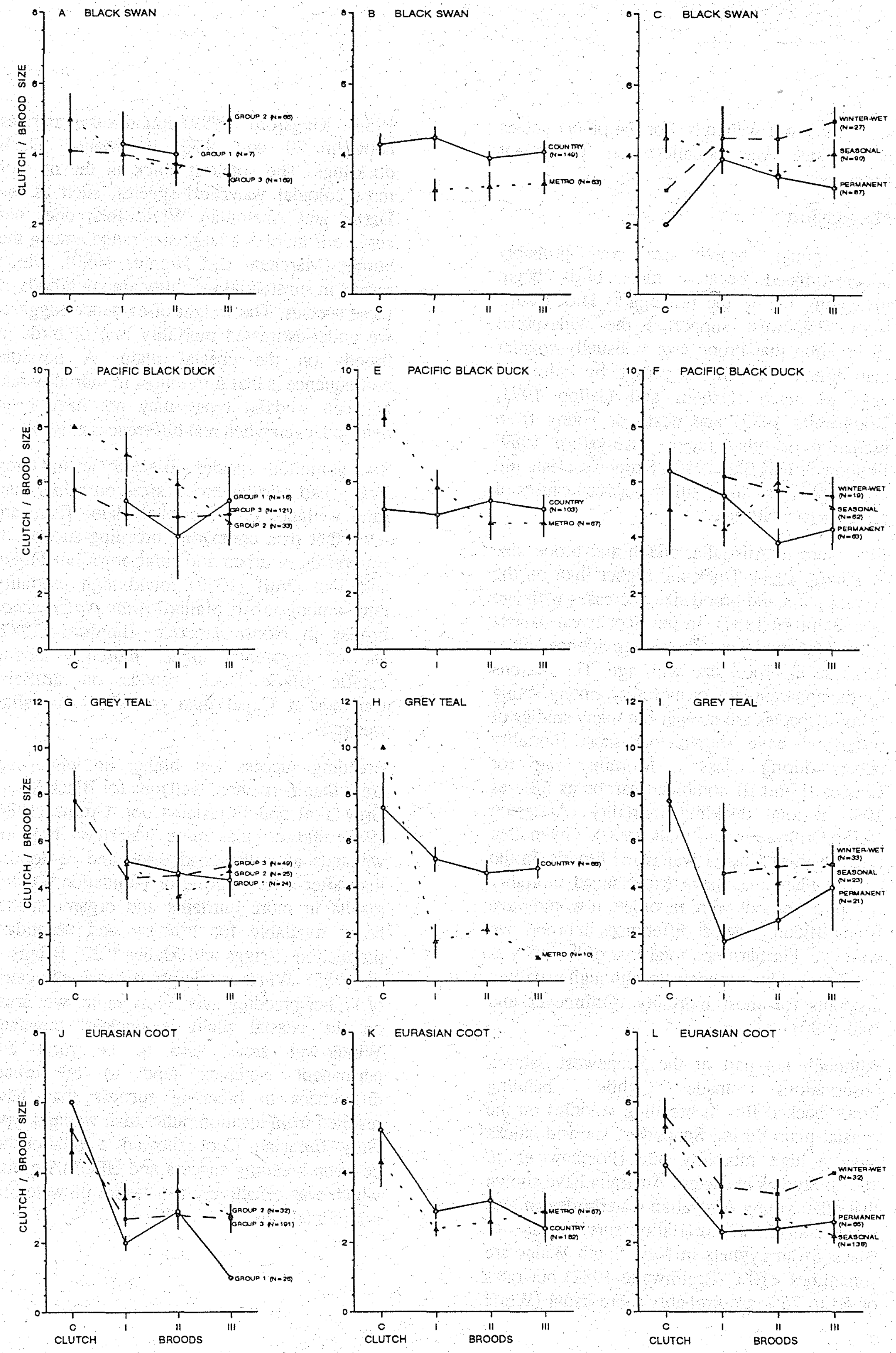


Figure 7.2 Mean (± SE) clutch size and brood sizes of Class I, II and III young of Black Swan, Pacific Black Duck, Grey Teal and Eurasian Coot in wetlands of the three UPMGA groups, in urban and rural wetlands, and in permanent, seasonal and winter-wet wetlands

and winter-wet wetlands. For the other species brood size was smallest on permanent wetlands.

7.4 Discussion

Even though brood size was probably underestimated because most birds begin incubating before the last egg is laid, results from Scopewest supported the widespread observation that brood size is usually smaller than clutch size. This is caused by failure of eggs to hatch (Dzubin and Gallop 1972; Braithwaite 1982) and death of young from predation or other factors (Kingsford 1989; Orthmeyer and Ball 1990). Scopewest data did not enable us to differentiate between causes of reproductive failure.

Elsewhere in Australia, clutch and brood size of Pacific Black Duck are higher than on the coastal plain and brood size decreases with age (see Bamford 1987). In the Scopewest dataset only Maned Duck showed evidence of a decrease in brood size with age. The reasons for the apparent lack of mortality among young of most species are unclear but many studies of waterfowl have shown that most mortality occurs during Class I. Mortality rate for Classes II and III combined can be as little as 10% of total duckling mortality (Anderson 1975; Orthmeyer and Ball 1990). Given that birds in most Class I waterfowl broods on the coastal plain may have experienced mortality before the broods were recorded, it would have been difficult to detect differences in brood size with age. Furthermore, total loss of broods was not detected by our analysis, although usually it accounts for most mortality (Orthmeyer and Ball 1990).

Although not part of the Scopewest dataset, observations made while banding Straw-necked Ibis in breeding colonies on the coastal plain during Scopewest showed chicks have a high mortality rate (Forshaw *et al.* 1992). Studies in eastern Australia have shown that other young Australian waterbirds can also suffer considerable mortality: survival rates of Black Swan cygnets in New South Wales are sometimes <10% (Braithwaite 1982) but rates of 50 to 75% are probably more usual (White 1986). Kingsford (1989) found survival rates between 20 and 90% in Maned Duck ducklings. The smallest chick in the nest of most colonial waterbird species, such as the Darter and Australian White Ibis, does not survive if there is a large size range among the young (Marchant and Higgins 1990), which results in substantial mortality among broods of these species. The weight of evidence suggests we under-estimated mortality rate of birds in broods on the coastal plain. A possible consequence is that differences in mortality rate between wetland types may not have been detected, even when real differences existed.

Two ubiquitous species - Black Swan and Grey Teal - had smaller brood sizes on urban than rural wetlands of the coastal plain. There are few other data comparing breeding success of waterbirds in urban and rural areas but Figley and Van Druff (1982) found high mortality rates among urban Mallard *Anas platyrynchos* broods in North America. Bamford (1987) showed apparently higher mortality among Pacific Black Duck broods on artificial wetlands at Capel than on other Australian wetlands.

Breeding success was higher on winter-wet areas than permanent wetlands for Black Swan, Grey Teal and Eurasian Coot. Crome (1986, 1988) showed that more waterfowl bred on wetlands after they had dried and re-flooded than after a long period of inundation. Drying results in more nutrients and organic matter being available for primary and secondary production (Briggs and Maher 1983; Briggs *et al.* 1985). Whether this process was the cause of higher breeding success in winter-wet areas on the coastal plain is unclear, however. Winter-wet areas tend to be rural and permanent wetlands tend to be urban; differences in breeding success may have resulted from location rather than wetland type. Only Eurasian Coot showed a relationship between breeding success and UPGMA group, which was effectively a measure of waterbird use of wetlands.

8 General Discussion

8.1 Wetland classification

The ideal classification scheme for wetlands of the Swan Coastal Plain would reflect all limnological and conservation parameters of interest to wetland managers. Results from Scopewest suggest that such a scheme is unlikely to be devised because various biological groups respond differently to environmental characteristics of wetlands and the relationships between environment and biological groups are not always tight ones.

For waterbirds, the UPGMA classification of wetlands based on their environmental characteristics could not be used to predict waterbird usage with a high degree of success, nor could the geomorphic settings that Semeniuk (1988) used to derive consanguineous suites of wetlands. Waterbird use of wetlands was not strongly related to the pre-defined wetland types used in Scopewest. Although not formally tested, it is also unlikely that waterbirds differentiated between the wetland mapping units used by Semeniuk (1987), which were similar to the pre-defined wetland types.

The UPGMA classification of wetlands based on waterbirds is not a practical management tool. It requires detailed waterbird data and, because species lists produced by surveys are quite sensitive to survey effort and wetland conditions at the time of survey, wetlands surveyed at a future date cannot be fitted into the Scopewest classification easily.

Additional analysis of Scopewest data is required to determine whether alternative classifications can be devised. Perhaps a classification based on a mixture of intuition and multivariate analysis would be useful. For example, within each pre-defined wetland type there may be wetlands that are good, intermediate or poor (Groups 1,2,3) in terms of waterbird usage. These may comprise more homogeneous groups than those in the overall UPGMA classification of wetlands based on waterbird data and, therefore, may show stronger relationships with environmental variables. The approach developed by Pressey and Bedward (1991a,b) and Bedward *et al.* (1992), using homogeneity analysis to determine optimum number of groups for a classification, should be applied to the Scopewest dataset when the programs are readily available.

The UPGMA classifications of wetlands, according to their waterbird communities, that are presented in this report used data on all waterbird species. Shortage of time prevented wetlands being classified according to their use by particular taxonomic or ecological groups of species, such as shorebirds, herons and allies, or ducks.

8.2 Environmental characteristics affecting waterbird usage

The Scopewest dataset contained many inter-dependent variables. If experiments had been practical, which they were not, hypothesis testing via controlled experiments would have been a more satisfactory method of distinguishing the effect of different variables on waterbird usage. Before all information about environmental characteristics and waterbird use of wetlands contained in the Scopewest dataset will be available, more rigorous examination of the data is required than was possible during the period of the project. 'Experiments' will need to be designed *a posteriori* to control the effects of wetland area, flooding regime and flow regime before examining the effects of other variables on waterbird usage. The possibility that responses will not be linear should be considered.

The initial analyses suggested that environmental variables associated with wetland size, depth, vegetation structure, primary productivity, width of wading zone and fish abundance had most effect on composition of waterbird communities. Davis *et al.* (1993) found that salinity, the degree of eutrophication, colour and seasonality were the main factors affecting the aquatic invertebrate fauna. Degree of eutrophication and primary production are essentially the same measurement, although nutrient levels did not seem to affect waterbirds directly; similarly, seasonality and depth are very strongly related. At the species level salinity was a significant variable but it did not appear to affect the compositon of waterbird communities in wetlands. This may be the result of so few saline wetlands being surveyed during Scopewest and the UPGMA classification being very broad. Halse *et al.* (1993) and

Goodsell (1990) discussed the effect of salinity on waterbirds in detail.

The Scopewest analyses did not examine the effect of environmental variables on different ecological groupings of waterbird species. There are likely to be differences in the way groupings respond to environmental variables and, from a management viewpoint, analysis at the level of waterbird groupings may be more useful than whole community analysis and should be investigated in the future.

8.3 Waterbird breeding sites

Some of the wetlands found to support comparatively high numbers of breeding species during Scopewest had not been surveyed previously or were not recognized as important. For other sites, such as Thomsons Lake, far fewer species were recorded breeding during Scopewest than between 1981 and 1988. The generally low number of breeding records during Scopewest made it difficult to fit wetlands surveyed only during Scopewest into an overall evaluation of the significance of different wetlands for breeding. More surveys are required to identify the best breeding sites and to locate more comprehensively the breeding sites of species with cryptic nesting behaviour, such as bitterns, crakes and rails.

In spite of the paucity of breeding data from Scopewest, it was clear that winter wet-areas, because of their prevalence, are an extremely important habitat for Pacific Black Duck and Grey Teal. The significance of different habitats for breeding should be calculated for all species. We used pre-defined wetland types in calculations for Pacific Black Duck and Grey Teal but a wetland classification with greater relevance to waterbirds might be more appropriate when formulating management action.

8.4 Role of Swan Coastal Plain in maintaining waterbird populations

Results from Annual Waterfowl Counts (Halse *et al.* 1990, 1992a, unpubl. data), RAOU surveys (Jaensch *et al.* 1988) and previous surveys of Great Egret colonies (Jaensch and Vervest 1989) indicated that in recent years the Swan Coastal Plain has been an important breeding area for waterbirds in south-western Australia, although previously it had been viewed more as a drought refuge than a breeding ground (Gentilli and Bekle 1983). Conflicting views about the importance of the Swan Coastal Plain for breeding can, at least partially, be reconciled if the amount of breeding on the coastal plain diminishes during wet years when there is extensive flooding inland. At such times many freshwater lakes fill in the Goldfields, Gascoyne and Pilbara and salt is flushed out of Wheatbelt lakes. Because of salination in the Wheatbelt (Halse *et al.* 1992b), there are few inland lakes that are suitable for prolific breeding in years with average, or below average, rainfall (Halse 1987; Goodsell 1990).

Results of the colour-marking program supported the idea that the coastal plain is the major breeding area for large wading birds in south-western Australia (Serventy and Whittell 1976; Jaensch and Vervest 1989). Great Egret and ibis, particularly, appeared to radiate out from colonies on the coastal plain. Results for Pacific Black Duck suggested there was little movement off the coastal plain, although this may have been an artefact of the small size, and hence poor visibility, of the nasal saddles.

Observations and, to a lesser extent, the colour-marking data implied that the majority of Pacific Black Duck remaining on the coastal plain in winter disperse to breed on small wetlands, mostly on farmland. While the coastal plain appears to be a major breeding area for Pacific Black Duck and Grey Teal in south-western Australia, maintenance of populations of these species will be largely dependent on the continued existence of small wetlands (mostly winter-wet areas) on farmland.

There is a group of Pacific Black Duck that appear to be confined to the Perth metropolitan area. Many of them are fed bread in the urban parks and these birds are comparatively tame. It is unclear whether the proportion of 'urban' birds in the metropolitan area is static or increasing.

8.5 Water levels in wetlands

The need for permanent, freshwater wetlands on the Swan Coastal Plain to act as drought refuges for waterbirds during summer is obvious. The importance of water depth and flooding regime at other times of the year is less clear. Several authors have suggested that drying out improves a wetland as breeding habitat for waterbirds, especially ducks, when it re-floods (Frederickson and Taylor 1984; Crome 1986). The larger brood sizes on winter-wet areas of the Swan Coastal Plain for three of the four species investigated provides support for the notion. On the other hand, species such as the fish-eating Little Black Cormorant and Darter breed only in wetlands where water has been present some time, fish are established and a climax aquatic community has developed (Crome 1988).

Although decisions about drying swamps out over summer to improve their value for waterbird breeding are complex, Crome (1988) thought such action was often beneficial if wetlands contained only a small area of shallow water in summer and, thus, did not have a useful drought-refuge function. Crome (1988) noted, however, that there were situations where the remaining water was of greater benefit for terrestrial fauna, or wetland-associated plants, than drying would have been to waterbird breeding. If it is decided to artificially dry out a wetland, which is usually done at the beginning of summer, there should not be a sudden drop in water level while some waterbirds are still breeding because that is likely to cause widespread breeding failure (Baker-Gabb 1985).

8.6 Wetland monitoring

Davis *et al.* (1993) suggested salinity, pH, colour, dissolved oxygen, nutrients and chlorophyll *a* should be measured to monitor the value of Swan Coastal Plain wetlands for aquatic invertebrates. Our waterbird analyses suggested that depth, vegetation structure, pH, dissolved oxygen, chlorophyll *a* and salinity, because of its importance for individual species and ease of measurement, would be the most useful variables to monitor. The two sets of variables are similar but the implications of changes in values of the variables are quite different for the two faunal groups. It is important to decide the purpose for which a wetland is being managed prior to monitoring.

At present there is no accepted list of characteristics that should be monitored to manage the overall environmental condition of wetlands on the Swan Coastal Plain when the management objective is not aimed at a particular biological group, such as aquatic invertebrates or waterbirds. There may be benefit in further developing the Scopewest UPGMA classification of wetlands based on environmental variables to choose variables for general purpose monitoring. In its current state the classification suggests area, amount of submerged macrophyte and extent of vegetation buffer are the most important attributes for reflecting differences between the types of wetland that exist on the coastal plain. Buffers are widely regarded as important for maintaining the ecological health of wetlands (Davis 1989; Lane 1991) and wetlands with extensive submerged macrophytes function differently from those dominated by planktonic algae (Davis *et al.* 1993; Hough *et al.* 1989), so measurements of these variables should be useful.

8.7 Wetland management

Many significant relationships existed between wetland characteristics and waterbird use on the Swan Coastal Plain but the relationships were not tight ones; there were a lot of wetlands that were exceptions to general rules. This means that wetland management for waterbirds on the Swan Coastal Plain is not yet at the stage where it can be undertaken by routine prescriptions; instead it must be wetland-by-wetland and based on what is currently known about waterbird biology and how wetlands function.

A few generalizations can be made, however. Bigger wetlands support more birds and wetlands with complex vegetation and higher primary productivity support more birds. Water depth should probably be >1 m at the time of the year the wetland is filling its primary waterbird function. Most species prefer comparatively fresh water. The requirements of breeding birds are less clear but the presence of trees is important for many species, depth should be >0.5 m and some species prefer wetlands with abundant fish. Wetlands containing fish are usually permanent.

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Appendix 1. Wetland codes, names, types (A=artificial, D=drain, E=estuarine lagoon, R=river section, P=permanent, S=seasonal, W=winter-wet) and locations (1:100,000 topographic map number, Easting and Northing). Wetlands studied by Davis *et al.* (1992) are marked by *. Permission was obtained to enter private property.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
ABER	ABERNETHY ROAD DRAIN	2033	401700	6434400	D	Between Kargotich and Hopkinson Roads in Byford - drain runs ENE. Map 134 of street directory. 1.8 km long
ADEN	ADENIA ROAD LAGOON	2033	396800	6455200	E	Adjacent to corner of Adenia Road and Balista Street, Riverton
AIPS	PERTH AIRPORT SWAMP*	2034	404300	6466300	P	Munday Swamp - Kalamunda-Wittenoon-Dundas rds, follow track N along railway & then follow first drain running NW, MSD map 64
AIPW	PERTH AIRPORT WINTER-WET	2034	404500	6466500	W	NW corner of AIPS, MSD map 64, enter off King Rd, via Kalamunda Rd
AIRD	AIRFIELD ROAD DRAIN	2035	396900	6519400	D	Ca 1 km E along airfield Rd (passed the windmill). Walk north along drain to woodland. Gingin topo, SW of Mungala.
ALCO	ALCOA POND	2033	390800	6425100	A	N of Zigzag Rd, MSD map 139.
ALEX	ALEXANDER ISLAND	2031	379000	6313500	R	Collie River section in Clifton Park just before bridge. Bunbury topo, 3.5 km SE of Australind.
ALFR	ALFRED COVE	2033	387800	6455700	E	Off Burke Drive between Lentona and Stoneham Rd - survey only the cove itself and the tower marsh - not the mudflats.
AMIE	AMIENS POOL	2134	406300	6462000	R	Adjacent Amiens Court, Willendon, MSD map 29.
ASHF	ASHFIELD FLATS	2034	399800	6468000	E	Off Ashfield Parade, Ashfield. Map 62 and 63 street directory.
AUST	AUSTRALIND NATURE RESERVE	2031	379800	6315300	S	Bunbury topo, 1.5 km S of Australind, S of the entrance rd to the titanium plant.
BALD	BALDIVIS ROAD WINTER WET	2033	388900	6421600	W	300 m N of Clyde-Baldivis intersection on E side, MSD map 147.
BALL	BALANNUP LAKE*	2033	400300	6446200	S	Off Ranford Rd, Forrestdale, MSD map 105.
BALP	EMU-BALLAJURA PONDS	2034	394900	6477000	A	In Ballajura, E of Alexander Drive.
BAMD	BAMBUN ROAD DRAIN	2035	395400	6523300	D	Follows Bambun Rd from highway to bend in the road.
BAML	LAKE BAMBUN	2035	394600	6522700	P	End of Bambun Rd, Gingin topo.
BAMW	BAMBUN ROAD WINTER WET	2035	396100	6523300	W	Winter-wet along N side of Bambun Rd from Brand Hwy to sharp corner south.
BANG	BANGANUP LAKE*	2033	389400	6440700	S	In Harry Waring Marsupial Reserve, off Russel Rd, Wattleup.
BARL	BARRETT-LENNARD LAKE	2035	384200	6550500	P	N of Beermullah Lake, ca 3.0 km N of Drew Rd, Gingin topo.
BARS	BARRAGHUP SWAMP	2032	385800	6396800	P	Pinjarra Rd, Barraghup.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
BAYS	BAYSWATER SWAMP	2034	397800	6466600	P	Off the extension of King William St.
BEEL	LAKE BEERMULLAH	2035	384000	6547800	P	Enter via Drew Rd, W of Brand Hwy, opposite Wannamal West Rd. 1.3 km W on Drew, turn S through gate and follow fence S then W to lake.
BEEN	BEENYUP SWAMP	2033	389200	6416500	S	Off Stakehill Rd, N of Serpentine Pine forest - enter at Beenyup Farm.
BEES	BEERMULLAH SEASONAL SWAMP	2035	376000	6544700	S	N of Beermullah Rd, 2.7 km W of Pin Pin Rd.
BELM	BELMONT CLAYPITS	2034	397400	6465700	A	Flooded clay pits S of Eastway drive-in, off Daley St, Belmont. (IPT 20 site).
BENG	BENGER SWAMP	2031	391600	6328600	S	12 km S of Harvey, W off S.W. Hwy onto Swamp Rd, cross drain and turn N onto Melaleuca Rd (at CALM reserve sign), site 250 m North.
BIBR	BIBRA LAKE*	2033	388600	6448200	P	MSD map 102.
BIGC	BIG CARINE SWAMP*	2034	384900	6475100	P	S of Beach Rd, Carine, MSD maps 31 & 45.
BIND	BINDOON-MOORA ROAD WINTER WET	2135	410900	6549500	W	1 km S of Wannamal school on W side of Rd.
BLAC	BLACKWATCH SWAMP	2032	386400	6375300	P	S of intersection of Heron Point Rd and Old Bunbury Rd, enter off Fishermans Rd.
BLAL	BLACK LAKE	2032	386800	6399300	E	Off Mandurah/Pinjarra Rd, S of Serpentine R., turn N onto Watson Rd, at sharp left corner turn right onto sand track and follow to lake.
BLUE	BLUE GUM SWAMP	2033	391100	6454700	P	Off Reynolds Rd, Mt Pleasant, MSD map 92.
BLYT	BLYTHS LAKE	2035	380400	6534600	S	Gingin topo, on Gingin Brook Rd, 0.5 km W of Quin Rd crossing.
BODK	BODKIN MARSH	2033	394500	6456800	E	Off Kilkenny Close, Waterford - adjoins Canning River (Estuary), MSD map 83.
BOGG	BOGGY BAY SOUTH	2032	382500	6387100	E	Off track that continues N of Lake Mealup Rd, before turning into Carraburnup Rd, Pinjarra topo, sample lagoons in bay to extreme E.
BOOG	BOORAGOON SWAMP	2033	390500	6453900	P	MSD map 92.
BRO2	BROWNES LANE WINTER WET	2032	390500	6375800	W	3.7 km S along Brownes Lane from Old Bunbury Rd on E side.
BULL	BULL CREEK	2033	392300	6453900	R	Bateman Park - creek adjacent and drain/creek to the W, MSD map 93.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
CAMP	CAMPBELL ROAD WINTER WET	2031	389400	6330500	W	At 5.8 km and 6.3 km on W side of Campbell Rd from Partridge Rd, survey w-w areas. 6.3 km access from side rd down to Wellesley River.
CANC	CANNING COUNCIL PONDS	2033	398700	6456800	A	Off Albany Hwy, Cannington, MSD map 84.
CANF	CANNING RIVER - FERNDALE	2033	398400	6456100	R	NW of Lofoten Way (off Metcalfe - Ferndale Cr - and Willcock St), MSD map 84, walk down track opposite house # 16.
CANW	CANNING RIVER - WILSON	2033	396100	6456200	E	To the west of Centenary Ave. off Manning Rd, MSD maps 83/84.
CARA	LAKE CARABOODA*	2034	378300	6500900	P	E of Wanneroo Rd, Carabooda, MSD map 8.
CARE	CARENIUP SWAMP	2034	386400	6473500	S	N of Erindale Rd, Gwelup, MSD map 45.
CARI	CARIS PARK DRAIN	2032	385400	6386200	D	On Edges Rd at turnoff from Greenlands Rd at Lager Downs. Survey drain running beside road NW. Pinjarra topo.
CARR	CARRABURMUP ROAD WINTER WET	2032	381400	6386100	W	0.6 km along Carraburmup Rd from Lake Mealup Rd on S side of rd, + w-w at 2.0 km S side (combine).
CARS	CARRABURMUP SWAMP	2032	380200	6386900	S	Pinjarra topo, N of Carraburmup Rd in Nature Reserve, at E side of reserve, through cleared field.
CHAS	LAKE CHANDALA*	2035	400600	6514500	S	Gingin topo (and Perth), off Brand Hwy, 10 km N of Muchea.
CHIT	LAKE CHITTERING	2135	413800	6521300	S	Chittering topo, S end of lake, near outflow to stream, enter farmyard off Chittering Valley Rd.
CLAR	LAKE CLAREMONT	2034	384300	6462800	P	Claremont, to W of Davies Rd.
CLIB	CLIFTON ROAD BRIDGE	2032	381800	6367800	R	Pinjarra topo, Harvey River crossing E of junction between Clifton and Old Bunbury Rds.
CLIS	CLIFTON ROAD SWAMP	2032	380400	6368300	S	Pinjarra topo, S of Harvey delta and N of Clifton Rd (kink in rd).
COD1	CORONATION ROAD DRAIN 1	2031	382000	6362200	D	0.9 kn E of Doman Rd - drain running north.
COD2	CORONATION ROAD DRAIN 2	2032	391500	6365400	D	2.5 km along Coronation Rd passed Dorsett Rd - scan down drain on both sides.
COO1	COONABIDGEE ROAD WINTER WET 1	2035	394500	6529700	W	1.6 km W of Hwy on straight section of rd running SE, on S side of road, Gingin topo.
COO2	COONABIDGEE ROAD WINTER WET 2	2035	392500	6529400	W	3.3 km W of Brand Hwy, Gingin topo - include drain and winter wet at 3.3 km.
COO3	COONABIDGEE ROAD WINTER WET 3	2035	389200	6527800	W	0.7 km W of Strickland Rd (near bend in rd) on left. Winter-wet area leading into swamp.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
COOC	COOLUP ROAD CROSSING	2032	396800	6377400	R	Pinjarra topo, E of Coolup town, ca. 0.5 km E on Coolup Rd passed Avondale Farm.
COOD	COOLUP DRAIN	2032	385400	6384300	D	On Paull Rd from Greenlands Rd to point where drain runs SE - scan down drain.
COOG	COOGEE SPRINGS*	2034	377300	6500500	S	Off Bernard Rd South, Carabooda. MSD map 8.
COOO	LAKE COOLOONGUP*	2033	386500	6425700	S	Off Mandurah Rd, MSD map 138.
COOS	COONABIDGEE SWAMP	2035	388700	6527700	S	Connected to Coonabidgee No.3 winter-wet which is 0.7 km along Coonabidgee Rd to the W of Strickland Rd on the left.
COPO	LAKE COPOLUP	2033	390700	6441500	S	E of Thompsons, NW of intersection of Hammond and Russel Rd, Success.
COR1	CORONATION ROAD WINTER WET 1	2032	381700	6362800	W	0.9 km E of Doman Rd, follow drain to winter wet.
COR2	CORONATION ROAD WINTER WET 2	2032	388300	6365500	W	1.0 km E along Coronation Rd passed Dorsett Rd on N side, opposite Lot 1328.
COR3	CORONATION ROAD WINTER WET 3	2032	391100	6365200	W	2.2 km E along Coronation Rd, passed Dorsett Rd on N side.
CORX	CORONATION ROAD CROSSING	2032	334400	6362500	R	Harvey Bridge on Coronation Rd, E of Yalgorup National Park.
COWA	COWALLA POOL	2035	361800	6562300	R	On Cowalla Rd at Moore River Bridge crossing.
CRAG	CRAIGIE LEA EAST DAM	2031	387200	6309000	A	S of Burekup off SW Hwy onto Henty Rd, W onto Offer Rd, W onto Edwards Rd. 100m S from bend enter field and follow fence W to site
CRAM	CRAMERS DAM	2133	412300	6443500	A	Churchmans Bk Rd, access off Albany or Brookton Hwys, swamp downstream of Churchmans Reservoir, MSD map 118.
CREA	CREATON POOL	2032	394600	6392500	R	On Paterson Rd, N of Pinjarra, bend in river near rd.
CULC	LAKE CULCADARRA	2035	377500	6537700	S	North of Gingin Brook Rd.
CURT	CURTIN POND	2033	394900	6458200	A	Corner of Kent St and Beazley Ave. in grounds of Curtin University.
DEEP	DEEPWATER LAGOON	2035	388800	6528500	S	North of Coonabidgee Swamp, E of Coonabidgee Rd, marked on topo sht.
DEVI	DEVILS ELBOW SWAMP	2032	384800	6379600	P	2.4 km E along Mills Rd from Thomsons Rd, N of the kink in the rd.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
DIAM	DIAMOND ISLAND	2035	361300	6530400	R	E of Guilderton on Moore River.
DILS	DILLEYS SWAMP	2032	388600	6374700	S	Off Fishermans Rd, 1 km W of Brownes Lane intersection. Turn S past dairy shed, 100 m W then south through gate to swamp 600 m across field
DUCK	DUCK POOL	2033	395400	6426600	D	North of Mundijong Rd, Baldivis. MSD 141. Count drain from road and pool.
EAGL	EAGLE BROOK DAM	2133	409600	6442600	A	Albany Hwy, turn N onto Carradine Rd, E of Camms Rd and Locke Dr junctions, turn N onto property at Eagle Brook sign.
EAST	EAST HORSE PADDOCK SWAMP	2033	390300	6449500	S	E of North Lake, N of Hope Rd, MSD map 102 (not marked).
ELLE	ELLEN BROOK SWAMP*	2134	408700	6486500	S	Ca 3.5 km N of upper Swan Bridge along Great Northern Hwy (N of Hwy).
EVER	EVERGREEN STUD WINTER-WET	2032	382900	6360400	W	On Peppermint Grove Rd, E of Peppermint Grove Swamp. S side of rd, just E of Evergreen Stud.
FIGI	FIGIERTS ROAD WINTER WET	2032	387900	6395600	W	About 500 m W of junction of Figierts Rd and Old Mandurah Rd.
FIS1	FISHERMANS ROAD WINTER WET 1	2032	390500	6375500	A	Opposite junction with Brownes Lane (has an island in the middle).
FIS2	FISHERMANS ROAD WINTER WET 2	2032	389700	6375700	W	0.6 km W along Fishermans Rd from Brownes Lane opposite house on N side of rd.
FIS3	FISHERMANS ROAD WINTER WET 3	2032	388900	6375500	W	1.3 km W along Fishermans Rd from Brownes Lane on S side.
FIS4	FISHERMANS ROAD WINTER WET 4	2032	387500	6375200	W	3.0 km along Fishermans Rd from Brownes Lane on N side (pine tree on roadside near bend).
FISS	FISHERMANS ROAD SWAMP	2032	390100	6375500	S	0.6 km W along Fishermans Rd from Brownes Lane on the S side of road next to house.
FOLM	FOLLY-MARAMANUP DRAIN	2033	389600	6422600	D	1.7 km of drain between Folly Rd and Maramanup pool, MSD 147.
FOLP	FOLLY POOL	2033	389500	6422800	R	North of Folly Rd, Baldivis - count drain NW from road and pool together, MSD 147.
FOOT	FOOTBALL LAKE	2135	408300	6552400	P	1.4 km W on Wannamal West Rd off Bindoon/Moora rd. Park opposite gate and walk 500 m S to gap in melaleuca around lake.
FORL	FORREST-LIDDELOW WINTER WET	2033	395100	6443900	W	Near mansion and poultry sheds at cnr of Forrest/Liddelow.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
FORR	LAKE FORRESTDALE*	2033	399800	6441900	S	S of Armadale Rd, Forrestdale, MSD Maps 114 & 115. Follow sandtrack S from W end of Broome St to junction.
FORT	FORREST-TAPPER SWAMP	2033	393400	6444400	S	SE of intersection of Forrest and Tapper Rds, Banjup, MSD map 113.
FREE	FREEWAY PONDS	2034	391000	6463300	A	Opposite Mount Hospital, Perth city, MSD map 1B.
FREM	FREMANTLE ROAD BRIDGE	2033	402800	6451500	R	On Fremantle Rd, Gosnells, bridge over Southern River, MSD map 95.
GANS	GANYAH FARM DAMS	2031	385800	6320600	A	On the entrance road to Ganyah homestead, E of the road.
GANY	GANYAH FARM RIVER	2031	385400	6320800	R	Wellesley River near Ganyah Farm 6.0 km W of Brunswick Junction, Bunbury topo. Access via farmyard.
GIB1	GIBBINGS ROAD WINTER WET 1	2032	392700	6373200	W	0.7 km SW along Gibbings from Coolup on N side.
GIB2	GIBBINGS ROAD WINTER WET 2	2032	392500	6372900	W	0.9 km SW along Gibbings from Coolup Rd on S side and W a little - in front of shed.
GIBA	GIBBS-BARTRAM ROAD SWAMP*	2033	394200	6441800	S	N of Gibbs Rd between Beenyup and Liddelow - W of Baronia Rd swamp MSD map 113.
GIBB	GIBB ROAD SWAMP	2033	397400	6441700	S	0.5 km W of Nicholson Rd along Gibbs Rd. N side of road, MSD map 114.
GIN1	GINGIN BROOK ROAD SWAMP 1	2035	385700	6534700	S	1.3 km from Sandringham Rd to bend in road - survey all roadside winter-wets.
GIN2	GINGIN BROOK ROAD SWAMP 2	2035	378400	6534300	S	2.5 km from Quin Rd - 2 winter-wet areas on N side of rd passed Barunah Farm turn-off.
GIN3	GINGIN BROOK ROAD WINTER WET3	2035	376000	6535300	W	Winter-wet area near Gingin Brook crossing at Gingin Brook East.
GIN4	GINGIN BROOK ROAD SWAMP 4	2035	374400	6535500	S	1.0 km on from Gingin Brook East crossing - on N side of rd (with trees in it) and do south side as well.
GIN5	GINGIN BROOK ROAD SWAMP 5	2035	373000	6535800	P	1.6 km from Gingin Brook East crossing on N and S sides of road.
GINE	GINGIN BROOK EAST CROSSING	2035	375800	6534600	R	Gingin Brook crossing at Gingin Brook East.
GINJ	GINGIN BROOK JD*	2035	384500	6527800	S	S of Gingin Bk Rd, into Quin Rd and Tangletoe Rd (see mudmap for full directions).
GINL	GINGIN NATURE RESERVE	2035	387800	6525400	P	Off Coonabidgee Rd, S onto Strickland rd, after 3.1 km veer W, cross drain, follow rd to 6.2 km & enter W via track or drain 200m N.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
GINN	GINNIBY POOL EAST	2135	415200	6532700	R	Bindoon-Moora Rd N from Great Northern Hwy, after 1.0 km turn N onto Toy rd, W at foot of hill and sample pool to W of rd bridge.
GLOV	GLOVER WELLS BRIDGE	2135	412800	6535200	R	River crossing near where Glover-Wells Rd crosses Moora Rd, Chittering topo.
GNAL	LAKE GNANGARA*	2034	393200	6482300	S	N of Gnangara Rd, Gnangara, MSD map 26.
GNAR	GNANGARA ROAD WINTER WET	2034	391300	6481500	W	NW of Gnangara/Sydney Rd intersection, MSD map 25.
GOBB	GOBBA LAKE	2034	397500	6467000	A	Corner of Guildford rd and Tonkin Hwy - MSD map 62.
GOEG	GOEGRUP POOL	2032	384900	6402500	E	E of Mandurah on Lakes Rd, approx 1 km W of Serpentine bridge, short track to S at end of fence line.
GOLD	GOLDINGS SOAK DAM	2031	383800	6307600	A	NW corner of Wireless and Harris Rds, near Pelusey/Harris swamp.
GOOD	GOODALE SANCTUARY SWAMP	2032	384900	6378700	P	Off Birchmont Rd, 3.0 km S of Mills Rd.
GOOL	LAKE GOOLLELAL*	2034	387800	6480300	P	N of Hepburn Ave, Kingsley, MSD map 31.
GOSS	GOSS ROAD WINTER-WET	2031	381400	6347500	W	Opposite junction of Goss Rd and Old Coast Rd. In paddock to west, has paperbarks in parts. Goss Rd ca. 3.0 km S of Riverdale rd.
GOYA	GOYAMIN POOL	2134	418900	6507900	R	Off Chittering Rd (cnr Chittering and Keating Rds) on Brockman River.
GREE	GREENLANDS MARSH	2032	385200	6390100	S	In nature reserve E of Peel Inlet. Follow Beecham Rd W onto sand track to junction, turn S then W and follow track to wetland.
GREY	GREY ROAD SWAMP	2032	386100	6391300	S	N off the end of Grey Rd, Pinjarra topo.
GUNG	GUNGAWAH POOL	2035	357500	6558600	R	On Moore River, S of Baramba Farm
GWEL	LAKE GWELUP*	2034	385200	6472500	P	N of Karinyup Rd, Karinyup, MSD map 45.
HAR1	HARVEY ESTUARY 1	2032	378600	6371100	W	4.4 km S along Southern Estuary Rd from Island Point turnoff, on a bend, E side of road running W and watertank nearby.
HAR2	HARVEY ESTUARY 2	2032	377500	6373400	E	1.9 km along Southern Estuary Road from Island Point turnoff, on E side of road.
HAZE	HAZELMERE LAKE	2034	404700	6469000	S	Hazelmere Circus, Hazelmere, MSD map 64, off Bushmead Rd.
HEBB	HEBBLE LOOP SWAMP	2033	395200	6464700	S	E of Liddelow Rd, S of Hebble Loop, marked as 'KRAEMER RESERVE', MSD map 113.
HEND	HENDERSON ROAD DRAIN	2033	394900	6413800	D	On Henderson Rd, survey from Purack Rd junction for 1-2 km E (walk up over bank).

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
HERD	HERDSMAN LAKE*	2034	386000	6467500	P	MSD map 59 (Partitioned into HERI (Industrial Water) and HERF (Floreat waters) in Murdoch study).
HOLM	HOLMES-BALFOUR SWAMP	2033	401300	6448500	S	S of Holmes between Lakey and Balfour streets, E of pond, MSD map 105.
HOPE	HOPE ROAD SWAMP	2033	388800	6449700	S	S of North Lake, N of Bibra Lake, MSD map 102.
HURS	HURSTVIEW LAKE	2036	365900	6586500	S	16 km N of Moore River/Regans Ford on Brand Hwy, turn W and lake is 700 m W of Hwy.
HYDE	HYDE PARK	2034	392300	6465800	A	Corner Vincent and William Streets, Perth, MSD map 61.
JAME	JAMES SWAMP	2033	398800	6440900	S	W side of Forrestdale Lake off Commercial Rd, MSD map 114.
JAND	LAKE JANDABUP*	2034	390900	6487000	P	E of Joondalup Lake, enter off Hawkins Rd south, MSD map 21.
JOHN	JOHNSON-MILLAR ROAD DRAIN	2033	390800	6428700	D	S of Wellard Bullrush Swamp, runs W of Johnson, then S to Millar Rd finishing at bridge.
JOO1	JOONDALUP LAKE-N OF CAUSEWAY	2034	385900	6483700	S	Joondalup Lake - basin immediately to the north of Ocean Reef Road Causeway.
JOO2	JOONDALUP LAKE-S OF CAUSEWAY	2034	385900	6483400	S	Joondalup Lake - basin immediately to the south of Ocean Reef Road Causeway.
JOON	LAKE JOONDALUP*	2034	384300	6487400	P	W of Wanneroo Rd, Wanneroo, MSD Maps 24 & 20.
JULI	JULIMAR BRIDGE	2135	415700	6515000	R	Julimar turnoff from Chittering Rd, section S for 0.5 km.
KARA	KARAKIN WINTER WET	1935	354400	6563800	W	E-S-E of Lancelin, end of Karakin Lakes Rd, Ledge Point topo.
KARD	KARNUP ROAD DRAIN	2033	389100	6416500	D	0.9 km E of Baldivis Rd - survey N to the bridge and S to bend in drain.
KARW	KARNUP ROAD WINTER WET	2033	393600	6418300	W	0.5 km W of Yangetti Rd, winter-wet on both sides of road between two houses near Keilly Lane.
KAWI	KAWIGIN POOL	2035	360700	6562000	R	N of Cowalla Bridge, Moore River, off Baramba Rd, Gingin topo.
KEMP	KEMERTON SWAMP 1	2031	381700	6328200	P	Most northerly Kemerton wetland, NE of Rosamel swamp (top of Leschenault inlet) drive in through gate and follow edge of swamp.
KEMS	KEMERTON SWAMP 2	2031	384600	6322700	S	Along Rosamel Rd E to junction with Marriot Rd, left and after 3.3 km park on right, follow fence N to drain and then walk into swamp.
KENT	KENT STREET WEIR	2033	397800	6456600	R	Over Canning River near end of Kent St, MSD map 84.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
KEOG	KEOGH SWAMP	2032	386400	6398900	S	NE of Mandurah/Pinjarra Rd, S of Serpentine, turn NE onto Watson Rd and SE onto Matthie Rd, swamp is NE between Matthie & Black Lake.
KING	KING-LIEPOLD ROAD DRAIN	2033	397300	6428500	D	Section of drain running E from King Rd on N side of Leipold Rd. MSD 141.
KOGO	KOGOLUP LAKE*	2033	389600	6443700	P	N of Thomsons Lake, MSD map 112 (Partitioned into KOGN (North body) and KOGS (South body) for Murdoch Study).
LAKE	LAKES ROAD SWAMP	2032	389900	6402300	S	Just E of Gull Rd (winter-wet being cleared) 4.2 km from Goegrup Bridge, reedy winter-wet area.
LAKS	LAKES ROAD SOUTH SWAMP	2032	394600	6401700	W	Near intersection of Yangeti and Lakes Rd, just E of the powerlines.
LANC	LANCELIN ROAD POOL	2035	362400	6535700	R	Moore River, pool at crossing with Lancelin Rd, 6.5 km NE of Guilderton, Gingin topo.
LEED	LEEDALE FARM	2032	387900	6402200	W	E of Goegrup Lake, just W of Leedale Farm, w-w on both sides of rd. 1.6 km E of Goegrup Bridge on S side + w-w at 2.0 km on both sides.
LIMA	LIMA PONDS	2031	376100	6311500	E	1st pond on right after crossing Preston Bridge - in front of house. Combine with pond adj. LIMA building off Nth Inner Harbour Rd.
LMOG	LOWER MOGUMBER POOL	2135	412900	6566300	R	4.0 km E of Mogumber, N of the Mogumber-Yarrawindah Rd.
LOCH	LOCH MCNESS*	2034	374700	6508800	P	In Yanchep National Park, MSD map 5.
MANL	MANDOGALLUP LAKE*	2033	389200	6438500	P	E of Mandogallup - Sayer Rd junction, Wattleup, MSD map 122 (also known as Lake Wattleup).
MANR	MANDURAH ROAD WINTER WET	2033	385800	6422100	W	S of Mandurah - Safety Bay swamp, cover reedy pools from swamp to first house south.
MANS	MANDURAH-SAFETY BAY RD SWAMP	2033	385900	6422700	S	S of Safety Bay - Mandurah Rd intersection on W side of rd, MSD map 146.
MARA	MARAMANUP POOL	2033	390400	6421300	R	E of Walyungup Lake - enter off Doghill Rd, MSD 147.
MARI	LAKE MARIGINIUP*	2034	387300	6489000	S	NW of Jandabup Lake, enter off Wade Street, MSD maps 20 & 21.
MARR	MARRIOT CROSSING	2031	385900	6323100	R	Survey both sides of bridge at Marriot Rd crossing over Wellesley River.
MARY	MARY CARROLL PARK	2133	405700	6450200	P	In Gosnells, MSD maps 106 & 96 (include swampland to SW off Coulston Way).

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
MATH	MATHER RESERVE	2033	393700	6442800	S	(Old Bartram Rd swamp). E of Thomsons Lake, E of intersection of Bartram - Tapper Rd, MSD map 113.
MAYC	MAYLANDS CLAYPITS	2034	396600	6464800	A	N of Swan River on Maylands Peninsula. Enter off Clarkson Rd, MSD map 74.
MAYF	MAYFIELD DRAIN	2032	382400	6369800	D	Drain heading W towards Harvey Estuary off Old Bunbury Rd, follow for 0.5 km each way - W and E.
MAYW	MAYLANDS MARSH	2034	396900	6464400	E	N of Swan River on Maylands Peninsula, W of Clarkson Reserve, MSD map 74.
MCDO	MCDOUGALL PARK	2033	392400	6458100	A	NE of Canning Bridge, E of Clydesdale Street, MSD map 83.
MCLA	LAKE MCLARTY	2032	379400	6379800	S	E of Harvey Estuary, N of end of Mills Rd.
MEAL	LAKE MEALUP	2032	379300	6383000	S	N of McLarty Lake, off Lake Mealup Rd.
MEAR	MEALUP ROAD WINTER WET	2032	381900	6385500	S	On W side of Mealup Rd just N of the top of Munginup swamp.
MELA	MELALEUCA PARK*	2034	397200	6495900	S	Off Neaves Rd, 13.2 km E of Pinjar Rd and 2 km E of Timely Hostess Mews junction. Swamp on N side of Neaves Rd.
MIL1	MILLS ROAD WINTER WET 1	2032	383500	6379500	W	1.6 km along Mills Rd, E of Thomsons Rd (near small swamp) on S side.
MIL2	MILLS ROAD WINTER WET 2	2032	384600	6379400	W	Opposite Devils Elbow Swamp on S side of road.
MIL3	MILLS ROAD WINTER WET 3	2032	388000	6379700	W	5.6 km E along Mills Rd from Thomson Rd opposite Evans Rd junction (N), W of Dairy shed.
MILS	MILLS ROAD SWAMP	2032	383500	6379500	S	1.7 km along Mills Rd, E of Thomsons Rd, W of house on lot 847.
MOGU	MOGUMBER WEST ROAD WINTER WET	2035	393700	6569200	W	15.5 km W of Mogumber along Mogumber West Rd, N side of road.
MONG	LAKE MONGER*	2034	388600	6466400	P	N of Lake Monger Drive, MSD map 60.
MONI	MONIER POND	2034	401500	6464600	A	Off Tonkin Hwy in grounds of Monier tile factory, Kewdale. Enter off Tonkin Hwy, between Gt Eastern and Leach Hwys, MSD map 75.
MOOR	MOORE ROAD SWAMP	2031	380800	6307000	S	SE of junction of Picton/Dardanup Rd and Moore Rd.
MTBR	LAKE MOUNT BROWN*	2033	386100	6439300	S	W of Rockingham rd, opposite Wattleup rd.
MUCL	LAKE MUCKENBURRA	2035	384200	6532300	P	12 km W of Gingin off Sandringham Rd, Gingin topo.
MUCR	MUCKENBURRA ROAD SWAMP	2035	385800	6533200	S	0.7 km along Muckenburra Rd off Sandringham Rd. W-w on N side of road.

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MUCY	MUCKENBURRA YABBIE DAMS	2035	383800	6532500	A	At the end of Muckenburra Rd.
MUSS	MUSSELL POOL*	2034	400300	6476300	A	In Whiteman Park, Whiteman, MSD map 35.
NAMM	NAMMING LAKE	2036	363700	6581300	P	7.5 km N of Regans Ford, turn W onto Nammegarra Rd (opposite pond) off Brand Hwy, follow rd on to farm to lake.
NEER	LAKE NEERABUP*	2034	380800	6495900	S	E of Wanneroo Rd, Neerabub, MSD map 15.
NGIB	NORTH GIBBS ROAD WINTER WET	2033	397400	6442200	W	W-w area off Taylor Rd to the E & N of Gibbs Rd swamp, MSD map 114.
NICM	NICHOLSON-MASON ROAD SWAMP	2033	398200	6442800	S	N of intersect of Forrest-Nicholson Rd on W side of Rd. 'W-w type drain'.
NICO	NICHOLSON-OXLEY RD WINTER WET	2033	398500	6440200	W	Near intersection of Nicholson and Oxley Rd, E of Nicholson, S of Oxley, MSD map 114.
NICS	NICHOLSON-SPENCER SWAMP	2033	399500	6455600	S	NW of junction of Nicholson and Spencer Rds, MSD map 84.
NINE	NINE MILE LAKE	2032	385700	6376000	P	N of junction of Old Bunbury and Herron Point Rds.
NLAK	NORTH LAKE*	2033	388800	6450200	P	E of Progress Drive, North Lake, MSD map 92.
NOON	NOONEE POOL	2035	360300	6551700	R	Off Bennies Rd, 4.0 km SW of Bidaminna Lake.
NOWE	LAKE NOWERGUP*	2034	379600	6499700	P	E of Wanneroo Rd, Nowergup in Nowergup Lake Fauna Sanctuary, MSD map 11.
NROS	NORTH ROSAMEL SWAMP	2031	380400	6326200	S	1st swamp on the E side of road N of the Rosamel/Old Coast Rd crossing, NE of the top of the Leschenault Inlet.
OLDB	OLD BUNBURY-RD WINTER WET	2032	393100	6383900	W	E of intersection of Old Bunbury and S.W. Hwy in farmlands.
PARR	PARRY-GARRETT ROAD MARSH	2034	397400	6466100	E	Marsh and riverine vegetation from Garrett Rd bridge to Parry Cove, including open water.
PAU1	PAULL ROAD No.1 WINTER-WET	2032	389800	6381700	W	2 km W along Paull Rd from Old Bunbury Rd, on S side, between two dairy sheds (one new and one old).
PEHA	PELUSEY/HARRIS WINTER WET	2031	381500	6308300	W	SW corner of junction of Harris and Martin Pelusey Rds.
PELI	PELICAN POND	2031	378400	6313400	E	0.6 km S of Collie Bridge on right hand side, adjacent to bend in Estuary Drive off Old Coast Rd (survey whole pond).
PEPP	PEPPERMINT GROVE SWAMP	2032	382200	6360400	S	Opposite junction of Talbot - Peppermint Grove Rd, E of pine plantation.
PERR	PERRY LAKES	2034	385000	6464800	A	N of Underwood Avenue, Floreat, MSD map 71 & 59.
PINB	PINJARRA TOWN BRIDGE	2032	394700	6389500	R	Bridge over Murray River, survey easiest section.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
PINE	PINEY LAKES*	2033	390100	6453400	P	SW of Booragoon Lake, E of Murdoch Drive, MSD map 92.
PINR	PINJARRA ROAD WINTER WET	2032	389600	6393900	W	S of Ravenswood Bridge on W side of road.
PIPI	PIPIDINNY SWAMP	2034	375000	6505200	P	W of Wanneroo Rd, Eglinton, MSD map 7 and 5.
PUNC	PUNCHBOWL SWAMP	2031	372700	6309700	P	In Bunbury townsite.
PUNR	PUNRACK ROAD BRIDGE	2033	397700	6416400	D	Drain between Hopelands Rd and Utley Rd bridge. 6.0 km W-S-W of Serpentine.
REGA	REGANS FORD	2036	376300	6570900	R	Crossing of Brand Hwy over Moore River, Dandaragan topo.
RIVD	RIVERDALE NATURE RESERVE	2032	386400	6348800	S	Nature reserve on Riverdale Rd, bottom of Pinjarra topo.
RIVF	RIVERLEA FARM	2033	395900	6421900	R	Serpentine River pool on Riverlea Farm, private access past farmhouse, off end of Lowland Rd.
ROBE	ROBERT BAY	2032	377800	6387700	W	4.2 km along Carraburmup Rd in front of house in paddock to 4.9 km NW (treat as one).
ROCK	ROCKINGHAM PARK	2033	380500	6426400	D	0.8 km W of Rockingham Park shopping centre. Enter off Cygnrs St (200 x 80).
ROGE	ROGERS ROAD WINTER WET	2032	390300	6397900	W	Track 4.5 km along Paterson, turn right into Rogers Rd, head W for 0.5 km and w-w on both sides of road, plus w-w at 1.0 km.
RONS	RON STONE PARK	2034	392600	6467600	A	Near Mt Lawley College, Bradford Street, MSD map 61.
ROSA	ROSAMEL SWAMP	2031	380200	6325800	S	SW of corner of Rosamel Rd and Leschenault Rd, E of top of Leschenault Inlet.
SAND	SANDRINGHAM ROAD SWAMP	2035	386500	6533400	S	0.3 km along Sandringham Rd from Gingin Brook Rd.
SCEE	SCENIC DRIVE SWAMP	2031	380200	6321400	E	S of car park on Buffalo Rd/ Scenic Rd drive, just after where dual rds merge into one.
SCEW	SCENIC DRIVE WINTER WET	2031	380100	6324100	W	N of scenic Drive swamp on E side of divided road, count all winter-wet areas to Rosamel Rd.
SERD	SERPENTINE ROAD DRAIN	2033	391800	6418000	D	From E bridge E to Powell Rd, then S along channel to bridge on Karnup Rd.
SPEC	THE SPECTACLES (NORTH EYE)*	2033	390500	6435500	S	W of Johnson Rd, The Spectacles, MSD map 122 & 131.
STAR	STAR SWAMP	2034	382400	6474800	S	Off Hope St, North Beach, MSD map 44.
STOK	STOKES FARM WINTER WET	2032	395100	6398300	W	Winter-wet in fields between farmhouse and West Corio Swamp.

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SWAN	SWAN STREET FOOTBRIDGE	2034	404800	6470300	R	Over Helena River footbridge near Swan Street, Hazelmere, MSD map 50.
TALB	TALBOT SWAMP	2032	382900	6359200	S	0.9 km S along Talbot Rd off Peppermint Grove Rd on E side at bottom of cleared paddock (tree planting). Tall paperbarks on wetland S side
TANG	TANGLETOE SWAMP*	2035	379200	6530200	S	Turn S off Gingin Bk Rd onto Quin Rd, cross Tangletoe Rd intersection, turn W at sharp turn in Rd and swamp is 300m from turn.
TAWA	TAWARRA ROAD WINTER WET	2035	399400	6517500	W	On E-W road S of Tawarra, N of Chandala Swamp, Gingin topo.
THOL	THOMSONS LAKE*	2033	389300	6441400	S	N of Russell Rd, Success, MSD map 112.
THOM	THOMSON-MILLS ROAD DRAIN	2032	383000	6379600	D	Drain from just N of Estuary Park SE to Mills Rd.
THOS	THOMSON ROAD WINTER WET	2032	383700	6382700	W	From Thomson Rd drain to Bettina Downs, count all winter-wet areas.
USWA	UPPER SWAN BRIDGE	2134	407300	6483200	R	Over the Swan River (Gt North. Hwy), MSD map 29.
WALL.	WALLERING SWAMP	2035	395300	6521800	S	W off Brand Hwy onto Bambun Rd, follow rd W then S, through gates and swamp is in reserve 500 m S of gates and 200-400m E of Rd.
WANN	LAKE WANNAMAL	2135	409300	6556800	P	4.0 km N of Wannamal on W side of road.
WART	WARTON-WRIGHT SWAMP	2033	398500	6446500	S	Between Warton Rd and Wright Rd, Forrestdale, MSD map 104.
WATE	WATERVIEW PARADE	2034	399700	6467000	E	Between Waterview Parade and Swan River - marshy area, MSD map 62 - off Gt East. Hwy, down Boulder, then Waterview and walk along ramp.
WCOR	WEST CORIO SWAMP	2032	394500	6398800	P	W of Corio Rd, 10 km N of Pinjarra.
WEEB	WEEBILL-SPOONBILL PONDS	2034	387500	6472000	A	In Stirling, MSD map 45.
WHIP	WHITEMAN PARK SWAMP	2034	398400	6477800	S	0.5 km W of parking area in Whiteman Park (near Mussel Pool).
WHIT	WHITEFIELD ROAD WINTER WET	2032	390400	6379700	W	Opposite junction of Mills and Old Bunbury Rd.
WIGI	WILLIAMSON/GIBBINS WINTER-WET	2032	388200	6369500	W	NE of junction of Williamson and Gibbins Rd, with several Melaleuca standing in winter-wet, behind house.
WILC	WILGIE CREEK	2032	386400	6395500	R	E and W of Wilgie Creek from the bridge crossing.
WILD	WILLIAMSON ROAD DRAIN	2032	385800	6369000	D	Section of drain on N side of Williamson Rd, E of Clifton Rd Swamp. Pinjarra topo.

Code	Wetland Name	Map Number	Easting	Northing	Wetland Type	Location
WILG	WILGARUP LAKE	2034	375600	6505900	S	E of Wanneroo Rd, NE of Pipidinny Swamp, MSD map 5.
WILS	WILSON PARK SWAMP	2033	397500	6456500	S	Off Leach Hwy, Bungaree Rd, Fern Rd (MSD map 84).
WRIG	WRIGHT LAKE	2133	405800	6447500	S	Off Lake Rd, Westfield, MSD map 106.
WSWR	WEST SWAN ROAD CROSSING	2134	405500	6482400	R	Bridge over Ellen Brook on West Swan Rd, Upper Swan, MSD map 29.
YANG	LAKE YANGEBUP*	2033	389600	6445200	P	Off Yangebup Rd, MSD map 102.
YOND	LAKE YONDERUP*	2034	375300	6507800	P	S of Yanchep National Park, MSD map 5.
YOUN	YOUNG ROAD SWAMP	2033	390600	6420300	S	S of Maramanup Pool, W of Young Rd, MSD map 147.
YUND	YUNDERUP NORTH SWAMP	2032	386300	6395000	E	Estuarine wetland W of Yunderup North Rd (off Tonkin Drive) - access off rd.

Appendix 2 Waterbird species recorded during Scopewest, giving species code, common name and scientific name (*, species protected by international treaties with Japan and/or China)

Code	Common Name	Scientific Name
Apel	Australian Pelican	*Pelecanus conspicillatus*
Auck	Australian Crake	*Porzana fluminea*
Augb	Australasian Grebe	*Tachybaptus novaehollandiae*
Ausb	Australasian Bittern	*Botaurus poiciloptilus*
Back	Baillon's Crake	*Porzana pusilla*
Balg	Banded Lapwing	*Vanellus tricolor*
Barg*	Bar-tailed Godwit	*Limosa laponica*
Bast	Banded Stilt	*Cladorhynchus leucocephalus*
Bbar	Buff-banded Rail	*Rallus philippensis*
Bbid	Blue-billed Duck	*Oxyura australis*
Bfop	Black-fronted Plover	*Charadrius melanops*
Blag*	Black-tailed Godwit	*Limosa limosa*
Btnh	Black-tailed Native-hen	*Gallinula ventralis*
Bwst	Black-winged Stilt	*Himantopus himantopus*
Cast*	Caspian Tern	*Hydroprogne caspia*
Cate*	Cattle Egret	*Ardeola ibis*
Chtl	Chestnut Teal	*Anas castanea*
Coms*	Common Sandpiper	*Tringa hypoleucos*
Coot	Eurasian Coot	*Fulica atra*
Cret	Crested Tern	*Sterna bergii*
Crew	Clamorous Reed-warbler	*Acrocephalus stentoreus*
Curs*	Curlew Sandpiper	*Calidris ferruginea*
Dart	Darter	*Anhinga melanogaster*
Dumo	Dusky Moorhen	*Gallinula tenebrosa*
Eare*	Eastern Reef egret	*Egretta sacra*
Exot	Exotic Duck	
Fait	Fairy Tern	*Sterna nereis*
Fred	Freckled Duck	*Stictonetta naevosa*
Gank*	Greenshank	*Tringa nebularia*
Gcgb	Great Crested Grebe	*Podiceps cristatus*
Gloi*	Glossy Ibis	*Plegadis falcinellus*
Grec	Great Cormorant	*Phalacrocorax carbo*
Grkn*	Great Knot	*Calidris tenuirostris*
Grte*	Great Egret	*Egretta alba*
Gryp*	Grey Plover	*Pluvialis squatarola*
Gytl	Grey Teal	*Anas gibberifrons*
Hard	Hardhead	*Aythya australis*
Hhgb	Hoary-headed Grebe	*Poliocephalus poliocephalus*
Lgop*	Lesser Golden Plover	*Pluvialis dominica*
Libc	Little Black Cormorant	*Phalacrocorax sulcirostris*
Ligd	Little Grassbird	*Megalurus gramineus*
Litb	Little Bittern	*Ixobrychus minutus*
Lite	Little Egret	*Egretta garzetta*
Lots*	Long-toed Stint	*Calidris subminuta*
Lpic	Little Pied Cormorant	*Phalacrocorax melanoleucos*
Maha	Marsh Harrier	*Circus aeruginosus*
Mand	Maned Duck	*Chenonetta jubata*
Mars*	Marsh Sandpiper	*Tringa stagnatilis*
Musd	Musk Duck	*Biziura lobata*
Ospy	Osprey	*Pandion haliaetus*
Pabd	Pacific Black Duck	*Anas superciliosa*

Appendix 2 (cont'd)

Code	Common Name	Scientific Name
Pchn	Pacific Heron	*Ardea pacifica*
Pead	Pink-eared Duck	*Malacorhynchus membranaceus*
Pecs*	Pectoral Sandpiper	*Calidris melanotos*
Piec	Pied Cormorant	*Phalacrocorax varius*
Pioy	Pied Oystercatcher	*Haematopus longirostris*
Pusn	Purple Swamphen	*Porphyrio porphyrio*
Rcap	Red-capped Plover	*Charadrius ruficapillus*
Rekn*	Red Knot	*Calidris canutus*
Rens*	Red-necked Stint	*Claidris ruficollis*
Rkdo	Red-kneed Dotterel	*Erithrogonys cinctus*
Rnav	Red-necked Avocet	*Recurvirostra novaehollandiae*
Rnhn	Rufous Night Heron	*Nycticorax caledonicus*
Rosl	Royal Spoonbill	*Platalea regia*
Rutu*	Ruddy Turnstone	*Arenaria interpres*
Saci	Australian White Ibis	*Threskiornis aethiopica*
Shel	Australian Shelduck	*Tadorna tadornoides*
Shov	Australasian Shoveler	*Anas rhynchotis*
Shts*	Sharp-tailed Sandpiper	*Calidris acuminata*
Sigl	Silver Gull	*Larus novaehollandiae*
Snki	Straw-necked Ibis	*Threskiornis spinicollis*
Spck	Spotless Crake	*Porzana tabuensis*
Swan	Black Swan	*Cygnus atratus*
Wbse*	White-bellied Sea-eagle	*Haliaeetus leucogaster*
Wfhn	White-faced Heron	*Ardea novaehollandiae*
Whit	Whiskered Tern	*Chlidonias hybrida*
Woos*	Wood Sandpiper	*Tringa glareola*
Ybsl	Yellow-billed Spoonbill	*Platalea flavipes*

Appendix 3. Mean abundance of waterbird species at each wetland during the study, giving number of species, number of breeding species, mean waterbird count and highest waterbird count for each wetland. See Appendices 1 and 2 for species and wetland names.

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Aber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aden	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	2.88	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.25	0.00	0.00	1.13
Aips	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.86	0.00	0.00	0.57	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aird	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alco	2.38	0.00	16.88	0.00	0.00	0.00	0.00	0.00	0.00	6.25	0.75	0.00	0.00	0.75	0.00	0.00	0.00	0.00	62.63	0.00	3.00	0.00	4.38	0.00	0.00	0.00	0.00	0.00	0.25
Alex	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.25	1.00	0.00	0.00	0.00	13.13	0.63	0.00	0.00	0.00	0.00	0.13
Alfr	8.75	0.00	0.00	0.00	0.00	0.25	2.88	0.25	0.13	0.00	1.00	0.25	0.00	21.13	7.50	0.00	0.13	0.00	0.00	1.88	0.00	135.75	0.13	0.00	0.00	0.00	3.75	0.00	5.13
Amie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ashf	0.13	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.38	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	0.88	0.38	0.00	0.00	0.00	0.00	0.00
Aust	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bald	0.33	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ball	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Balp	0.13	0.00	9.50	0.00	0.00	5.38	0.00	0.00	0.00	0.00	3.38	0.00	0.00	1.50	0.00	0.00	0.13	0.25	47.88	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Bamd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baml	0.00	0.00	84.50	0.00	0.00	0.00	0.00	0.00	0.00	29.63	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	141.75	0.00	0.25	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00
Bamw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bang	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barl	0.50	0.00	0.88	0.00	0.00	0.00	0.00	0.25	0.00	8.25	2.50	0.00	1.50	1.13	0.00	0.00	0.00	0.00	41.25	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.13	0.75
Bars	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	17.29	0.00	0.00	0.00	0.00	32.29	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.71
Bays	0.00	0.00	5.25	0.00	0.00	0.00	0.00	0.00	0.00	8.38	0.00	0.00	0.00	6.75	0.00	0.00	0.00	0.00	25.38	0.00	0.00	0.00	0.38	3.63	0.00	0.25	0.00	0.00	0.00
Beel	5.57	0.00	0.29	0.00	0.00	0.00	0.00	1.86	0.00	70.43	0.57	0.00	0.00	5.00	0.00	0.00	0.00	0.43	234.71	0.00	0.00	0.00	1.71	0.00	0.00	0.00	0.00	0.00	0.00
Been	0.00	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	0.00	4.00	0.00	0.00	0.00	0.00	20.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33
Bees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belm	1.63	0.00	8.38	0.00	0.00	0.00	0.00	0.00	0.00	3.50	1.63	0.00	0.00	10.25	1.13	0.00	0.00	0.13	38.38	0.00	0.13	0.00	0.25	3.13	0.00	0.00	0.00	0.00	0.00
Beng	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	12.67	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	5.50	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bibr	0.75	0.00	54.50	0.00	0.00	0.00	0.00	0.00	0.00	132.25	2.88	0.00	0.00	5.63	0.00	0.00	0.13	0.00	408.75	0.00	18.63	0.00	0.50	109.50	0.00	19.75	0.00	0.00	0.00
Bigc	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	0.00	0.00	0.14	0.00	0.00	0.00	0.00	65.43	0.00	0.43	0.00	0.00	3.57	0.00	0.29	0.00	0.00	0.00
Bind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blac	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	2.86	0.14	0.00	0.00	0.00	0.00	0.00
Blal	3.88	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	216.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.88
Blue	0.13	0.00	6.38	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	53.75	0.00	1.88	0.00	1.13	10.38	0.00	0.00	0.00	0.00	0.00
Blyt	0.29	0.29	3.14	0.00	0.00	0.00	0.00	0.00	0.00	0.14	3.71	0.00	0.43	2.14	0.00	0.00	0.00	0.14	25.71	0.00	0.00	0.00	0.14	1.00	0.00	0.00	0.00	0.00	0.00
Bodk	0.50	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.50	1.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.63
Bogg	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	73.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60
Boog	0.13	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.88	0.00	0.00	0.00	4.13	4.00	0.00	0.00	0.00	0.00	0.00

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Bro2	0.17	0.00	3.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bull	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	5.13	0.25	0.00	0.00	0.88	0.38	0.00	3.63	0.00	0.00	0.00
Camp	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Canc	0.13	0.00	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.25	0.00	0.00	9.38	0.00	0.00	0.00	0.00	0.00
Canf	0.00	0.00	14.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.88	0.00	6.75	0.00	2.75	103.25	0.00	7.25	0.00	0.00	0.00
Canw	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	1.80	0.00	0.00	0.00	0.00	7.00	0.00	0.60	0.00	2.20	29.20	0.00	11.20	0.00	0.00	0.00
Cara	0.00	0.00	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	12.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Care	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00	1.29	0.00	0.00	2.00	0.00	0.43	0.00	0.00	0.00
Cari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cars	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	3.17	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Chas	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.25	3.25	0.00	0.88	1.88	0.00	0.00	0.00	0.00	22.50	0.00	0.00	0.00	0.38	1.25	0.00	0.00	0.00	0.25	0.00
Chit	0.17	0.00	24.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	3.17	0.00	0.00	0.00	0.00	259.67	0.00	1.00	0.00	0.67	0.17	0.00	0.00	0.00	0.17	0.00
Clar	1.13	0.00	5.00	0.00	0.00	0.00	0.00	0.13	0.00	5.00	3.50	0.00	0.00	10.50	0.00	0.00	0.25	0.00	78.25	0.00	8.88	0.00	0.00	13.25	0.00	2.25	0.00	0.00	0.00
Clib	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cod1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cod2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo2	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cooc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00
Cood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coog	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	16.17	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
Cooo	1.00	0.00	0.00	0.00	0.00	0.00	0.00	59.43	0.00	0.00	0.00	0.00	0.00	107.14	0.00	0.00	0.00	0.00	1.43	0.00	0.00	141.86	0.00	0.00	0.00	0.00	0.00	0.00	0.71
Coos	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00
Copo	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	4.14	0.00	0.00	0.00	0.00	0.00	15.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.14
Cor1	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cor2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cor3	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
Corx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00
Cowa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crag	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cram	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Culc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.20	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Curt	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Deep	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	5.86	3.71	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
Devi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
Diam	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	2.25	0.13	0.00	0.00	0.00	0.00	0.00
Dils	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Duck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38
Eagl	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	1.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
East	0.00	0.00	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	1.00	0.00	0.00	0.00	0.00	9.75	0.00	0.00	0.00	0.00	6.38	0.00	0.00	0.00	0.00	0.00
Elle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ever	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	1.33	0.00	0.00	0.00	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Figi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis1	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis2	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis3	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis4	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Fiss	0.20	0.00	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00
Folm	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Folp	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
Foot	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.75	0.00	0.25	0.63	0.00	0.13	0.38	0.00	0.00	0.00	0.00	76.75	0.00	1.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
Forl	0.00	0.00	2.40	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2.80	0.00	0.00	23.00	0.00	0.00	0.00	0.00	15.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Forr	0.14	0.00	3.00	0.00	0.14	0.00	0.00	82.43	0.00	6.57	3.71	0.00	0.00	220.14	0.00	0.00	0.00	0.00	1202.86	0.00	15.43	34.29	0.14	0.29	0.00	0.00	0.00	0.00	1.14
Fort	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.29	0.00	2.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00
Free	0.00	0.00	10.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	85.25	0.00	0.13	0.00	0.13	4.75	0.00	0.25	0.00	0.00	0.00
Frem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.75	0.00	0.13	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00
Gans	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.38	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00
Gany	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.13	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
Gib1	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gib2	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Giba	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gibb	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.33	0.17	0.00	0.00	0.00	0.00	17.33	0.00	0.00	0.00	0.17	1.67	0.00	0.00	0.00	1.67	0.00
Gin1	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gin2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gin3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gin4	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.63	1.13	0.00	2.50	0.00	0.00	0.00	0.00	0.00	4.63	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00
Gin5	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.13	1.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00
Gine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.25	0.00	0.00	0.00	0.00	0.00
Ginj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ginl	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Ginn	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67	0.00	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gnal	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.29	0.00	0.00	4.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gnar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	3.00	0.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
Gobb	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.63	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00
Goeg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
Gold	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Good	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.14	0.00	0.57	0.00	4.86	0.00	0.00	0.00	0.00	0.00	0.00
Gool	0.71	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.14	0.71	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	34.29	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goss	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gree	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grey	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	22.50	0.00	0.00	0.00	0.00	26.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gwel	0.00	0.00	22.71	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	0.00	0.00	2.43	0.00	0.00	0.00	0.00	417.57	0.00	3.43	0.00	0.00	5.71	0.00	1.00	0.00	0.00	0.00
Har1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00
Har2	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haze	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.63	0.00	0.00	12.25	0.00	0.00	0.00	0.00	13.75	0.00	0.00	0.00	0.75	0.00	0.00	0.25	0.00	0.00	0.00
Hebb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00
Hend	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herd	3.50	0.00	24.50	0.00	0.00	0.00	0.00	0.00	0.13	9.00	9.63	0.00	0.50	7.63	0.00	0.00	0.00	0.00	601.50	0.00	3.00	0.00	0.50	5.13	0.00	0.00	0.00	0.00	2.38
Holm	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.14	0.57	0.00	0.00	0.00	0.00	3.86	0.00	1.43	0.00	0.00	1.57	0.00	0.00	0.00	0.71	0.00
Hope	0.00	0.00	9.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	3.71	0.00	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hurs	0.00	0.00	0.14	0.00	0.00	0.71	0.00	6.43	0.00	3.57	8.86	0.00	0.00	55.71	0.00	0.00	0.14	0.14	18.14	0.00	0.00	8.86	0.00	0.00	0.00	0.00	0.00	0.00	3.86
Hyde	0.13	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	45.63	0.00	0.00	0.00	0.00	24.00	0.00	25.63	0.00	0.00	0.00
Jame	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.29	0.00	0.00	0.00	0.00	13.14	0.00	4.14	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Jand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14
John	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Joo1	1.25	0.00	7.25	0.00	0.00	0.00	0.00	0.00	0.00	2.38	2.50	0.00	0.00	22.75	0.00	0.00	0.50	0.00	32.50	0.00	0.00	0.00	0.13	1.38	0.00	0.13	0.00	0.00	0.50
Joo2	0.88	0.00	6.25	0.00	0.00	0.00	0.00	0.00	0.00	2.88	2.25	0.00	0.00	6.13	0.00	0.00	0.00	0.00	28.88	0.00	0.00	0.00	0.00	0.38	0.00	0.75	0.00	0.00	0.38
Joon	0.00	0.00	10.63	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.38	0.00	0.00	63.38	0.00	0.00	0.38	0.00	172.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Juli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kara	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	79.60	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40
Kard	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Karw	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kawi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kemp	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.88	0.00	0.13	0.00	0.00	0.00	0.00	0.00	4.88	0.00	0.00	0.00	6.75	0.25	0.00	0.00	0.00	0.00	0.00

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Kems	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.60
Kent	0.13	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.63	0.00	0.00	0.00	0.00	0.00
Keog	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
King	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kogo	0.00	0.00	9.38	0.00	0.00	0.00	0.00	0.13	0.00	2.13	5.63	0.00	0.00	21.63	0.00	0.00	0.00	0.00	73.50	0.00	0.63	0.00	1.38	1.50	0.00	0.00	0.00	0.00	0.38
Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	0.00	0.50	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
Laks	0.00	0.00	1.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.43	0.00	0.00	1.43	0.00	0.00	0.00	0.29	0.86	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Lanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leed	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Lima	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lmog	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loch	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.63	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
Manl	0.00	0.00	2.13	0.00	0.00	0.00	0.00	0.13	0.00	1.00	3.25	0.00	0.13	9.38	0.00	0.00	0.00	0.00	36.13	0.00	0.00	0.25	0.00	2.50	0.00	8.38	0.00	0.00	0.00
Manr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mara	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.38	0.13	0.00	0.00	0.00	0.00	0.00
Mari	0.57	0.00	14.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47.43	0.00	0.00	0.00	0.00	2.86	0.00	0.29	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.14
Marr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mary	0.38	0.00	10.38	0.00	0.00	0.00	0.00	0.00	0.00	2.75	1.88	0.00	0.00	17.25	0.00	0.00	0.00	0.00	69.75	0.00	0.38	0.00	0.25	2.00	0.00	4.00	0.00	0.00	0.13
Math	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mayc	2.88	0.00	23.75	0.00	0.00	0.00	0.00	0.00	0.00	2.25	1.25	0.00	0.00	5.25	0.00	0.00	0.00	0.00	49.63	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.13
Mayf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mayw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.50	0.00	0.00	0.00	0.00	0.00
Mcdo	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.13	0.00	0.00	0.00	0.00	53.50	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Mcla	16.14	1.57	9.00	0.00	0.14	0.00	0.00	0.00	0.00	7.14	2.29	2.43	0.71	94.14	1.00	0.00	0.00	0.00	191.14	0.00	0.43	27.14	7.29	0.00	0.00	0.00	0.00	0.00	5.29
Meal	8.43	0.00	1.00	0.00	0.00	0.00	0.00	0.14	0.00	3.29	1.43	0.00	0.00	39.57	0.00	0.00	0.00	0.00	21.00	0.00	1.57	4.29	2.86	0.00	0.00	0.00	0.00	0.00	3.43
Mear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mela	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mogu	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.80	4.40	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mong	3.25	0.00	20.38	0.00	0.00	0.00	0.00	0.63	0.00	45.38	0.00	0.00	0.13	0.88	0.00	0.00	0.00	0.00	301.25	0.00	5.38	0.00	0.25	75.00	0.13	7.88	0.00	0.00	0.00
Moni	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.29	0.00	0.00	0.00	0.00	0.29	0.00	0.14	0.00	0.00	0.00
Moor	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.25	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00
Mtbr	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.00	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Mucr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Muss	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00
Namm	16.25	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	42.25	2.63	0.00	0.13	5.75	0.00	0.00	0.00	0.38	38.25	0.00	0.00	0.00	5.88	0.00	0.00	0.00	0.00	0.00	0.00
Neer	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.40	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ngib	0.14	0.00	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.86	2.71	0.00	0.00	2.86	0.00	0.00	0.00	0.00	9.86	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00
Nicm	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nico	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.00	0.00	0.83	11.50	0.00	0.00	0.17	0.00	60.50	0.00	1.50	0.00	0.00	0.83	0.00	0.00	0.00	1.00	0.50
Nics	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.33	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00
Nine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.13	0.00	0.00	0.00	0.00	1.25	0.00	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
Nlak	1.00	0.00	7.13	0.00	0.00	0.00	0.00	0.00	0.00	10.38	1.00	0.00	0.00	5.75	0.00	0.00	0.00	0.00	32.50	0.00	1.13	0.00	1.00	18.50	0.00	7.75	0.00	0.00	0.00
Noon	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nowe	0.00	0.00	3.86	0.00	0.00	0.00	0.00	0.29	0.00	2.86	0.14	0.00	0.00	2.43	0.00	0.00	0.00	0.00	27.71	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nros	0.00	0.00	2.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.14	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00
Oldb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parr	1.14	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	1.29	0.00	0.00	0.00	0.00	82.57	1.57	0.29	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00
Paul	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peha	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	5.25	0.00	0.00	0.00	0.00	7.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.13	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pepp	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Perr	1.88	0.00	2.38	0.00	0.00	0.00	0.00	0.25	0.00	0.50	1.38	0.00	0.00	6.25	0.00	0.00	0.38	0.00	123.38	0.00	1.25	0.00	0.25	42.13	0.00	9.38	0.00	0.00	0.00
Pinb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00
Pine	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.38	0.00	0.00	0.00	8.50	1.88	0.00	0.00	0.00	0.00	0.00
Pinr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00
Pipi	0.25	0.00	1.00	0.00	0.13	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	15.38	0.00	1.88	0.00	0.13	1.25	0.00	0.00	0.00	0.00	0.00
Punc	0.75	0.00	5.63	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	1.50	0.00	0.00	1.00	0.00	87.75	0.00	0.50	0.00	0.38	9.25	0.00	4.13	0.00	0.00	0.00
Punr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rega	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rivd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rivf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Robe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75
Rock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00
Roge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rons	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00
Rosa	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.13	0.88	0.00	0.00	0.00	0.00	0.00
Sand	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.80	0.00	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scew	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Code	Apel	Auck	Augb	Ausb	Back	Balg	Barg	Bast	Bbar	Bbid	Bfop	Blag	Btnh	Bwst	Cast	Cate	Chtl	Coms	Coot	Cret	Crew	Curs	Dart	Dumo	Eare	Exot	Fait	Fred	Gank
Serd	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00
Spec	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	4.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	10.67	0.00	1.17	0.00	3.50	3.00	0.00	0.00	0.00	0.00	0.17
Star	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	0.00	0.00	0.00	0.00	3.67	0.00	0.83	0.00	0.00	0.00
Stok	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Swan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00
Talb	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.50	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00
Tang	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thol	0.00	2.14	53.86	0.14	1.00	0.00	0.00	1.14	0.57	86.43	0.57	0.86	0.00	480.00	0.00	0.00	0.29	0.00	888.43	0.00	6.86	34.29	0.00	0.57	0.00	0.00	0.00	0.00	1.14
Thom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thos	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00
Uswa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wall	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.60	0.00	3.20	1.00	0.00	0.00	0.00	0.00	7.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
Wann	0.00	0.00	0.13	0.00	0.00	0.00	0.00	13.75	0.00	0.00	0.38	0.00	0.00	4.88	0.00	0.00	0.25	0.00	650.50	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wart	0.00	0.00	1.83	0.00	0.00	0.00	0.00	0.00	0.00	3.83	0.33	0.00	0.00	0.33	0.00	0.00	0.00	0.00	4.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
Wate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wcor	0.50	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.13	0.00	0.00	0.00	12.00	0.13	0.00	0.00	0.00	0.00	0.00
Weeb	0.00	0.00	3.88	0.00	0.00	0.00	0.00	0.00	0.00	0.25	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.50	0.00	0.25	0.00	0.00	1.13	0.00	17.88	0.00	0.00	0.00
Whip	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Whit	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wigi	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wilc	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00
Wild	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wilg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wils	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.13	0.00	0.38	1.00	0.00	0.00	0.00	0.00	0.00
Wrig	0.00	0.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	51.80	0.00	0.00	0.00	0.00	10.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wswr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yang	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.38	0.00	38.50	2.13	0.00	0.13	12.25	0.00	0.00	0.00	0.00	56.88	0.00	0.00	1.13	0.13	0.25	0.00	0.00	0.00	0.00	0.00
Yond	0.25	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
Youn	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yund	0.38	0.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.75	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	4.50

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Aber	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aden	0.00	0.00	0.00	0.00	0.50	0.00	0.75	0.00	0.13	0.00	0.75	0.00	0.00	0.38	0.00	0.75	0.00	2.38	0.00	0.00	0.00	18.50	0.00	0.00	0.00	0.13	0.00	0.00	0.00
Aips	0.00	0.00	0.00	0.00	0.71	0.00	3.43	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.43	0.00	31.86	0.00	1.00	0.00	6.57	0.00	2.00	0.00	0.00	0.00	0.14	0.00
Aird	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	4.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alco	0.38	0.00	3.38	0.00	0.75	0.00	7.25	16.75	7.00	0.00	1.50	0.00	0.00	0.00	0.00	6.75	0.50	4.00	0.00	8.38	0.00	47.88	0.00	0.00	0.00	0.00	0.00	2.13	0.00
Alex	0.00	0.00	2.63	0.00	0.38	0.00	3.25	0.00	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.38	0.13	20.88	0.00	0.00	0.00	3.63	0.00	0.13	0.00
Alfr	0.00	0.00	7.00	30.25	0.38	13.63	68.75	0.00	0.00	0.00	99.63	0.00	0.00	0.13	0.13	24.75	0.00	0.00	0.00	0.00	0.88	6.13	0.13	0.00	0.00	0.13	8.50	0.00	3.25
Amie	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ashf	0.13	0.00	0.00	0.00	0.50	0.00	2.25	0.00	0.00	0.00	0.63	0.00	0.00	0.13	0.00	2.38	0.25	0.25	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00
Aust	0.00	0.00	0.00	0.00	7.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bald	0.00	0.00	0.00	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.33	2.33	0.00	0.00	0.00	22.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Ball	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.67	0.00	0.67	0.00	0.33	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Balp	0.00	0.00	0.00	0.00	0.25	0.00	0.88	1.00	1.13	0.00	1.63	0.00	0.00	0.00	0.00	2.88	0.00	168.38	0.00	4.13	0.00	252.13	0.00	0.00	0.00	0.00	0.00	0.00	0.50
Bamd	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	3.67	0.67	0.00	0.00	0.00	0.00	0.00	0.00
Baml	1.38	1.38	0.00	0.00	0.63	0.00	137.63	10.63	48.50	0.00	6.25	0.00	0.00	0.00	0.00	2.88	0.13	0.00	0.00	19.13	0.00	54.75	0.00	37.00	0.00	0.00	0.00	0.00	0.00
Bamw	0.00	0.00	0.00	0.00	1.67	0.00	6.67	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bang	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barl	0.88	0.00	0.88	0.00	1.50	0.00	64.25	2.50	41.75	0.00	6.63	0.00	0.00	0.00	0.00	1.88	0.00	3.25	0.00	1.63	0.00	12.13	0.25	219.75	0.00	0.00	0.00	0.00	0.00
Bars	0.00	0.00	0.29	0.00	0.00	0.00	72.00	1.14	0.14	0.00	12.29	0.00	0.00	0.00	0.00	1.00	0.00	5.57	0.00	0.71	0.00	21.86	0.00	57.57	0.00	0.00	0.00	0.00	0.00
Bays	0.00	0.00	0.25	0.00	0.50	0.00	20.63	2.25	0.00	0.00	0.38	0.00	0.00	0.00	0.00	4.63	0.00	0.00	0.00	0.13	0.00	27.75	0.00	35.75	0.00	0.00	0.00	2.00	0.00
Beel	1.57	0.00	0.00	0.00	1.71	0.00	36.14	3.14	18.57	0.00	54.71	0.00	0.00	0.00	0.00	4.57	0.00	2.14	0.00	36.57	0.00	8.57	0.00	1.29	0.00	0.00	0.00	0.00	0.00
Been	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	3.00	0.00	0.17	0.00	16.33	0.00	0.00	0.00	0.00	0.00	0.83	0.00
Bees	2.50	0.00	0.00	0.00	0.00	0.00	7.25	0.00	0.50	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belm	0.00	0.00	0.13	0.00	1.00	0.00	14.50	5.13	0.00	0.00	3.25	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	30.25	0.25	1.75	0.00	0.13	0.00	2.00	0.75
Beng	0.00	0.00	0.00	0.00	1.00	0.00	16.50	3.83	2.83	0.00	0.00	0.17	0.00	0.00	0.00	1.00	1.33	0.00	0.00	9.67	0.00	19.83	0.00	0.00	0.00	0.00	0.00	4.00	0.00
Bibr	1.75	0.00	0.63	0.00	2.13	0.00	78.00	21.50	534.88	0.00	1.13	2.75	0.00	0.00	0.00	1.00	0.75	3.13	0.00	103.75	0.00	151.63	0.00	22.38	0.00	0.00	0.00	29.63	0.00
Bigc	1.29	0.00	0.00	0.00	0.86	0.00	5.00	0.57	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.71	0.00	0.29	0.00	1.57	0.00	38.29	0.00	0.00	0.00	0.00	0.00	11.14	0.00
Bind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Blac	0.00	0.00	45.43	0.00	0.00	0.00	4.14	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	5.00	0.00	30.86	0.00	0.71	0.00	43.86	0.00	0.00	0.00	0.00	0.00	1.43	0.00
Blal	0.00	0.00	0.13	0.00	3.63	0.00	251.50	0.00	0.25	0.00	3.50	0.00	0.00	0.00	0.00	7.50	0.13	0.00	0.00	1.88	0.00	68.00	0.00	0.00	0.00	0.25	0.00	0.00	3.00
Blue	0.00	0.00	1.00	0.00	0.50	0.00	3.63	2.50	0.00	0.00	5.13	0.00	0.00	0.00	0.00	2.75	0.00	0.00	0.00	0.00	0.00	78.38	0.00	0.00	0.00	0.00	0.00	2.25	0.00
Blyt	0.00	0.00	0.00	0.00	0.00	0.00	33.86	1.14	10.14	0.00	0.14	0.14	0.00	0.00	0.00	4.00	0.14	8.57	0.00	1.43	0.00	17.57	0.00	3.43	0.00	0.00	0.00	0.29	0.00
Bodk	0.00	0.00	0.00	0.00	1.00	0.00	1.75	0.13	0.00	0.00	0.25	0.38	0.00	0.00	0.00	1.63	0.00	0.63	0.00	0.00	0.13	11.25	0.00	0.00	0.00	0.13	0.00	0.13	0.00
Bogg	0.00	0.00	0.00	0.00	2.40	0.00	44.80	0.00	0.00	0.00	1.00	0.20	0.00	0.00	0.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Boog	0.00	0.00	118.25	0.00	0.13	0.00	0.50	0.13	0.00	0.00	177.13	0.00	0.00	0.00	0.00	6.25	0.25	0.13	0.00	1.88	0.00	31.00	0.00	0.00	0.00	0.00	0.00	2.75	0.00
Bro2	0.00	0.00	0.00	0.00	0.17	0.00	18.67	2.33	7.17	0.00	0.00	0.00	0.00	0.00	0.00	1.33	0.00	0.33	0.00	0.00	0.00	26.50	0.50	1.33	0.00	0.00	0.00	0.00	0.00
Bull	0.00	0.00	0.13	0.00	0.13	0.00	0.50	0.00	0.13	0.00	1.63	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	5.88	0.00	0.00	0.00	0.38	0.00	0.13	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Camp	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	3.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00
Canc	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.50	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.25	0.00	21.88	0.00	0.00	0.00	33.38	0.00	0.00	0.00	0.00	0.00	0.88	0.00
Canf	0.00	0.00	0.38	0.00	0.63	0.00	3.50	1.75	0.00	0.00	4.25	0.13	0.00	0.00	0.00	2.50	0.00	15.50	0.00	0.13	0.00	130.38	0.00	0.00	0.00	0.00	0.00	9.63	0.00
Canw	0.00	0.00	0.20	0.00	0.40	0.00	0.40	0.20	0.00	0.00	0.40	0.00	0.00	0.00	0.00	3.20	0.00	3.60	0.00	0.00	0.00	72.00	0.00	0.00	0.00	0.80	0.00	5.60	0.00
Cara	0.00	0.00	0.00	0.00	0.00	0.00	6.14	1.29	0.00	0.00	1.14	0.00	0.00	0.00	0.00	0.29	0.00	10.00	0.00	0.86	0.00	11.57	0.00	0.00	0.00	0.00	0.00	0.14	0.00
Care	0.00	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.71	0.00	0.00	0.00	0.00	0.00	0.57	0.00
Cari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Carr	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.25	0.00	0.00	0.00	0.00	0.25	0.00
Cars	0.00	0.00	0.00	0.00	0.33	0.00	358.83	0.00	0.00	0.00	244.67	0.00	0.00	0.00	0.00	11.50	0.17	0.67	0.00	0.33	0.00	6.17	0.00	0.17	0.00	0.00	0.00	0.00	0.00
Chas	0.00	0.75	0.00	0.00	2.88	0.00	51.13	0.38	0.00	0.00	2.88	0.00	0.00	0.00	0.00	4.38	0.00	19.88	0.00	1.25	0.00	19.25	0.88	0.88	0.00	0.00	0.00	0.00	0.00
Chit	2.50	0.00	0.00	0.00	15.33	0.00	217.50	51.00	37.00	0.00	20.33	1.00	0.00	0.00	0.00	13.00	0.00	39.33	0.00	4.67	0.00	207.83	0.00	3.50	0.00	0.00	0.00	0.00	0.00
Clar	0.00	0.13	0.13	0.00	0.13	0.00	32.50	0.88	0.00	0.00	0.13	0.75	0.00	0.00	0.00	1.00	0.13	0.00	0.00	0.25	0.00	81.63	0.00	11.25	0.00	0.13	0.00	15.75	0.00
Clib	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clis	0.00	0.00	0.00	0.00	0.71	0.00	1.00	0.00	0.00	0.00	0.14	0.14	0.00	0.00	0.00	1.14	0.14	0.00	0.00	0.43	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.14	0.00
Cod1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	2.33	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cod2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo1	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coo3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cooc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coog	0.00	0.00	0.00	0.00	0.00	0.00	6.17	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	7.83	0.00	0.83	0.00	13.33	0.00	0.00	0.00	0.00	0.00	4.50	0.00
Cooo	0.00	0.00	0.00	0.00	0.00	0.00	102.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.14	0.00	0.00	1.00	0.14	270.43	0.00	0.00	0.00	0.00	0.00	0.00	52.71
Coos	0.00	0.00	0.00	0.00	0.00	0.00	6.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	1.20	0.00	0.00	0.00	1.60	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Copo	0.00	0.00	0.00	0.00	0.00	0.00	88.29	7.57	1.00	0.00	0.29	0.00	0.00	0.00	0.00	0.29	0.14	22.43	0.00	0.71	0.00	78.00	0.14	2.43	0.00	0.00	0.00	0.14	0.00
Cor1	0.00	0.00	0.00	0.00	1.20	0.00	6.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	3.40	0.40	0.40	0.00	0.00	0.00	8.60	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Cor2	0.00	0.00	0.00	0.00	0.00	0.00	39.14	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.86	0.00	0.57	0.00	12.86	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Cor3	0.00	0.00	0.00	0.00	0.00	0.00	6.13	0.75	0.88	0.00	0.13	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	22.88	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Corx	0.00	0.00	0.00	0.00	0.13	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.25	0.50	0.00	0.00	0.00	14.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00
Cowa	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	2.63	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crag	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	5.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	1.71	0.00	0.00	0.00	1.14	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Crea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.14	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Culc	0.00	0.00	0.00	0.00	0.20	0.00	1.40	0.00	5.80	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.20	0.00	7.60	0.00	0.00	0.00	0.00	0.00	0.00	5.80
Curt	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	24.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deep	0.00	0.00	0.00	0.00	0.00	0.00	15.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	11.71	0.00	0.14	0.00	5.43	0.00	0.14	0.00	0.00	0.00	0.00	0.00
Devi	0.25	0.00	0.00	0.00	0.00	0.00	4.88	0.00	0.13	0.00	0.25	0.00	0.00	0.13	0.00	0.00	0.00	5.00	0.00	0.00	0.00	7.25	0.00	0.00	0.00	0.00	0.00	1.13	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Diam	0.00	0.00	0.00	0.00	0.38	0.00	0.25	0.00	0.00	0.00	1.88	0.00	0.00	0.13	0.00	1.13	0.00	1.25	0.00	0.00	0.13	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dils	0.00	0.00	0.00	0.00	0.00	0.00	6.40	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00	1.00	0.20	0.20	0.00	1.20	0.00	71.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00
Duck	0.00	0.00	0.00	0.00	0.13	0.00	4.75	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	4.88	0.00	7.63	0.00	0.00	0.00	17.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eagl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.88	0.00	0.00	0.00	1.88	0.00	0.00	0.00	0.00	0.00	0.25	0.00
East	0.00	0.00	0.00	0.00	0.63	0.00	14.13	3.88	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.25	0.00	2.75	0.00	0.50	0.00	10.00	0.13	0.00	0.00	0.00	0.00	1.63	0.00
Elle	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ever	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	1.33	0.00	11.00	1.33	0.00	0.00	0.00	0.00	0.17	0.00
Figi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis1	0.00	0.00	0.00	0.00	0.14	0.00	10.57	0.00	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.86	0.00	1.00	0.00	0.00	0.00	13.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis2	0.00	0.00	0.00	0.00	0.00	0.00	21.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.60	0.00	0.20	0.00	4.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fis3	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	9.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Fis4	0.00	0.00	0.00	0.00	0.29	0.00	4.86	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.29	0.00	2.86	0.00	0.00	0.00	0.00	0.00	0.57	0.00
Fiss	0.00	0.00	0.20	0.00	0.00	0.00	5.20	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	1.00	0.00	2.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Folm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.25	0.00
Folp	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.25	0.13	0.13	0.00	0.13	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.38	0.00
Foot	2.75	0.00	0.00	0.00	3.88	0.00	141.13	12.75	5.38	0.00	6.25	1.25	0.00	0.00	0.00	2.63	0.38	0.38	0.00	1.75	0.00	61.38	0.00	1.63	0.00	0.00	0.00	0.00	0.13
Forl	0.00	0.00	0.00	0.00	0.00	0.00	22.60	3.20	4.40	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	8.00	0.00	0.00	0.00	51.40	0.00	3.80	0.00	0.00	0.00	0.00	3.60
Forr	0.00	0.00	0.00	0.00	1.71	0.00	430.71	67.57	310.29	0.00	0.00	4.43	0.14	0.00	0.43	1.86	0.71	0.14	0.00	2.14	0.00	147.57	0.86	19.14	0.00	0.00	0.00	14.29	73.14
Fort	0.00	0.00	0.00	0.00	0.00	0.00	2.86	0.29	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.43	0.00	1.00	0.00	0.00	0.00	7.57	0.00	0.29	0.00	0.00	0.00	3.71	0.00
Free	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	33.88	0.00	0.00	0.00	0.00	0.00	0.13	0.00
Frem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.88	0.00
Gans	0.00	0.00	0.00	0.00	0.13	0.00	3.88	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.25	0.00	0.75	0.00	0.00	0.00	11.25	0.00	0.00	0.00	0.00	0.00	1.50	0.00
Gany	0.00	0.00	0.00	0.00	0.75	0.00	7.13	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.13	0.00	1.50	0.00	0.00	0.00	16.38	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Gib1	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gib2	0.00	0.00	0.00	0.00	0.33	0.00	43.67	0.00	1.83	0.00	1.33	0.00	0.00	0.00	0.00	0.33	0.00	2.67	0.00	0.00	0.00	21.17	0.00	0.67	0.00	0.00	0.00	0.00	0.00
Giba	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.60	0.20	0.00	0.00	0.20	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	6.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gibb	0.00	0.00	0.00	0.00	0.83	0.00	23.67	4.83	1.33	0.00	0.17	0.00	0.00	0.00	0.00	4.00	0.00	0.67	0.00	2.00	0.00	31.33	0.00	16.67	0.00	0.00	0.00	0.67	0.00
Gin1	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00	0.40	0.00	0.00	0.00	0.40	0.20	1.40	0.00	0.00	0.00	0.00	0.00
Gin2	0.00	0.00	0.00	0.00	0.00	0.00	6.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	3.80	0.00	0.60	0.00	0.60	0.00	1.00	0.00	0.00	0.00	0.00	0.00
Gin3	0.00	0.00	0.00	0.00	0.20	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	3.20	0.00	0.00	0.00	12.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gin4	0.00	0.00	0.00	0.00	0.00	0.00	2.88	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	3.88	0.00	0.25	0.00	2.13	0.00	1.25	0.00	0.00	0.00	0.50	0.00
Gin5	0.00	0.00	0.00	0.00	0.00	0.00	1.88	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.25	0.00	3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gine	0.00	0.00	0.00	0.00	0.13	0.00	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	1.75	0.00	0.00	0.00	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ginj	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.50	0.00	0.50	0.00	8.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ginl	0.00	0.00	0.00	0.00	0.17	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.17	0.00	0.33	0.00	2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ginn	0.00	0.00	0.00	0.00	0.67	0.00	35.83	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.17	0.00	36.00	0.00	0.00	0.00	19.33	0.00	0.50	0.00	0.00	0.00	0.00	0.00
Glov	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Gnal	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.00	21.86
Gnar	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	4.75	0.25	0.00	0.00	0.00	0.00	0.00	0.00
Gobb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.13	0.00
Goeg	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gold	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	0.00	0.00	12.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Good	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.57	0.00	3.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gool	9.14	0.00	1.14	0.00	1.86	0.00	0.00	0.00	2.14	0.00	1.86	0.43	0.00	0.14	0.00	3.71	0.29	0.43	0.00	7.14	0.00	8.29	0.00	0.00	0.00	0.00	0.00	4.29	0.00
Goss	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Goya	0.00	0.00	0.00	0.00	0.38	0.00	13.50	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.75	0.13	14.00	0.00	0.00	0.00	6.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gree	0.00	0.00	0.00	0.00	0.75	0.00	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Grey	0.00	0.00	0.00	0.00	0.00	0.00	90.00	0.50	1.75	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.50	0.00	0.00	0.25	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gung	0.00	0.00	0.00	0.00	0.00	0.00	1.83	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.17	0.00	3.33	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gwel	3.57	0.00	0.14	0.00	0.71	0.00	6.57	5.86	0.00	0.00	0.00	0.14	0.00	0.00	0.00	1.14	0.00	0.14	0.00	15.71	0.00	27.14	0.00	2.43	0.00	0.14	0.00	4.14	0.00
Har1	0.00	0.00	0.00	0.00	1.00	0.00	3.75	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	1.75	0.00	0.00	0.00	4.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Har2	0.00	0.00	0.00	0.00	0.40	0.00	1.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Haze	0.00	0.00	0.00	0.00	0.13	0.00	31.88	2.00	0.38	0.00	0.63	0.00	0.00	0.00	0.00	1.00	0.00	12.50	0.00	0.38	0.00	10.88	0.00	4.50	0.00	0.00	0.00	0.50	0.00
Hebb	0.00	0.00	0.00	0.00	0.00	0.00	1.75	0.50	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.50	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hend	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herd	20.13	1.25	3.63	0.00	7.75	0.00	97.38	13.75	0.00	0.00	16.50	1.50	0.00	0.13	0.00	23.13	0.75	0.25	0.00	16.38	0.00	298.00	0.00	14.00	0.00	0.00	0.00	37.88	8.50
Holm	0.00	0.00	0.00	0.00	0.00	0.00	3.86	0.86	0.29	0.00	0.29	0.71	0.00	0.00	0.00	4.29	0.00	1.43	0.00	0.86	0.00	12.29	0.00	1.00	0.00	0.00	0.00	1.86	0.00
Hope	0.00	0.00	0.00	0.00	0.43	0.00	10.29	1.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.29	0.00	0.14	0.00	15.14	0.00	5.00	0.00	0.00	0.00	0.00	0.00
Hurs	0.00	0.43	0.00	0.00	0.14	0.00	101.86	8.71	77.57	0.14	0.00	0.57	0.00	0.00	0.00	1.86	0.14	11.86	0.00	7.71	0.00	67.29	0.14	301.43	0.00	0.00	0.00	0.00	107.43
Hyde	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.13	0.00	0.13	0.00	0.00	0.00	171.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Jame	0.00	0.00	0.00	0.00	0.86	0.00	8.43	2.71	0.00	0.00	0.00	0.86	0.00	0.00	0.00	1.29	0.43	0.29	0.00	0.86	0.00	24.57	0.14	1.43	0.00	0.00	0.00	6.57	0.00
Jand	0.00	0.00	0.00	0.00	0.14	0.00	11.29	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.57	0.14	0.00	0.00	0.00	0.00	0.86	0.00
John	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	3.63	0.00	0.00	0.00	5.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Joo1	4.50	0.00	0.00	0.00	1.13	0.00	78.75	4.00	2.25	0.00	4.13	0.63	0.00	0.00	0.00	3.25	0.13	10.25	0.00	7.50	0.00	38.13	0.00	0.00	0.00	0.00	0.00	2.00	0.00
Joo2	2.38	0.00	0.00	0.00	3.50	0.00	28.75	10.00	2.00	0.00	4.25	0.13	0.00	0.00	0.00	0.75	0.00	4.25	0.00	4.75	0.00	36.00	0.13	0.25	0.00	0.13	0.00	1.13	0.00
Joon	3.50	0.00	0.00	0.00	1.38	0.00	3.75	4.63	1.50	0.00	0.50	0.50	0.00	0.13	0.00	4.00	0.00	0.13	0.00	5.00	0.00	11.75	0.00	7.50	0.00	0.00	0.00	1.75	0.00
Juli	0.00	0.00	0.00	0.00	0.13	0.00	1.88	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.25	0.00	8.50	0.00	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kara	0.00	0.40	0.00	0.00	0.20	0.00	67.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.00	1.00	0.00	0.60	0.00	15.00	10.60	0.00	0.00	0.00	0.00	0.00	0.00
Kard	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Karw	0.00	0.00	0.00	0.00	0.20	0.00	41.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	1.00	0.00	0.00	0.00	6.40	0.00	0.40	0.00	0.00	0.00	0.00	0.00
Kawi	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.25	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kemp	0.00	0.00	1.00	0.00	0.00	0.00	4.63	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.38	6.38	0.00	0.88	0.00	8.38	0.00	0.00	0.00	0.00	0.00	0.38	0.00
Kems	0.00	0.00	0.00	0.00	0.20	0.00	21.40	2.40	0.80	0.00	0.20	0.00	0.00	0.00	0.00	1.00	0.20	0.40	0.00	0.00	0.00	42.20	0.00	0.00	0.00	0.00	0.00	0.20	0.00
Kent	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.75	0.00	3.00	0.00	0.00	0.00	8.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Keog	0.00	0.00	0.00	0.00	0.00	0.00	18.80	0.00	0.20	0.00	1.60	0.00	0.00	0.00	0.00	47.00	0.00	0.20	0.00	0.40	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
King	0.00	0.00	0.00	0.00	0.17	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kogo	0.00	0.13	0.00	0.00	2.38	0.00	88.50	4.25	11.00	0.00	4.75	0.00	0.00	0.00	1.63	2.75	0.38	2.63	0.00	11.25	0.00	147.38	0.00	70.13	0.13	0.00	0.00	15.00	0.00
Lake	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.17	0.00	0.00	1.17	0.00	9.33	0.17	0.00	0.00	0.00	0.00	0.33	0.00
Laks	0.00	0.00	0.00	0.00	0.00	0.00	23.57	0.00	1.86	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.14	8.00	0.00	0.29	0.00	17.71	0.00	0.43	0.00	0.00	0.00	0.71	0.14
Lanc	0.00	0.00	0.00	0.00	0.00	0.00	3.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	1.25	0.00	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leed	0.00	0.00	0.00	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25	0.75	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.25	0.00
Lima	0.00	0.00	0.00	0.00	0.13	0.00	10.38	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	34.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lmog	0.00	0.00	0.00	0.00	0.38	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	2.63	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Loch	0.00	0.00	0.13	0.00	0.13	0.00	9.25	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	1.38	0.00	29.13	0.00	1.25	0.00	86.38	0.00	0.00	0.00	0.00	0.00	26.38	0.00
Manl	0.00	0.00	0.00	0.00	0.00	0.00	11.38	0.38	9.13	0.00	0.00	0.25	0.00	0.00	0.00	1.63	0.25	7.88	0.00	2.25	0.00	89.50	0.00	1.00	0.00	0.00	0.00	4.13	0.00
Manr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Mans	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mara	0.00	0.00	0.38	0.00	0.25	0.00	2.63	0.00	0.00	0.00	3.75	0.00	0.00	0.00	0.00	0.50	0.00	2.38	0.00	0.25	0.00	37.38	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Mari	0.00	0.14	0.00	0.00	0.86	0.00	5.14	0.00	0.00	0.00	0.29	0.29	0.00	0.00	0.00	0.29	0.00	3.29	0.00	6.29	0.00	32.29	0.00	0.00	0.00	0.00	0.00	3.29	0.00
Marr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mary	0.00	0.00	0.50	0.00	0.38	0.00	17.50	1.00	2.38	0.00	2.63	0.00	0.00	0.00	0.00	3.00	0.00	14.38	0.00	2.63	0.00	165.25	0.00	0.00	0.00	0.00	0.00	6.63	0.00
Math	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mayc	0.00	0.00	13.88	0.00	0.25	0.00	1.25	9.38	0.00	0.00	5.00	0.13	0.00	0.00	0.00	6.38	0.00	0.00	0.00	1.13	0.00	7.88	0.00	0.00	0.00	0.00	0.00	1.88	0.00
Mayf	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mayw	0.00	0.00	0.00	0.00	0.50	0.00	0.13	0.00	0.00	0.00	1.00	1.63	0.00	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.13	0.00
Mcdo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.13	0.00	0.25	0.00	0.00	0.00	85.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mcla	0.00	0.14	2.57	0.00	16.29	0.00	334.00	16.71	191.71	0.00	31.29	3.86	0.00	0.14	1.14	5.86	1.43	1.43	7.43	17.29	0.00	332.86	0.57	14.43	0.00	0.00	0.00	5.14	9.43
Meal	0.43	0.14	1.29	0.00	1.14	0.00	99.71	22.29	3.29	0.00	2.43	1.14	0.00	0.00	0.00	2.86	1.00	0.71	0.00	4.43	0.00	134.14	0.00	0.14	0.00	0.00	0.00	7.86	0.00
Mear	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mela	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil1	0.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	5.25	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Mil2	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	15.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mil3	0.00	0.00	0.00	0.00	0.00	0.00	2.20	0.00	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.40	0.00	0.40	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mils	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	2.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mogu	0.00	0.00	0.00	0.00	0.00	0.00	15.40	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	0.00	7.00
Mong	1.50	0.00	2.63	0.00	0.38	0.00	4.25	7.63	3.88	0.00	2.13	1.50	0.00	0.00	0.00	1.00	0.00	0.25	0.00	58.13	0.00	150.13	0.00	140.75	0.00	0.00	0.00	21.50	0.00
Moni	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.57	0.00	0.00	0.00	5.14	0.00	0.00	0.00	0.00	0.00	0.29	0.00
Moor	0.00	0.00	0.00	0.00	0.50	0.00	9.25	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00
Mtbr	0.00	0.00	0.00	0.00	0.60	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.00	6.60	0.00	1.40	0.00	0.00	0.00	0.00	0.00
Mucr	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Muss	0.00	0.00	0.00	0.00	0.00	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	10.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Namm	0.25	0.00	2.13	0.00	0.75	0.00	425.75	10.50	149.00	0.00	9.13	0.00	0.00	0.00	0.00	1.75	0.25	2.25	0.00	18.38	0.00	33.13	0.13	189.25	0.00	0.00	0.00	0.00	0.00
Neer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	1.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
Ngib	0.00	0.00	0.00	0.00	0.14	0.00	28.29	0.86	1.14	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00	1.00	0.00	0.43	0.00	82.29	0.00	4.71	0.00	0.00	0.00	0.00	0.00
Nicm	0.00	0.00	0.00	0.00	0.00	0.00	2.60	1.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.60	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	0.00	0.20	0.00
Nico	0.00	0.00	0.00	0.00	0.00	0.00	154.17	3.00	4.00	0.00	0.00	0.67	0.00	0.00	0.00	8.00	0.17	57.67	0.00	0.83	0.00	69.00	0.17	18.50	0.00	0.00	0.00	1.00	0.00
Nics	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67	0.00	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.17	0.00
Nine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.13	0.00	0.00	0.00	2.13	0.50	0.00	0.00	1.13	0.00	2.13	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Nlak	0.00	0.00	1.50	0.00	0.25	0.00	21.13	6.38	5.38	0.00	2.75	0.00	0.00	0.00	0.00	3.25	0.00	0.25	0.00	10.00	0.00	33.88	0.00	0.00	0.00	0.00	0.00	3.63	0.00
Noon	0.00	0.00	0.00	0.00	0.25	0.00	1.25	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nowe	0.00	0.00	0.00	0.00	0.29	0.00	27.29	1.43	43.57	0.00	0.29	0.00	0.00	0.14	0.00	0.29	0.00	1.14	0.00	11.14	0.00	46.29	0.00	10.00	0.00	0.00	0.00	1.14	0.00
Nros	0.00	0.00	0.00	0.00	0.14	0.00	19.86	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	8.43	0.00	12.86	0.00	0.43	0.00	5.43	0.00	0.00	0.00	0.00	0.00	0.14	0.00
Oldb	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parr	0.00	0.00	0.14	0.00	2.71	0.00	5.57	0.00	0.00	0.00	4.86	1.29	0.00	0.00	0.00	2.71	0.14	0.00	0.00	0.00	0.14	13.29	0.14	0.00	0.00	0.00	0.00	0.43	0.00
Paul	0.00	0.00	0.00	0.00	0.17	0.00	10.17	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.17	0.00	0.33	0.00	0.00	0.00	3.67	0.17	0.00	0.00	0.00	0.00	0.00	0.00
Peha	0.00	0.00	0.00	0.00	0.00	0.00	45.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.50	0.00	0.00	0.00	31.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Peli	0.00	0.00	0.00	0.00	0.75	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	8.75	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pepp	0.00	0.00	0.00	0.00	1.13	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.13	0.00	0.00	0.25	0.00	2.00	0.50	0.00	0.00	0.00	0.00	6.75	0.00
Perr	0.00	0.00	0.00	0.00	0.50	0.00	24.88	0.00	0.00	0.00	4.25	0.25	0.00	0.00	0.00	1.88	0.00	0.00	0.00	0.50	0.00	134.88	0.00	0.13	0.00	0.00	0.00	26.13	0.00
Pinb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.38	0.00	1.38	0.00	0.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pine	0.00	0.00	0.00	0.00	0.13	0.00	0.75	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.13	0.50	0.00	0.00	0.00	4.50	0.00	0.00	0.00	0.00	0.00	1.75	0.00
Pinr	0.00	0.00	0.00	0.00	0.14	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.14	0.00	0.00	0.00	1.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipi	0.00	0.00	0.00	0.00	0.00	0.00	16.88	0.00	0.25	0.00	0.38	0.38	0.00	0.00	0.00	3.13	0.25	8.75	0.00	1.38	0.00	18.50	0.25	0.00	0.00	0.00	0.00	2.13	0.00
Punc	0.00	0.00	0.63	0.00	0.13	0.00	1.75	0.00	0.13	0.00	0.63	0.00	0.00	0.00	0.00	1.00	0.00	2.88	0.00	0.00	0.00	87.63	0.00	0.00	0.00	0.00	0.00	10.38	0.00
Punr	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rega	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rivd	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rivf	0.00	0.00	0.00	0.00	0.00	0.00	20.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.00	9.50	0.00	0.00	0.00	27.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Robe	0.00	0.00	0.00	0.00	0.00	0.00	2.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rock	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Roge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rons	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	46.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rosa	0.00	0.00	0.00	0.00	4.50	0.00	6.25	0.00	0.00	0.00	8.38	0.00	0.00	0.00	0.00	115.25	0.13	9.63	0.00	0.00	0.00	24.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scee	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Scew	0.00	0.00	0.00	0.00	0.50	0.00	10.50	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.33	0.00	31.17	0.00	0.00	0.00	19.50	0.00	0.00	0.00	0.00	0.33	0.00	0.00
Serd	0.00	0.00	0.00	0.00	0.13	0.00	1.25	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.75	0.00	0.50	0.00	0.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spec	0.00	0.00	0.00	0.00	1.83	0.00	10.00	0.50	1.83	0.00	11.33	0.00	0.00	0.00	0.17	2.00	1.67	10.00	0.00	2.83	0.00	15.00	0.00	0.83	0.00	0.00	0.00	0.17	0.00

Code	Gcgb	Gloi	Grec	Grkn	Grte	Gryp	Gytl	Hard	Hhgb	Lgop	Libc	Ligd	Litb	Lite	Lots	Lpic	Maha	Mand	Mars	Musd	Ospy	Pabd	Pchn	Pead	Pecs	Piec	Pioy	Pusn	Rcap
Star	0.00	0.00	0.00	0.00	0.17	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	18.83	0.00	0.00	0.00	0.00	0.00	2.50	0.00
Stok	0.00	0.00	0.00	0.00	0.00	0.00	7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Swan	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00	4.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Talb	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	1.00	0.00	3.67	0.00	0.00	0.00	0.00	0.00	1.00	0.00
Tang	0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.20	0.00	0.00	0.00	0.00	0.00	0.00
Tawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thol	0.00	0.00	0.14	0.00	0.86	0.00	1212.14	8.29	549.43	0.00	0.00	5.29	0.00	0.00	0.43	1.00	2.29	0.00	0.57	36.29	0.00	344.71	0.57	128.86	0.00	0.00	0.00	74.29	7.14
Thom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	3.75	0.00	0.00	0.00	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Thos	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	2.20	0.00	0.00	0.00	3.40	0.20	0.00	0.20	0.00	0.00	0.00	0.00
Uswa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wall	0.00	0.00	0.00	0.00	0.00	0.00	16.40	0.00	2.80	0.00	0.20	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	4.60	0.00	6.00	0.00	0.00	0.00	0.00	0.00
Wann	0.25	0.00	0.00	0.00	0.38	0.00	1057.50	6.13	19.63	0.00	0.00	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00	1.13	0.00	58.13	0.00	144.63	0.00	0.00	0.00	0.00	0.00
Wart	0.00	0.00	0.00	0.00	0.00	0.00	12.50	3.00	2.33	0.00	0.00	0.67	0.00	0.00	0.00	3.17	0.17	0.33	0.00	1.67	0.00	25.83	0.00	1.50	0.00	0.00	0.00	1.00	0.00
Wate	0.00	0.00	0.38	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wcor	0.00	0.00	16.88	0.00	0.13	0.00	47.75	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	2.50	0.00	0.25	0.00	0.25	0.00	18.88	0.00	0.00	0.00	0.00	0.00	0.63	0.00
Weeb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	64.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Whip	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Whit	0.00	0.00	0.00	0.00	0.33	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00	0.00	0.00	0.00	0.00
Wigi	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	1.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00
Wilc	0.00	0.00	0.00	0.00	0.13	0.00	1.75	0.63	0.00	0.00	25.38	0.00	0.00	0.00	0.00	31.25	0.13	0.38	0.00	0.00	0.00	12.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wild	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wilg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wils	0.00	0.00	0.00	0.00	0.13	0.00	6.63	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.50	0.00
Wrig	0.00	0.00	0.00	0.00	0.00	0.00	98.40	0.20	3.40	0.00	0.00	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	0.20	0.00	59.00	0.00	1.20	0.00	0.00	0.00	0.60	0.20
Wswr	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yang	0.00	0.00	0.00	0.00	0.25	0.00	60.75	9.75	131.50	0.00	1.63	0.00	0.00	0.00	0.25	0.13	0.13	0.50	0.00	43.88	0.00	15.25	0.00	130.25	0.13	0.00	0.00	1.25	0.13
Yond	0.00	0.00	0.00	0.00	0.13	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.75	0.00	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Youn	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	1.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00
Yund	0.00	0.00	0.00	0.00	1.38	0.00	126.13	0.38	5.88	0.00	0.00	0.00	0.00	0.13	0.00	4.25	0.25	0.00	0.00	1.50	0.00	118.75	0.13	0.00	0.00	0.00	0.00	0.00	7.00

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Aber	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	2	1	0.75	2
Aden	0.00	0.00	0.00	1.38	0.00	0.00	0.00	1.50	0.00	0.00	0.00	3.75	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	0.13	22	2	39.88	73
Aips	0.00	0.00	0.00	0.00	0.43	0.00	0.00	2.71	0.00	1.14	0.00	0.00	0.86	0.00	0.43	0.00	2.71	0.00	0.00	0.00	0.57	21	8	62.14	96
Aird	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	5	0	12.40	50
Alco	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	26.25	0.00	0.00	0.00	117.25	0.00	5.13	0.00	21.00	0.00	0.00	0.00	3.25	28	2	378.75	1004
Alex	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	30.38	0.00	0.00	0.25	0.00	1.25	0.00	0.00	0.00	0.00	22	1	82.13	174
Alfr	1.75	272.50	0.00	11.25	0.00	0.00	0.25	9.13	1.63	0.00	7.00	285.75	0.00	0.00	0.13	0.00	0.75	0.00	0.00	0.00	0.25	41	3	1042.88	2942
Amie	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	6	0	2.13	6
Ashf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.25	0.00	0.00	0.50	0.00	0.00	0.00	0.00	2.88	0.00	0.00	0.00	1.38	22	2	30.38	86
Aust	0.00	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	8	1	13.33	33
Bald	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	9.17	1.00	0.00	0.33	36.17	0.00	10.33	0.00	5.33	0.00	0.33	0.00	0.67	20	4	108.67	360
Ball	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	0.00	0.00	0.00	12	1	23.00	37
Balp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	2.00	0.00	0.00	0.00	0.00	0.00	3.50	0.00	0.50	0.00	0.00	0.00	0.00	23	6	507.25	1077
Bamd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	5	0	6.00	11
Baml	0.00	0.00	0.00	0.00	0.13	0.00	0.00	2.13	11.00	7.75	0.00	0.13	0.00	0.00	8.13	0.00	2.25	0.00	0.00	0.00	0.63	26	1	609.38	2119
Bamw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	6.33	0.00	0.00	0.00	20.67	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.33	10	0	67.67	148
Bang	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	0	0.20	1
Barl	0.00	0.00	2.88	2.63	0.13	0.13	0.00	0.38	209.38	9.50	0.00	0.13	2.88	0.00	0.63	0.00	5.88	0.00	0.25	0.00	12.25	37	1	661.75	1731
Bars	0.00	0.00	0.57	0.14	0.00	0.00	0.00	1.29	0.71	0.00	0.00	0.00	5.29	0.00	2.86	0.00	1.14	0.00	0.00	0.00	12.57	23	4	248.14	751
Bays	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.13	1.25	5.00	0.00	0.00	0.13	0.00	0.75	0.00	0.88	0.00	0.00	0.00	0.25	25	7	153.25	268
Beel	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.57	53.71	0.57	0.00	0.00	1.86	0.00	2.00	0.00	1.57	0.00	0.00	0.00	3.29	28	0	554.14	1177
Been	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.17	6.33	0.67	0.00	0.00	0.00	0.00	0.67	0.00	1.67	0.00	0.00	0.00	0.00	17	3	71.33	178
Bees	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9	0	26.75	72
Belm	0.00	0.38	0.00	0.00	1.25	0.00	0.00	0.63	1.50	6.00	0.00	8.00	0.00	0.13	3.13	0.00	9.38	0.00	0.00	0.00	2.25	33	4	161.25	516
Beng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.17	0.83	0.00	0.00	1.67	0.00	41.50	0.00	10.00	0.00	0.00	0.00	0.17	22	3	156.50	304
Bibr	0.00	0.00	0.00	0.00	0.13	0.00	0.00	1.00	3.13	23.38	0.00	1381.25	0.00	0.38	189.50	0.00	4.13	0.00	0.00	0.00	1.13	35	8	3312.25	7598
Bigc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.14	0.00	32.86	0.00	1.00	0.00	0.00	0.00	0.57	23	8	167.29	326
Bind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Blac	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.43	0.43	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.29	0.00	0.00	0.00	2.86	17	2	140.86	298
Blal	0.00	2.50	0.00	37.00	0.00	0.00	0.00	0.13	263.25	1.25	0.00	34.63	0.00	0.00	54.38	0.00	5.88	0.00	0.00	0.00	1.50	24	1	978.25	2517
Blue	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.38	0.75	0.63	0.00	43.75	0.00	0.00	1.38	0.00	0.50	0.00	0.00	0.00	0.00	22	7	227.75	316
Blyt	0.00	0.00	1.86	0.00	0.29	0.00	0.00	0.43	2.14	6.00	0.00	0.00	0.71	0.00	0.71	0.00	0.71	0.00	0.43	0.00	0.00	32	8	131.29	451
Bodk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.63	0.00	0.00	4.50	0.00	0.00	0.00	0.00	1.38	0.00	0.00	0.00	0.38	24	2	28.50	82
Bogg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	65.40	0.00	0.00	1.20	0.00	0.00	2.40	0.00	6.40	0.00	0.00	0.00	0.20	17	0	202.80	598
Boog	0.00	0.00	0.00	0.00	0.63	0.00	0.00	31.88	0.00	0.50	0.00	0.00	0.00	0.00	2.50	0.00	0.75	0.00	0.00	0.00	0.00	22	8	453.88	880
Bro2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	24.17	0.33	0.00	0.00	9.33	0.00	1.67	0.00	6.00	0.00	0.00	0.00	0.33	18	1	104.67	272

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Bull	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.13	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	17	1	32.50	75
Camp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	7	0	13.00	25
Canc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.75	0.13	0.00	0.25	0.00	0.00	1.50	0.00	0.38	0.00	0.00	0.00	0.00	19	3	80.25	156
Canf	0.00	0.00	0.00	0.00	0.75	0.00	0.00	9.25	0.13	0.00	0.00	0.00	0.00	0.25	0.00	0.00	3.00	0.00	0.00	0.00	0.25	24	7	332.63	701
Canw	0.00	0.00	0.00	0.00	0.40	0.00	0.00	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.20	22	0	155.40	415
Cara	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.29	3.29	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.14	0.00	0.00	0.00	0.43	18	6	54.14	95
Care	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	10	4	23.43	50
Cari	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2	0	0.60	2
Carr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.25	8	1	3.25	7
Cars	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	17.67	0.00	0.00	0.00	1.33	0.00	1.17	0.17	4.67	0.00	0.00	0.00	1.00	20	4	659.17	1132
Chas	0.00	0.00	0.00	0.00	4.25	0.00	0.00	5.63	3.50	0.75	0.00	0.00	32.13	0.00	3.13	0.00	12.63	0.00	0.00	0.00	8.00	28	7	207.75	445
Chit	0.00	0.00	0.00	0.00	5.17	0.00	0.00	19.50	24.83	0.67	0.00	0.17	21.17	0.00	39.33	0.00	14.50	0.00	0.00	0.00	29.50	30	8	1059.67	2546
Clar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	26.13	1.75	0.00	529.00	0.00	0.00	16.38	0.00	0.75	0.00	0.00	0.00	0.00	30	10	846.88	3758
Clib	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.38	6	0	4.13	11
Clis	0.00	0.00	0.00	0.00	0.29	0.14	0.00	32.71	0.71	0.00	0.00	0.00	0.14	0.00	0.29	0.00	0.29	0.00	0.00	0.00	1.29	19	4	42.29	86
Cod1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	0.00	0.00	0.00	4	1	6.67	15
Cod2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	2	0	3.50	16
Coo1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	6	1	3.20	8
Coo2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	3	0	2.00	5
Coo3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Cooc	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	5	0	0.88	4
Cood	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1	0	1.00	8
Coog	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	1.67	0.50	0.00	0.00	0.00	0.00	3.67	0.00	0.67	0.00	0.00	0.00	0.33	17	6	63.17	99
Cooo	0.00	215.71	0.00	15.71	0.00	0.00	0.00	0.00	48.00	0.57	4.29	50.14	0.00	0.00	104.29	0.00	0.57	0.00	0.00	0.00	0.00	21	1	1177.43	3449
Coos	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.40	0.60	0.00	0.00	0.20	0.00	0.00	0.00	0.80	0.00	0.00	0.00	1.00	13	1	13.80	31
Copo	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.14	7.00	0.14	0.00	0.00	2.14	0.00	1.57	0.00	1.86	0.00	0.00	0.00	0.14	26	10	237.29	581
Cor1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.40	23.20	1.60	0.00	0.00	2.60	0.00	6.20	0.00	10.00	0.00	0.00	0.00	5.00	17	1	89.40	164
Cor2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	59.57	0.86	0.00	0.00	10.43	0.00	1.57	0.00	3.71	0.00	0.00	0.00	1.29	15	0	133.71	507
Cor3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.25	0.63	0.00	0.00	19.38	0.00	0.75	0.00	3.25	0.00	0.00	0.00	0.00	17	3	68.63	277
Corx	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.38	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.13	0.00	0.00	0.00	0.00	11	0	22.13	67
Cowa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	0	3.50	17
Crag	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	2	8.67	14
Cram	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	7	0	5.43	9
Crea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4	0	1.43	2
Culc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.80	0.00	0.00	0.00	0.00	7.00	0.00	6.00	0.00	0.00	0.00	0.20	15	1	39.80	110
Curt	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6	3	34.38	65

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Deep	0.00	0.00	1.29	0.00	0.00	0.00	0.00	0.00	2.29	0.00	0.00	0.00	14.29	0.00	0.86	0.00	5.43	0.00	0.00	0.00	0.14	17	1	69.14	162
Devi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.88	0.25	0.00	0.00	0.63	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	15	2	23.00	72
Diam	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	13	0	10.25	19
Dils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.60	0.40	0.00	0.00	0.00	0.00	1.00	0.00	0.40	0.00	0.00	0.00	0.00	15	5	87.60	242
Duck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	0.00	0.00	0.00	2.13	0.00	0.00	0.00	7.75	0.00	0.00	0.00	0.25	12	1	48.38	84
Eagl	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7	4	10.50	23
East	0.00	0.00	0.00	0.00	0.25	0.00	0.00	2.00	0.00	1.25	0.00	0.00	0.00	0.00	1.50	0.00	1.88	0.00	0.00	0.00	0.25	21	2	62.75	147
Elle	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.25	0.00	0.00	0.00	0.00	3	0	13.50	30
Ever	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67	7.83	0.00	0.00	0.00	14.83	0.00	12.67	0.00	9.00	0.00	0.00	0.00	0.17	16	1	71.33	154
Figi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Fis1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	6.43	0.57	0.00	0.00	0.86	0.00	0.29	0.00	1.29	0.00	0.00	0.00	0.71	17	0	40.29	102
Fis2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.80	0.80	0.00	0.00	0.40	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	12	1	32.60	64
Fis3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	1.00	0.00	0.00	2.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	9	1	23.80	68
Fis4	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.71	3.14	0.00	0.00	0.00	0.00	0.00	1.57	0.00	0.14	0.00	0.00	0.00	0.86	16	0	20.14	43
Fiss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.60	13	1	16.40	34
Folm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	11.75	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	8	1	14.25	99
Folp	0.00	0.00	0.00	0.00	0.38	0.00	0.00	1.50	0.25	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.25	17	1	9.25	19
Foot	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	9.25	6.63	0.00	0.00	0.00	0.00	9.75	0.00	0.25	0.00	0.00	0.00	6.75	29	0	356.38	1158
Forl	0.00	0.20	0.60	0.00	0.00	0.00	0.00	0.00	9.40	6.80	0.00	0.00	1.40	0.00	0.80	0.00	1.20	0.00	1.60	0.00	0.00	21	7	164.20	199
Forr	0.00	148.57	0.71	208.86	0.86	0.00	0.00	1.00	125.43	87.86	100.43	2.14	0.00	0.86	182.43	0.00	3.29	0.14	0.00	0.00	0.43	43	7	3508.43	10153
Fort	0.00	0.00	0.00	0.00	0.57	0.00	0.00	1.14	0.00	0.29	0.14	0.00	9.57	0.14	1.00	0.00	0.57	0.00	0.00	0.00	0.00	21	7	45.00	83
Free	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.38	0.00	0.00	0.00	19.88	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	15	4	157.88	303
Frem	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.13	8	0	7.63	58
Gans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.88	1.50	0.00	0.00	0.00	5.25	0.00	0.88	0.00	2.38	0.00	0.00	0.00	0.75	17	2	35.25	124
Gany	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	1.50	0.00	0.00	0.00	0.00	0.00	0.63	0.00	1.63	0.00	0.00	0.00	0.50	16	5	37.38	64
Gib1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	5	2	8.00	24
Gib2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	9.17	0.00	0.00	0.00	2.67	0.00	3.83	0.00	3.00	0.00	0.00	0.00	0.33	17	3	91.83	234
Giba	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.00	8	2	16.00	33
Gibb	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.17	0.50	0.83	0.00	0.00	19.83	0.00	4.17	0.00	6.33	0.00	0.00	0.00	0.50	27	9	143.50	248
Gin1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.80	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.20	12	1	21.00	58
Gin2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9	0	16.60	55
Gin3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.80	0.00	0.00	0.00	0.00	19.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.20	9	0	47.20	74
Gin4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.25	0.00	0.00	8.75	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	19	5	34.00	75
Gin5	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	14	0	14.88	27
Gine	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.75	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	11	2	12.88	64
Ginj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	9	0	15.50	41

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Ginl	0.00	0.00	0.00	0.00	0.17	0.00	0.00	6.00	1.00	0.00	0.00	0.00	0.00	0.00	1.83	0.00	0.17	0.00	0.00	0.00	4.50	15	0	20.33	43
Ginn	0.00	0.00	0.50	0.00	0.00	0.00	0.00	1.67	5.83	0.00	0.00	0.00	9.83	0.00	1.50	0.00	10.00	0.00	0.00	0.00	1.50	17	3	136.33	211
Glov	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.00	2	1	0.50	3
Gnal	0.00	0.00	0.00	2.14	0.00	0.00	0.00	1.43	1.14	0.00	0.00	0.00	0.14	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	11	0	34.29	139
Gnar	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.50	0.00	0.00	0.25	0.00	0.50	0.00	0.25	0.00	0.00	0.00	0.00	13	4	22.75	57
Gobb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7	0	12.50	29
Goeg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	6	0	7.50	15
Gold	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.50	1.17	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00	7	0	24.00	99
Good	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.29	0.00	0.00	0.00	0.00	11	1	12.71	39
Gool	0.00	0.00	0.00	0.00	0.57	0.00	0.00	1.71	76.86	0.57	0.00	0.00	0.00	0.00	8.29	0.00	3.29	0.00	0.00	0.00	2.00	27	4	176.57	618
Goss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.80	0.00	0.00	0.00	0.00	8	4	16.40	57
Goya	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	3.13	0.00	0.00	0.00	1.63	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.38	13	3	45.00	113
Gree	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	6	0	10.25	30
Grey	0.00	0.00	0.00	0.00	0.25	0.00	0.00	4.75	45.75	0.00	0.00	0.00	19.25	0.00	20.25	0.00	2.75	0.00	0.00	0.00	1.50	18	2	242.50	485
Gung	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	7	1	8.17	25
Gwel	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.14	0.86	3.29	0.00	0.00	0.00	0.00	9.57	0.00	2.43	0.00	0.00	0.00	0.57	27	5	539.43	1602
Har1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	1.00	11	0	16.75	26
Har2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	4.80	8	0	24.80	51
Haze	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	8.88	0.63	0.00	0.00	0.63	0.00	6.63	0.00	0.88	0.00	0.00	0.00	0.00	23	5	120.88	333
Hebb	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	11	0	6.75	24
Hend	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3	0	2.57	7
Herd	0.00	0.00	0.75	0.88	0.00	0.00	0.00	4.25	14.75	16.50	0.63	60.25	0.13	0.00	122.13	0.00	4.00	0.00	0.00	0.00	1.38	40	11	1453.88	2434
Holm	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.71	0.00	0.29	0.00	0.00	1.43	1.43	0.29	0.00	3.00	0.00	0.00	0.00	0.00	26	12	45.43	87
Hope	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	1.43	2.43	0.00	0.00	0.00	0.00	1.57	0.00	1.14	0.00	0.00	0.00	0.00	17	2	62.43	178
Hurs	0.00	72.57	11.29	120.86	0.00	0.00	0.00	0.43	403.14	29.86	25.00	11.43	12.57	0.00	42.00	0.00	7.14	0.00	2.29	0.00	1.14	39	1	1533.57	2938
Hyde	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.88	0.00	0.00	0.00	0.00	0.00	2.38	0.00	0.00	0.00	0.00	0.00	0.00	12	3	280.25	436
Jame	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.71	0.29	1.86	0.00	0.00	0.14	1.86	0.57	0.00	4.86	0.00	0.00	0.00	0.00	25	11	81.71	140
Jand	0.00	0.00	0.00	3.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	1.86	0.00	1.00	0.00	0.00	0.00	0.00	13	0	29.00	178
John	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	5	1	12.13	34
Joo1	0.00	0.00	0.00	6.00	0.13	0.00	0.00	2.00	4.50	1.88	0.00	3.75	0.00	0.00	6.00	0.00	3.63	0.00	0.00	0.00	2.75	33	3	258.50	583
Joo2	0.00	0.00	0.00	7.75	0.13	0.00	0.00	1.00	6.00	1.25	0.00	0.00	0.13	0.00	4.13	0.00	4.25	0.00	0.00	0.00	7.25	33	4	179.00	309
Joon	0.00	0.00	0.00	0.25	0.00	0.00	0.00	3.25	2.13	2.88	0.00	0.00	0.38	0.00	32.75	0.00	3.63	0.00	0.00	0.00	0.00	27	2	338.63	1012
Juli	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.38	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.38	11	0	14.88	95
Kara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.60	1.80	20.00	4.40	138.00	0.00	12.00	0.00	3.00	0.00	0.00	0.00	8.60	23	3	384.60	801
Kard	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	7.29	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.29	7	0	12.14	58
Karw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.40	0.00	0.00	0.40	0.00	0.00	0.00	2.80	0.00	0.00	0.00	0.20	14	1	55.40	223

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Kawi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	7	0	3.50	21
Kemp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	3.63	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	3.63	21	2	49.88	113
Kems	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	25.00	0.20	0.00	0.00	0.00	0.00	1.60	0.00	6.40	0.00	0.00	0.00	0.80	19	3	113.40	312
Kent	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	13	0	18.00	32
Keog	0.00	0.00	0.00	0.00	0.20	0.00	0.00	7.60	0.00	0.00	0.00	0.00	0.00	0.20	2.20	0.00	2.20	0.00	0.00	0.00	7.20	15	6	105.40	167
King	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.00	0.00	0.00	6	0	15.00	53
Kogo	0.00	7.88	0.38	6.75	9.75	0.00	0.00	4.50	66.38	33.75	0.13	0.13	1.38	0.00	21.13	0.00	2.50	0.00	0.50	0.00	7.13	39	6	640.75	1732
Lake	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	0.00	0.00	0.00	14	2	26.83	78
Laks	0.00	0.86	1.71	0.00	0.00	0.00	0.00	0.57	14.14	0.29	0.00	0.00	0.29	0.00	1.14	0.00	8.71	0.00	2.14	0.00	0.86	27	5	96.43	263
Lanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	6	0	7.38	28
Leed	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	12	4	31.25	81
Lima	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.25	0.00	0.88	0.00	0.00	0.13	0.00	0.75	0.00	0.00	0.00	0.00	13	1	51.13	167
Lmog	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	10	1	10.50	20
Loch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	7.25	0.25	0.00	0.00	0.00	0.00	2.13	0.00	0.63	0.00	0.00	0.00	0.38	18	2	182.75	322
Manl	0.00	0.00	0.00	0.25	0.13	0.00	0.00	1.50	4.13	4.00	0.25	0.00	0.00	0.00	1.38	0.00	0.38	0.00	0.00	0.00	0.00	29	4	203.00	498
Manr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	2	0	2.00	2
Mans	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	1.00	0.00	0.00	0.00	0.00	4	0	2.00	5
Mara	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63	5.38	0.00	0.00	0.00	23.88	0.00	0.00	0.00	15.13	0.00	0.00	0.00	0.25	19	1	105.00	280
Mari	0.00	0.00	0.29	18.86	0.00	0.00	0.00	0.29	1.86	0.00	0.00	0.00	0.14	0.43	1.00	0.00	1.00	0.00	0.00	0.00	6.29	26	1	148.14	465
Marr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	2	1	2.63	6
Mary	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	6.00	0.88	0.00	0.38	0.00	0.00	4.88	0.00	1.75	0.00	0.00	0.00	1.38	29	11	341.38	830
Math	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	5	0	2.50	5
Mayc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.25	0.00	0.00	0.25	0.25	0.00	9.25	0.00	0.88	0.00	0.00	0.00	0.25	25	4	146.00	220
Mayf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	5	0	1.00	3
Mayw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75	0.00	0.00	0.00	0.38	13	1	12.63	29
Mcdo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	92.75	0.00	0.00	1.50	0.00	0.38	0.00	0.00	0.00	0.00	14	5	246.75	441
Mcla	0.00	4.86	3.86	114.29	0.14	0.00	0.00	5.86	613.29	38.71	32.29	0.00	7.29	1.14	94.43	0.14	8.29	3.71	18.14	0.00	6.43	51	1	2312.43	3986
Meal	0.00	0.00	0.00	0.14	0.43	0.00	0.00	3.43	9.29	5.57	39.29	0.00	0.00	1.00	23.14	0.14	27.71	0.00	0.71	0.00	47.57	39	3	528.43	1201
Mear	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	5	0	8.00	13
Mela	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Mil1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.25	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7	2	21.25	38
Mil2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.75	1.25	0.00	0.00	0.00	0.00	2.25	0.00	0.50	0.00	0.00	0.00	0.00	9	1	26.75	50
Mil3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	0.20	0.00	0.00	0.00	0.00	0.00	0.00	1.20	0.00	0.00	0.00	0.20	11	1	10.20	23
Mils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.14	0.00	0.00	0.00	0.00	0.14	0.00	0.29	0.00	0.00	0.00	0.00	8	2	10.14	34
Mogu	0.00	0.00	3.60	0.00	0.00	0.00	0.00	0.00	1.80	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	15	0	42.00	66
Mong	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	27.25	47.88	0.00	902.50	0.00	0.13	404.38	0.00	0.13	0.00	0.00	0.00	0.00	33	9	2238.63	4584

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Moni	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00	11	2	12.00	31
Moor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.50	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	12	5	34.25	62
Mtbr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	1.40	0.00	0.00	10.00	0.00	0.00	0.60	0.00	0.80	0.00	0.00	0.00	0.00	15	2	33.00	84
Mucr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6	1	15.00	32
Muss	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	7	0	15.88	25
Namm	0.00	0.00	0.50	1.50	0.00	0.00	0.00	1.00	96.50	14.88	0.00	4.38	6.63	0.00	36.88	0.00	2.25	0.13	0.00	0.00	4.13	34	4	1123.00	3097
Neer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.60	0.00	0.00	0.00	0.00	9	1	18.60	37
Ngib	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.71	0.43	0.00	0.00	0.14	0.00	0.57	0.00	5.57	0.00	0.29	0.00	0.29	24	2	146.00	568
Nicm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.20	0.00	0.00	0.00	0.20	0.00	0.00	2.00	0.00	0.00	0.00	0.00	12	1	15.00	42
Nico	0.00	0.00	1.17	0.00	0.83	0.00	0.00	0.67	25.50	2.33	0.00	0.00	1.17	0.17	3.67	0.00	4.33	0.00	2.33	0.00	0.00	33	9	442.83	647
Nics	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.33	13	4	32.17	78
Nine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.75	0.00	0.00	0.00	0.00	0.00	0.00	15	0	13.63	24
Nlak	0.00	0.00	0.00	1.38	0.00	0.00	0.00	1.50	0.38	0.50	0.00	33.25	0.00	0.00	6.50	0.00	2.38	0.00	0.00	0.00	0.63	29	4	221.00	521
Noon	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.13	11	1	9.75	23
Nowe	0.00	0.00	0.14	0.14	0.00	0.00	0.00	0.00	9.43	38.86	0.00	0.00	0.00	0.00	5.00	0.00	0.71	0.00	0.00	0.00	0.00	25	3	235.14	855
Nros	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.14	0.29	0.00	0.00	0.14	0.00	0.57	0.00	0.71	0.00	0.00	0.00	0.00	17	4	57.14	134
Oldb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.00	0.00	4	1	5.00	6
Parr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.14	0.43	0.57	0.00	39.00	0.00	0.29	0.71	0.00	12.86	0.00	0.00	0.00	4.57	27	0	187.14	407
Paul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	5.50	0.67	0.00	0.00	0.83	0.00	0.50	0.00	6.50	0.00	0.00	0.00	0.17	15	0	30.33	80
Peha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.25	3.50	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	11	2	98.50	171
Peli	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.25	0.00	0.00	0.13	0.00	0.00	0.25	0.00	0.63	0.00	0.00	0.00	0.63	15	1	18.13	83
Pepp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88	0.25	0.00	0.00	0.00	10.25	0.00	4.63	0.00	4.13	0.00	0.00	0.00	1.13	17	0	37.13	180
Perr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	74.38	1.75	0.00	384.75	0.00	0.00	23.00	0.00	0.50	0.00	0.00	0.00	0.25	27	10	867.38	1332
Pinb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.00	0.00	0.00	7	1	20.00	54
Pine	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.63	0.00	0.00	0.00	0.00	14	4	26.38	37
Pinr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.57	0.00	0.00	1.43	0.00	0.00	0.00	0.00	2.29	0.00	0.00	0.00	0.57	9	1	10.71	25
Pipi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.38	1.25	0.88	0.00	0.00	1.25	0.00	1.88	0.00	3.25	0.00	0.00	0.00	0.63	27	5	83.25	272
Punc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.13	8.50	3.25	0.00	40.50	0.00	0.00	4.50	0.00	1.38	0.00	0.00	0.00	0.00	25	5	276.38	460
Punr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	0	0.50	2
Rega	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	0	0.14	1
Rivd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.60	6	0	2.80	5
Rivf	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.63	3.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	9	3	67.63	133
Robe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.75	8	0	24.50	48
Rock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.38	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	8	1	21.50	54
Roge	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	50.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4	0	59.00	118
Rons	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	8	3	58.50	128

Code	Rekn	Rens	Rkdo	Rnav	Rnhn	Rosl	Rutu	Saci	Shel	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse	Wfhn	Whit	Woos	Wwgt	Ybsl	No. species	Breed. species	Mean count	Highest count
Rosa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.25	3.00	0.13	0.00	0.00	8.38	0.00	0.13	0.00	0.88	0.00	0.00	0.00	4.50	18	2	201.75	647
Sand	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	7	0	7.40	18
Scee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.60	8	0	4.20	10
Scew	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67	15.00	0.00	0.00	0.00	10.33	0.00	0.00	0.00	11.67	0.00	0.00	0.00	0.00	13	0	105.50	142
Serd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75	0.00	0.00	0.00	2.13	14	0	14.38	39
Spec	0.00	0.17	0.67	0.00	6.00	0.00	0.00	4.83	3.00	0.00	0.00	0.00	0.17	0.33	1.83	0.00	6.33	0.00	0.83	0.00	10.33	33	12	120.17	176
Star	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	12	3	37.50	56
Stok	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.50	0.00	0.00	0.00	0.00	5	0	10.00	32
Swan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	5	3	14.88	47
Talb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	1.50	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.17	12	1	20.50	67
Tang	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6	1	4.80	17
Tawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	1.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	5	0	13.50	20
Thol	0.00	0.00	0.71	196.00	0.00	0.00	0.00	3.00	135.43	191.86	55.29	2.86	0.14	4.29	241.86	0.00	16.71	0.71	6.43	9.43	0.29	47	4	4795.57	18472
Thom	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.13	6	1	9.25	26
Thos	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.20	0.20	0.00	0.00	0.20	0.00	0.40	0.00	0.60	0.00	0.00	0.00	0.20	15	2	33.20	97
Uswa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	3	0	1.13	4
Wall	0.00	0.00	1.80	0.00	0.00	0.00	0.00	0.20	1.60	0.40	0.00	0.00	1.40	0.00	0.00	0.00	2.20	0.00	0.00	0.00	1.80	20	4	55.20	103
Wann	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	23.13	0.00	0.00	0.00	0.00	145.50	0.00	0.88	0.00	0.00	0.00	0.88	21	2	2148.63	10347
Wart	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.50	0.00	0.17	0.00	0.00	0.00	0.83	0.67	0.00	1.67	0.00	0.00	0.00	0.33	25	10	67.50	170
Wate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.38	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	8	0	8.63	69
Wcor	0.00	0.00	0.00	0.00	1.00	0.00	0.00	1.75	4.13	1.50	0.00	0.00	10.50	0.00	0.75	0.00	0.50	0.00	0.00	0.00	5.88	23	5	129.75	302
Weeb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	3.38	0.00	1.13	0.00	0.00	0.00	0.00	13	5	111.38	170
Whip	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Whit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	8	2	4.83	9
Wigi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	8	1	9.75	20
Wilc	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	1.25	14	3	76.75	404
Wild	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3	0	1.25	3
Wilg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0.00	0
Wils	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.63	12.13	0.13	0.00	0.00	0.00	0.00	0.50	0.00	0.25	0.00	0.00	0.00	0.13	18	3	28.50	74
Wrig	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	11.00	1.20	0.00	0.60	0.00	0.00	2.60	0.00	2.60	0.00	0.00	0.00	0.00	19	6	250.60	845
Wswr	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00	4	0	4.00	16
Yang	0.00	0.00	0.13	4.00	0.13	0.00	0.00	0.50	20.75	12.25	0.13	0.13	0.00	0.00	49.50	0.00	1.75	0.00	0.88	0.00	0.00	36	3	601.13	1404
Yond	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	11	0	8.75	25
Youn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	7	2	4.43	9
Yund	0.00	13.63	0.00	0.00	0.00	0.00	0.00	0.38	62.25	1.50	0.00	4.63	0.00	0.00	6.88	0.00	3.13	0.00	0.00	0.00	1.75	25	2	420.88	1825

Appendix 4 Total number of clutches and broods recorded for all species breeding at each wetland. See Appendices 1 and 2 for species and wetland names.

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn	Yb
Aber	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Aips	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	2	0	0	0	1	0	0	0	0	0	1	1	0
Alco	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0
Alex	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Alfr	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Ashf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Aust	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bald	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	4	0	0
Ball	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Balp	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	2	3	0	0	0	0	0	0	0	0	0	0	2	0	0
Baml	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Bars	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	5	0	12
Bays	2	0	0	2	0	0	0	10	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	29	0	0	0	0	0	1	0	0	0	0	0	0
Been	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0
Belm	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Beng	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0
Bibr	0	0	0	1	0	0	0	21	0	0	8	1	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	17	0	0
Bigc	0	0	0	0	0	0	0	4	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	1	0	2	0	2	0	0	0	0	0	0	0	0	14	0	0
Blac	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Blal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
Blue	7	0	0	0	0	0	0	7	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	0	3	0	0
Blyt	0	0	0	0	0	0	0	11	0	0	3	0	0	0	0	0	6	0	0	0	0	0	9	0	0	3	1	0	0	0	0	0	1	0	0	0	1	0	0
Bodk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Boog	0	0	0	0	0	0	0	4	0	1	0	0	0	0	211	0	0	0	0	20	0	0	0	0	0	3	0	2	0	0	0	28	0	0	0	0	1	0	0
Bro2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Bull	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Canc	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Canf	8	0	0	0	1	0	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0
Cara	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Care	1	0	0	0	0	0	0	9	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Carr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	501	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Chas	0	0	0	0	0	0	0	6	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	2	0	0	0	5	0	2	0	0
Chit	0	0	0	0	0	0	0	27	0	0	0	0	0	0	0	0	0	3	0	4	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	5	1	16

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn	Ybsl
Clar	6	0	0	1	0	0	0	11	3	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	12	4	6	0	0	0	0	0	0	0	0	5	0	0
Clis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	4	0	0	0	0	1	0	0
Cod1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Cool	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Coog	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2	0	0	3	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0	0
Cooo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Coos	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copo	2	0	0	0	0	1	0	7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	2	0	0	0	2	0	0
Cor1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Cor3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Crag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Culc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Curt	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Deep	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Devi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Dils	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0
Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eagl	2	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Ever	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0
Fis2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fis3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fiss	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Folm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Folp	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forl	3	0	0	0	0	0	1	6	0	0	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	2	0	0
Forr	0	0	0	0	0	0	0	23	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	1	9	0	0	0	0	0	0	0	19	0	0
Fort	3	0	0	0	0	0	0	9	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	0	1	0	0	0	0	0	0	0	0	3	0	0
Free	6	0	0	0	0	0	0	16	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Gans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0
Gany	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0
Gib1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Gib2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	2	0	0
Giba	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gibb	0	0	0	0	0	0	0	20	0	0	4	0	1	0	0	0	0	0	0	0	0	0	10	0	0	2	5	1	0	0	0	0	0	0	0	0	13	2	0
Gin1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Gin4	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn	Yb
Gine	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ginn	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Glov	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gnar	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Good	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gool	0	0	0	1	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Goss	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Goya	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Grey	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0
Gung	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gwel	0	0	0	0	0	0	0	15	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Haze	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Herd	5	0	0	2	0	0	0	37	0	0	4	0	0	13	0	0	3	4	0	0	0	0	0	0	2	2	0	8	0	0	0	0	0	0	0	0	8	0	0
Holm	1	0	0	0	0	0	1	7	0	0	1	0	2	0	0	0	1	0	0	0	0	0	19	1	0	5	1	1	0	0	0	0	0	0	0	0	1	0	0
Hope	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hurs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Hyde	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Jame	1	0	0	0	0	0	0	8	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	1	6	0	5	0	0	0	0	1	0	0	0	1	6	0
John	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Joo1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0
Joo2	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Joon	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	4	0	0	0	5	0	0
Karw	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kems	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	1	0	0
Keog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	71	0	0	0	0	0	0	0	0	0	0	0	0	1	3	1	5
Kogo	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	5	0	1	0	0	0	0	1	0	0	0	14	0	0
Lake	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Laks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	3	0	0	0	3	0	0
Leed	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Lima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Lmog	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Loch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
Manl	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	0
Mara	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn	Ybsl
Marr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mary	1	0	0	0	0	0	0	8	0	0	1	0	0	0	0	0	2	0	2	0	0	0	0	2	1	5	0	2	0	0	0	0	1	0	0	0	7	0	0
Mayc	2	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
Mayw	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mcdo	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	1	0	0
Mcla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Meal	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	19	0	0
Mil1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mil2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Mil3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Mils	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mong	1	0	0	5	0	0	0	0	0	0	10	0	0	0	0	0	0	1	0	0	0	0	0	0	3	10	0	3	0	0	0	0	1	0	0	0	51	0	0
Moni	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moor	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	3	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Mtbr	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mucr	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Namm	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Neer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ngib	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nicm	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nico	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	2	0	0	0	1	0	13	1	0	1	5	0	0	0	0	0	1	0	0	0	8	0	0
Nics	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Nlak	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	2	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Noon	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nowe	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0
Nros	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Oldb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Peha	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Peli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Perr	2	0	0	1	0	0	0	8	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	8	0	0	0	0	1	0	0	0	6	0	0
Pinb	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pine	0	0	0	0	0	0	0	2	0	19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pinr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Pipi	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0	3	0	0
Punc	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0	1	0	0
Rivf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Rock	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn	Yb
Rons	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Rosa	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spec	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	2	0	3	5	0	0	0	0	1	4	1	0	0	0	12	7	0	0	0	0	2	0	6
Star	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Swan	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Talb	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tang	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thol	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	7	0	0
Thom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Thos	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wall	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Wann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0	0
Wart	3	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	5	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0
Wcor	0	0	0	0	0	0	0	0	0	5	0	0	0	0	20	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
Weeb	3	0	0	0	0	0	0	4	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Whit	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wigi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilc	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Wils	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
Wrig	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	5	0	0	0	0	0	0	1	1	0	0	0	0	0
Yang	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	0
Youn	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yund	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3	0	0

Appendix 5 Physical, chemical and morphological features of each wetland. Mean values are presented for variables measured on more than one occasion (Geometry types: St, Straight; Si, Sinuous; An, Anastomosing; Ir, Irregular; Li, Linear; El, Elongate; Ov, Ovoid; Ro, Round; Semeniuk Consanguineous wetland suites: q, Quindalup; s, Spearwood; y, Yoongarillup; sb, Spearwood/Bassendean; b, Bassendean; bp, Bassendean/Pinjarra; p, Pinjarra; e, estuarine; r, riverine; dp, Dandaragan Plateau; dpd, Dandaragan/Darling Plateau; d, Darling Plateau), * indicates missing data, refer to Table 4.1 for units of measurement. See Appendix 1 for wetland names. Note that Grass (%) etc. are expressed as proportional cover instead of percentage cover.

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
ABER	0.62	0.30	7.44	19.26	96.8	0.0	0.00	2.0	0.0461	2.0	7.10	76.7	0.970	0.060	0.003	0.001	0.50	1000	30	0.30	0.00	0.00	0.00	0.00	0.00	1
ADEN	0.21	1.44	7.50	16.20	92.5	0.0	0.00	0.2	0.0039	39.2	3.63	96.7	1.957	0.093	0.003	0.001	5.00	1200	30	0.06	0.18	0.00	0.03	0.03	0.00	4
AIPS	0.77	0.33	6.78	15.81	41.6	13.3	5.35	1.4	0.2967	12.3	4.53	170.0	1.418	0.103	0.027	0.004	16.00	3400	80	0.01	0.01	0.00	0.32	0.64	0.01	5
AIRD	0.19	0.53	6.90	15.40	78.6	14.0	17.64	0.6	0.0072	10.0	2.75	500.0	2.150	0.470	0.001	0.005	0.75	1000	40	0.04	0.00	0.00	0.36	0.00	0.00	2
ALCO	4.65	0.88	8.67	21.11	112.6	3.5	34.06	0.5	0.0003	3.6	4.95	36.3	1.203	0.015	0.022	0.000	15.10	1497	5	0.01	0.02	0.00	0.03	0.00	0.00	3
ALEX	3.50	11.29	7.81	17.93	90.3	0.0	0.00	1.3	0.0007	0.8	4.65	27.5	0.965	0.033	0.005	0.003	5.00	1000	5	0.00	0.04	0.00	0.02	0.00	0.01	3
ALFR	0.15	8.98	8.28	22.43	86.6	0.0	0.00	0.8	0.0149	38.1	9.10	32.5	1.345	0.013	0.005	0.003	5.00	1100	70	0.00	0.14	0.49	0.07	0.07	0.00	4
AMIE	0.84	4.70	7.97	19.06	109.9	11.9	5.70	1.1	0.1180	0.0	3.33	25.0	0.975	0.023	0.012	0.002	1.00	300	15	0.00	0.00	0.00	0.03	0.12	0.01	4
ASHF	0.21	5.77	7.09	18.63	79.6	8.7	10.54	0.6	0.0081	41.4	25.33	66.7	1.700	0.007	0.023	0.003	4.00	400	90	0.05	0.45	0.18	0.27	0.09	0.01	6
AUST	0.08	0.39	4.95	13.50	11.8	5.0	9.04	0.0	*	0.0	40.00	15.0	2.300	0.010	0.005	0.000	6.00	1200	100	0.15	0.15	0.00	0.10	0.80	0.05	5
BALD	0.29	0.61	7.02	17.48	95.4	30.0	23.73	0.0	0.1206	18.0	3.95	380.0	3.550	0.515	0.003	0.003	6.00	1000	50	0.10	0.40	0.00	0.00	0.03	0.00	3
BALL	0.21	0.41	7.00	18.38	52.8	1.3	0.13	0.0	0.0484	6.5	1.20	410.0	1.800	0.185	0.002	0.000	20.00	2000	90	0.05	0.09	0.00	0.36	0.45	0.00	4
BALP	3.28	0.12	7.20	20.75	95.5	0.6	1.24	1.8	0.2050	2.4	4.30	42.5	0.760	0.015	0.012	0.002	5.00	1600	2	0.00	0.02	0.00	0.00	0.00	0.00	1
BAMD	0.10	0.62	7.63	17.37	96.7	30.0	33.56	0.0	0.1656	2.7	2.05	240.0	2.700	1.165	0.025	0.009	1.00	1000	100	1.00	0.00	0.00	0.10	0.10	0.00	3
BAML	1.99	1.01	8.60	20.45	94.7	0.0	0.00	1.0	0.1416	0.0	18.63	191.3	2.525	0.730	0.328	0.000	40.10	2362	5	0.00	0.01	0.00	0.05	0.00	0.00	3
BAMW	0.04	0.62	7.99	15.90	111.0	40.0	3.28	0.0	0.0634	35.0	1.10	730.0	3.000	1.600	0.006	0.004	1.00	1000	100	1.00	0.00	0.00	0.05	0.00	0.00	2
BANG	0.12	0.75	5.64	21.30	88.5	41.3	40.18	0.0	0.0599	39.4	1.80	675.0	3.600	0.020	0.011	0.006	38.00	2500	90	0.00	0.81	0.00	0.05	0.18	0.00	3
BARL	1.19	5.46	9.20	19.99	130.5	0.0	0.00	0.1	1.0288	6.1	10.43	317.5	6.075	0.500	0.264	0.049	35.70	2322	29	0.01	0.01	0.00	0.03	0.00	0.23	4
BARS	0.99	11.24	8.52	20.70	112.9	22.5	15.01	0.4	0.3540	30.5	5.88	140.0	9.250	0.618	0.068	0.002	23.00	1773	89	0.00	0.00	0.00	0.04	0.45	0.36	3
BAYS	0.62	1.05	8.71	21.76	121.0	0.0	0.00	1.3	0.9482	5.0	12.60	67.5	7.875	0.720	0.135	0.008	4.00	1000	15	0.01	0.04	0.00	0.08	0.06	0.01	5
BEEL	1.55	9.36	8.81	19.89	102.1	2.0	0.43	0.8	0.0500	7.0	3.53	55.0	3.950	0.033	0.023	0.004	39.60	2375	17	0.00	0.01	0.00	0.00	0.00	0.00	2
BEEN	0.44	3.82	8.84	18.88	123.2	29.0	192.52	0.0	0.2335	16.4	2.45	50.0	2.450	0.020	0.009	0.004	3.00	600	10	0.03	0.02	0.00	0.03	0.04	0.00	4
BEES	0.18	0.42	7.31	15.22	50.4	33.0	11.01	0.0	0.1356	50.0	19.75	195.0	1.700	0.150	0.005	0.003	4.00	800	75	0.15	0.04	0.00	0.68	0.00	0.00	3
BELM	6.04	0.76	8.90	20.48	109.1	2.5	13.16	0.1	0.0063	0.7	8.68	12.5	1.158	0.055	0.021	0.001	2.00	500	0	0.00	0.00	0.00	0.00	0.00	0.00	0
BENG	0.27	0.21	6.99	15.90	87.5	27.8	0.92	0.5	0.1147	15.6	2.85	97.5	1.250	0.620	0.003	0.001	16.00	1600	75	0.56	0.19	0.00	0.00	0.00	0.00	2
BIBR	1.90	0.52	8.86	19.19	109.8	0.0	0.00	0.0	0.1897	0.0	8.18	56.3	4.825	0.233	0.082	0.008	135.00	6670	5	0.00	0.01	0.00	0.03	0.02	0.00	4
BIGC	1.01	0.38	8.12	19.74	92.1	4.9	9.39	1.4	0.0307	25.6	0.68	26.3	0.685	0.010	0.008	0.002	20.00	1900	60	0.03	0.48	0.00	0.12	0.09	0.00	4
BIND	0.05	1.45	8.27	17.00	96.5	5.0	0.27	0.0	0.1716	42.5	97.00	180.0	2.200	0.290	0.009	0.003	1.00	400	90	0.81	0.00	0.00	0.00	0.09	0.00	2
BLAC	1.49	0.48	6.73	19.54	69.4	0.0	0.00	0.9	0.0571	0.0	0.43	675.0	3.250	11.750	0.004	0.000	14.60	1759	64	0.00	0.00	0.00	0.51	0.10	0.03	3
BLAL	0.71	26.58	8.86	24.25	126.7	33.8	26.13	1.0	0.0235	185.0	1.05	127.5	2.725	0.240	0.025	0.001	60.00	3800	10	0.00	0.03	0.04	0.03	0.01	0.01	5
BLUE	1.62	0.43	8.80	19.96	121.6	0.6	14.22	0.6	0.1814	3.9	2.75	50.0	1.408	0.390	0.208	0.012	7.00	2500	15	0.04	0.02	0.00	0.00	0.00	0.11	3
BLYT	0.91	9.79	9.01	20.93	108.1	4.3	12.17	0.0	0.6539	19.3	2.60	108.3	2.623	1.120	0.030	0.002	10.00	1600	15	0.03	0.02	0.00	0.11	0.03	0.00	5

Code	Augb	Balg	Bbar	Bbid	Bfop	Btnh	Bwst	Coot	Crew	Dart	Dumo	Exot	Fred	Gcgb	Grec	Grte	Gytl	Hard	Hhgb	Libc	Ligd	Litb	Lpic	Mand	Musd	Pabd	Pead	Pusn	Rcap	Rkdo	Rnhn	Saci	Shel	Shov	Snki	Spck	Swan	Wfhn
Rons	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Rosa	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spec	0	0	0	0	0	0	0	1	0	8	0	0	0	0	0	0	2	0	3	5	0	0	0	0	1	4	1	0	0	0	12	7	0	0	0	0	2	0
Star	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Swan	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Talb	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tang	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thol	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	7	0
Thom	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Thos	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wall	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Wann	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4	0
Wart	3	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	1	1	0	0	0	5	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Wcor	0	0	0	0	0	0	0	0	0	5	0	0	0	0	20	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Weeb	3	0	0	0	0	0	0	4	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Whit	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wigi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilc	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Wils	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Wrig	1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	5	0	0	0	0	0	0	1	1	0	0	0	0
Yang	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0
Youn	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yund	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3	0

Appendix 5 Physical, chemical and morphological features of each wetland. Mean values are presented for variables measured on more than one occasion (Geometry types: St, Straight; Si, Sinuous; An, Anastomosing; Ir, Irregular; Li, Linear; El, Elongate; Ov, Ovoid; Ro, Round; Semeniuk Consanguineous wetland suites: q, Quindalup; s, Spearwood; y, Yoongarillup; sb, Spearwood/Bassendean; b, Bassendean; bp, Bassendean/Pinjarra; p, Pinjarra; e, estuarine; r, riverine; dp, Dandaragan Plateau; dpd, Dandaragan/Darling Plateau; d, Darling Plateau), * indicates missing data, refer to Table 4.1 for units of measurement. See Appendix 1 for wetland names. Note that Grass (%) etc. are expressed as proportional cover instead of percentage cover.

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
ABER	0.62	0.30	7.44	19.26	96.8	0.0	0.00	2.0	0.0461	2.0	7.10	76.7	0.970	0.060	0.003	0.001	0.50	1000	30	0.30	0.00	0.00	0.00	0.00	0.00	1
ADEN	0.21	1.44	7.50	16.20	92.5	0.0	0.00	0.2	0.0039	39.2	3.63	96.7	1.957	0.093	0.003	0.001	5.00	1200	30	0.06	0.18	0.00	0.03	0.03	0.00	4
AIPS	0.77	0.33	6.78	15.81	41.6	13.3	5.35	1.4	0.2967	12.3	4.53	170.0	1.418	0.103	0.027	0.004	16.00	3400	80	0.01	0.01	0.00	0.32	0.64	0.01	5
AIRD	0.19	0.53	6.90	15.40	78.6	14.0	17.64	0.6	0.0072	10.0	2.75	500.0	2.150	0.470	0.001	0.005	0.75	1000	40	0.04	0.00	0.00	0.36	0.00	0.00	2
ALCO	4.65	0.88	8.67	21.11	112.6	3.5	34.06	0.5	0.0003	3.6	4.95	36.3	1.203	0.015	0.022	0.000	15.10	1497	5	0.01	0.02	0.00	0.03	0.00	0.00	3
ALEX	3.50	11.29	7.81	17.93	90.3	0.0	0.00	1.3	0.0007	0.8	4.65	27.5	0.965	0.033	0.005	0.003	5.00	1000	5	0.00	0.04	0.00	0.02	0.00	0.01	3
ALFR	0.15	8.98	8.28	22.43	86.6	0.0	0.00	0.8	0.0149	38.1	9.10	32.5	1.345	0.013	0.005	0.003	5.00	1100	70	0.00	0.14	0.49	0.07	0.07	0.00	4
AMIE	0.84	4.70	7.97	19.06	109.9	11.9	5.70	1.1	0.1180	0.0	3.33	25.0	0.975	0.023	0.012	0.002	1.00	300	15	0.00	0.00	0.00	0.03	0.12	0.01	4
ASHF	0.21	5.77	7.09	18.63	79.6	8.7	10.54	0.6	0.0081	41.4	25.33	66.7	1.700	0.007	0.023	0.003	4.00	400	90	0.05	0.45	0.18	0.27	0.09	0.01	6
AUST	0.08	0.39	4.95	13.50	11.8	5.0	9.04	0.0	*	0.0	40.00	15.0	2.300	0.010	0.005	0.000	6.00	1200	100	0.15	0.15	0.00	0.10	0.80	0.05	5
BALD	0.29	0.61	7.02	17.48	95.4	30.0	23.73	0.0	0.1206	18.0	3.95	380.0	3.550	0.515	0.003	0.003	6.00	1000	50	0.10	0.40	0.00	0.00	0.03	0.00	3
BALL	0.21	0.41	7.00	18.38	52.8	1.3	0.13	0.0	0.0484	6.5	1.20	410.0	1.800	0.185	0.002	0.000	20.00	2000	90	0.05	0.09	0.00	0.36	0.45	0.00	4
BALP	3.28	0.12	7.20	20.75	95.5	0.6	1.24	1.8	0.2050	2.4	4.30	42.5	0.760	0.015	0.012	0.002	5.00	1600	2	0.00	0.02	0.00	0.00	0.00	0.00	1
BAMD	0.10	0.62	7.63	17.37	96.7	30.0	33.56	0.0	0.1656	2.7	2.05	240.0	2.700	1.165	0.025	0.009	1.00	1000	100	1.00	0.00	0.00	0.10	0.10	0.00	3
BAML	1.99	1.01	8.60	20.45	94.7	0.0	0.00	1.0	0.1416	0.0	18.63	191.3	2.525	0.730	0.328	0.000	40.10	2362	5	0.00	0.01	0.00	0.05	0.00	0.00	3
BAMW	0.04	0.62	7.99	15.90	111.0	40.0	3.28	0.0	0.0634	35.0	1.10	730.0	3.000	1.600	0.006	0.004	1.00	1000	100	1.00	0.00	0.00	0.05	0.00	0.00	2
BANG	0.12	0.75	5.64	21.30	88.5	41.3	40.18	0.0	0.0599	39.4	1.80	675.0	3.600	0.020	0.011	0.006	38.00	2500	90	0.00	0.81	0.00	0.05	0.18	0.00	3
BARL	1.19	5.46	9.20	19.99	130.5	0.0	0.00	0.1	1.0288	6.1	10.43	317.5	6.075	0.500	0.264	0.049	35.70	2322	29	0.01	0.01	0.00	0.03	0.00	0.23	4
BARS	0.99	11.24	8.52	20.70	112.9	22.5	15.01	0.4	0.3540	30.5	5.88	140.0	9.250	0.618	0.068	0.002	23.00	1773	89	0.00	0.00	0.00	0.04	0.45	0.36	3
BAYS	0.62	1.05	8.71	21.76	121.0	0.0	0.00	1.3	0.9482	5.0	12.60	67.5	7.875	0.720	0.135	0.008	4.00	1000	15	0.01	0.04	0.00	0.08	0.06	0.01	5
BEEL	1.55	9.36	8.81	19.89	102.1	2.0	0.43	0.8	0.0500	7.0	3.53	55.0	3.950	0.033	0.023	0.004	39.60	2375	17	0.00	0.01	0.00	0.00	0.00	0.00	2
BEEN	0.44	3.82	8.84	18.88	123.2	29.0	192.52	0.0	0.2335	16.4	2.45	50.0	2.450	0.020	0.009	0.004	3.00	600	10	0.03	0.02	0.00	0.03	0.04	0.00	4
BEES	0.18	0.42	7.31	15.22	50.4	33.0	11.01	0.0	0.1356	50.0	19.75	195.0	1.700	0.150	0.005	0.003	4.00	800	75	0.15	0.04	0.00	0.68	0.00	0.00	3
BELM	6.04	0.76	8.90	20.48	109.1	2.5	13.16	0.1	0.0063	0.7	8.68	12.5	1.158	0.055	0.021	0.001	2.00	500	0	0.00	0.00	0.00	0.00	0.00	0.00	0
BENG	0.27	0.21	6.99	15.90	87.5	27.8	0.92	0.5	0.1147	15.6	2.85	97.5	1.250	0.620	0.003	0.001	16.00	1600	75	0.56	0.19	0.00	0.00	0.00	0.00	2
BIBR	1.90	0.52	8.86	19.19	109.8	0.0	0.00	0.0	0.1897	0.0	8.18	56.3	4.825	0.233	0.082	0.008	135.00	6670	5	0.00	0.01	0.00	0.03	0.02	0.00	4
BIGC	1.01	0.38	8.12	19.74	92.1	4.9	9.39	1.4	0.0307	25.6	0.68	26.3	0.685	0.010	0.008	0.002	20.00	1900	60	0.03	0.48	0.00	0.12	0.09	0.00	4
BIND	0.05	1.45	8.27	17.00	96.5	5.0	0.27	0.0	0.1716	42.5	97.00	180.0	2.200	0.290	0.009	0.003	1.00	400	90	0.81	0.00	0.00	0.00	0.09	0.00	2
BLAC	1.49	0.48	6.73	19.54	69.4	0.0	0.00	0.9	0.0571	0.0	0.43	675.0	3.250	11.750	0.004	0.000	14.60	1759	64	0.00	0.00	0.00	0.51	0.10	0.03	3
BLAL	0.71	26.58	8.86	24.25	126.7	33.8	26.13	1.0	0.0235	185.0	1.05	127.5	2.725	0.240	0.025	0.001	60.00	3800	10	0.00	0.03	0.04	0.03	0.01	0.01	5
BLUE	1.62	0.43	8.80	19.96	121.6	0.6	14.22	0.6	0.1814	3.9	2.75	50.0	1.408	0.390	0.208	0.012	7.00	2500	15	0.04	0.02	0.00	0.00	0.00	0.11	3
BLYT	0.91	9.79	9.01	20.93	108.1	4.3	12.17	0.0	0.6539	19.3	2.60	108.3	2.623	1.120	0.030	0.002	10.00	1600	15	0.03	0.02	0.00	0.11	0.03	0.00	5

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
BODK	0.20	6.88	7.29	20.33	97.1	9.3	27.23	0.1	0.0743	32.1	4.17	68.3	1.377	0.010	0.006	0.000	5.00	1200	50	0.10	0.40	0.05	0.05	0.00	0.00	3
BOGG	0.06	16.37	8.51	16.57	111.0	26.7	3.75	0.0	0.1592	56.7	2.20	55.0	1.200	0.045	0.022	0.006	4.00	600	70	0.04	0.07	0.49	0.04	0.11	0.01	6
BOOG	1.48	0.73	7.54	18.98	72.0	14.4	18.49	1.4	0.0415	0.0	1.33	67.5	2.555	4.200	0.010	0.007	13.00	3200	40	0.00	0.02	0.00	0.04	0.36	0.00	3
BRO2	0.49	0.14	8.14	21.93	120.4	39.2	51.34	0.3	0.1718	27.8	6.23	176.7	3.367	0.157	0.070	0.026	4.00	800	90	0.90	0.00	0.00	0.00	0.02	0.00	2
BULL	0.86	9.21	7.17	21.69	87.5	0.0	0.00	1.1	*	8.9	6.95	40.0	0.820	0.028	0.006	0.002	3.00	800	10	0.00	0.04	0.00	0.01	0.05	0.00	4
CAMP	0.20	0.14	8.67	16.90	126.1	93.8	135.00	0.0	0.0499	62.5	6.00	135.0	2.950	1.450	0.006	0.008	6.00	1400	100	0.90	0.05	0.00	0.05	0.10	0.00	4
CANC	1.08	0.52	8.58	20.11	114.5	32.6	40.56	0.5	0.0330	2.6	5.93	71.3	1.168	0.068	0.006	0.001	1.00	300	30	0.00	0.30	0.00	0.00	0.00	0.00	1
CANF	1.21	0.44	7.21	18.08	76.3	0.0	0.00	1.1	0.0033	0.0	4.28	63.8	1.180	0.050	0.004	0.001	2.00	1080	10	0.02	0.02	0.00	0.00	0.08	0.00	3
CANW	0.31	11.96	7.80	17.12	108.7	8.5	33.59	0.7	0.2327	20.2	4.27	88.3	1.833	0.073	0.006	0.001	5.00	1200	85	0.09	0.77	0.09	0.02	0.00	0.00	4
CARA	3.85	0.63	8.04	19.28	81.9	3.6	11.75	1.6	0.1497	2.3	1.50	66.3	1.270	0.075	0.031	0.006	60.00	4000	40	0.00	0.28	0.00	0.08	0.12	0.00	4
CARE	1.00	0.45	8.34	18.78	81.1	1.9	16.51	1.3	0.2811	4.6	14.65	17.5	1.165	0.165	0.107	0.000	1.00	400	15	0.00	0.15	0.00	0.00	0.00	0.00	1
CARI	0.34	3.55	8.74	22.64	131.6	0.0	0.00	1.7	0.1809	2.8	8.53	91.3	2.250	0.115	0.008	0.004	0.40	1000	10	0.01	0.10	0.00	0.00	0.00	0.00	2
CARR	0.34	0.36	8.62	20.54	120.6	36.0	24.95	0.0	0.9971	3.2	1.80	80.0	1.550	0.075	0.003	0.000	0.20	340	90	0.90	0.00	0.00	0.00	0.00	0.00	0
CARS	0.58	4.59	8.01	18.65	63.0	20.8	32.71	0.0	0.2780	7.5	1.63	360.0	15.133	6.170	0.666	0.341	8.00	1200	80	0.08	0.04	0.00	0.20	0.64	0.04	5
CHAS	0.68	0.92	7.23	21.10	83.2	16.9	14.56	1.0	0.1731	67.2	5.53	332.5	2.000	0.548	0.027	0.008	109.00	4000	82	0.08	0.08	0.00	0.33	0.33	0.01	5
CHIT	0.63	4.06	7.82	17.73	96.1	33.3	54.65	1.0	0.0253	18.3	3.40	42.5	2.050	0.010	0.005	0.000	143.00	8700	56	0.00	0.00	0.00	0.22	0.34	0.03	3
CLAR	0.97	3.61	9.16	21.61	113.3	2.9	34.73	0.1	1.6446	14.6	21.70	128.3	7.200	0.283	0.111	0.016	18.00	2400	45	0.02	0.32	0.00	0.05	0.05	0.09	5
CLIB	1.08	0.24	7.48	17.54	90.8	0.0	0.00	1.0	0.0085	2.0	16.58	100.0	1.158	0.085	0.007	0.004	0.50	500	10	0.10	0.00	0.00	0.00	0.00	0.00	1
CLIS	0.56	0.42	7.37	18.88	76.3	1.7	1.58	0.8	0.0833	26.7	10.20	173.3	2.000	0.090	0.019	0.004	45.00	3600	90	0.05	0.05	0.00	0.81	0.00	0.00	3
COD1	0.22	0.36	7.57	18.76	99.8	32.2	17.91	0.6	0.0269	3.6	0.60	245.0	1.100	0.020	0.002	0.000	0.20	1000	100	1.00	0.00	0.00	0.00	0.00	0.00	1
COD2	0.52	0.11	7.15	18.21	94.4	2.5	0.07	0.8	0.0008	1.8	20.38	21.3	0.633	0.010	0.003	0.001	0.30	1000	10	0.10	0.00	0.00	0.00	0.00	0.00	1
COO1	0.15	0.47	7.51	14.13	62.4	8.8	15.11	0.0	0.0418	40.0	1.00	795.0	4.300	2.800	0.016	0.002	5.00	1200	80	0.56	0.08	0.00	0.08	0.01	0.00	4
COO2	0.11	0.35	6.50	15.38	33.3	12.5	2.61	0.0	0.0655	21.3	0.60	905.0	2.500	1.380	0.012	0.008	0.25	200	100	0.60	0.30	0.00	0.10	0.00	0.00	3
COO3	0.04	0.52	7.15	12.40	28.7	26.7	6.77	0.0	0.2168	20.0	1.50	885.0	5.950	5.950	0.004	0.001	0.02	60	100	0.90	0.05	0.00	0.05	0.00	0.00	3
COOC	1.59	1.99	7.29	17.00	86.3	0.0	0.00	1.1	0.0532	0.2	1.25	27.5	0.588	0.015	0.002	0.000	1.00	1000	10	0.02	0.02	0.00	0.02	0.06	0.00	4
COOD	0.28	1.58	8.10	20.30	130.6	5.7	32.32	0.4	0.0828	2.0	9.00	106.3	1.600	0.118	0.010	0.003	1.00	1000	0	0.00	0.00	0.00	0.00	0.00	0.00	0
COOG	0.52	0.73	7.96	19.42	109.1	41.8	38.48	0.2	0.4345	14.3	2.05	125.0	2.250	0.260	0.008	0.000	2.50	700	70	0.07	0.56	0.00	0.07	0.14	0.01	5
COOO	0.33	6.18	8.88	17.80	79.5	18.7	0.27	0.0	0.0631	391.4	1.13	11.7	3.800	0.010	0.007	0.001	720.00	7000	5	0.01	0.05	0.00	0.00	0.00	0.00	2
COOS	0.76	11.58	8.32	20.89	96.9	0.0	0.00	0.3	0.0617	23.8	2.23	1266.7	3.653	0.190	0.027	0.021	12.00	1200	15	0.00	0.05	0.00	0.03	0.12	0.00	3
COPO	0.65	0.57	7.82	19.16	102.4	0.0	0.00	0.1	0.1653	7.0	3.33	446.7	12.067	4.033	0.067	0.003	2.50	500	3	0.01	0.00	0.00	0.02	0.00	0.00	2
COR1	0.16	0.37	8.19	17.55	126.5	72.5	51.14	0.0	0.0868	112.5	2.95	190.0	1.900	0.090	0.007	0.008	6.00	1000	100	0.90	0.20	0.00	0.05	0.00	0.00	3
COR2	0.17	0.24	7.23	16.80	96.8	61.3	27.57	0.0	0.1280	66.3	1.55	750.0	4.000	0.155	0.004	0.003	6.00	1000	100	0.95	0.10	0.00	0.05	0.00	0.00	2
COR3	0.43	0.45	6.59	18.55	81.7	38.3	20.75	0.3	0.2417	26.7	2.67	820.0	3.600	0.283	0.072	0.004	1.50	700	100	0.90	0.10	0.00	0.05	0.01	0.00	4
CORX	0.75	0.25	7.27	18.13	89.4	0.0	0.00	1.0	0.0051	4.4	12.80	116.3	1.425	0.070	0.008	0.003	0.75	1000	10	0.10	0.00	0.00	0.00	0.00	0.00	1
COWA	1.11	3.96	7.71	17.98	85.8	0.0	0.00	1.4	0.0248	1.9	8.05	46.3	0.948	0.010	0.005	0.003	0.50	280	30	0.06	0.06	0.00	0.06	0.12	0.00	4
CRAG	0.24	0.98	7.85	20.63	112.3	0.4	0.13	1.1	0.1132	16.9	13.10	140.0	2.725	0.108	0.063	0.008	0.10	90	5	0.01	0.00	0.00	0.05	0.00	0.00	2

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/ rush (%)	Samph. (%)	Shrub/ bush (%)	Tree (%)	Dead tree (%)	Veg. types
CRAM	1.26	0.12	6.80	18.64	85.3	0.0	0.00	0.1	0.0008	9.4	10.35	21.3	0.433	0.020	0.001	0.001	0.75	300	25	0.04	0.20	0.00	0.01	0.00	0.00	3
CREA	2.32	1.85	7.14	17.93	77.4	0.0	0.00	1.1	*	0.0	1.53	16.3	0.620	0.010	0.002	0.001	2.00	2000	5	0.00	0.02	0.00	0.01	0.03	0.00	4
CULC	0.24	6.16	8.83	21.75	96.5	45.3	86.05	0.0	0.1216	65.6	0.70	55.0	1.320	0.010	0.001	0.000	20.00	3000	95	0.90	0.10	0.00	0.10	0.02	0.00	4
CURT	1.54	0.14	7.05	20.51	94.8	0.0	0.00	1.3	0.0020	2.5	0.60	10.0	1.293	0.005	0.004	0.000	0.75	350	5	0.05	0.01	0.00	0.00	0.00	0.00	3
DEEP	0.65	2.36	7.86	20.57	76.1	0.7	0.08	0.3	0.0798	34.6	0.33	3146.7	3.353	3.143	0.009	0.002	6.00	900	15	0.00	0.02	0.00	0.14	0.00	0.00	2
DEVI	0.89	0.29	6.60	16.65	46.3	0.3	0.07	1.9	0.1693	1.9	1.23	680.0	2.850	0.730	0.100	0.000	3.12	900	75	0.00	0.04	0.00	0.11	0.56	0.01	4
DIAM	4.35	1.95	7.98	19.01	104.9	0.0	0.00	1.3	0.0078	0.0	2.55	90.0	0.953	0.040	0.008	0.001	1.00	500	5	0.00	0.05	0.00	0.01	0.02	0.00	4
DILS	0.42	0.89	6.59	17.75	63.0	5.0	0.09	0.5	0.1327	0.0	1.67	168.3	1.867	0.023	0.006	0.001	3.50	900	45	0.00	0.00	0.00	0.07	0.41	0.00	2
DUCK	0.60	0.64	7.33	23.25	108.1	0.0	0.00	1.3	0.0136	4.7	18.50	300.0	2.025	0.178	0.015	0.006	1.00	1000	1	0.01	0.01	0.00	0.00	0.00	0.00	2
EAGL	3.05	0.18	6.40	18.93	89.9	3.9	123.19	1.0	0.0321	0.0	1.98	13.8	0.330	0.008	0.002	0.001	0.75	300	30	0.00	0.21	0.00	0.08	0.03	0.00	3
EAST	0.33	0.56	7.04	23.18	78.6	0.4	4.61	1.0	0.0256	25.0	1.83	321.7	5.000	0.243	0.015	0.008	12.00	1400	15	0.00	0.03	0.00	0.02	0.11	0.00	3
ELLE	0.23	0.05	6.81	19.05	108.5	5.0	0.53	0.0	*	100.0	6.00	29.0	0.490	0.035	0.002	0.000	10.00	1200	95	0.05	0.05	0.00	0.90	0.00	0.00	3
EVER	0.35	0.98	8.51	20.18	101.5	53.3	62.64	0.7	0.0281	210.8	1.13	350.0	3.433	0.043	0.017	0.006	5.00	900	90	0.90	0.05	0.00	0.05	0.00	0.00	3
FIGI	0.12	1.31	7.58	19.23	101.8	63.8	43.52	0.0	0.0709	38.8	2.45	290.0	1.900	0.520	0.007	0.000	0.80	480	80	0.72	0.00	0.00	0.08	0.00	0.00	2
FIS1	0.98	0.70	8.39	21.81	126.5	19.3	32.86	0.0	0.2730	11.0	5.40	101.7	2.433	0.097	0.046	0.009	1.50	450	20	0.20	0.00	0.00	0.00	0.00	0.00	1
FIS2	0.29	0.16	7.89	20.05	110.3	20.0	56.62	0.3	0.0859	26.5	1.00	200.0	2.850	1.630	0.019	0.009	2.00	600	100	1.00	0.00	0.00	0.00	0.00	0.00	1
FIS3	0.24	0.12	7.18	18.10	82.6	42.5	76.80	0.0	0.4701	13.1	1.15	385.0	2.100	5.050	0.004	0.011	0.75	300	70	0.70	0.00	0.00	0.00	0.00	0.00	1
FIS4	0.31	0.82	7.36	19.25	95.7	26.8	14.02	0.2	0.5699	55.0	1.60	140.0	5.167	1.190	0.057	0.006	1.50	500	5	0.01	0.03	0.00	0.01	0.00	0.00	3
FISS	0.27	0.16	6.73	16.05	56.4	78.8	36.56	0.0	0.1091	13.0	0.70	240.0	2.100	0.740	0.004	0.000	0.75	300	90	0.09	0.00	0.00	0.81	0.05	0.00	3
FOLM	0.46	0.91	7.56	20.84	82.4	0.0	0.00	1.4	0.0533	0.7	16.48	173.8	1.795	0.220	0.020	0.005	1.70	1000	1	0.00	0.01	0.00	0.00	0.00	0.00	2
FOLP	0.81	0.53	7.23	19.27	68.0	7.1	13.72	1.7	0.0027	4.4	13.13	213.3	1.810	0.283	0.012	0.005	2.00	750	30	0.00	0.09	0.00	0.03	0.18	0.00	3
FOOT	1.70	12.86	8.46	20.18	92.9	28.1	42.50	0.8	0.0477	9.8	1.00	97.5	3.025	0.018	0.014	0.002	17.50	2926	85	0.00	0.09	0.00	0.77	0.00	0.04	3
FORL	0.35	0.18	7.37	16.50	91.6	18.4	18.96	0.0	0.2038	36.0	1.25	475.0	2.950	1.350	0.003	0.003	9.00	1200	100	1.00	0.00	0.00	0.00	0.05	0.00	2
FORR	0.36	3.84	9.42	22.28	138.9	50.0	56.99	0.2	0.0961	85.0	6.30	92.5	3.550	0.085	0.005	0.002	248.00	7000	15	0.01	0.11	0.00	0.01	0.05	0.00	4
FORT	0.28	0.20	6.62	15.56	74.5	11.0	68.29	0.0	0.0401	8.4	0.80	395.0	1.500	0.120	0.002	0.009	2.00	600	60	0.12	0.48	0.00	0.00	0.01	0.00	3
FREE	0.73	0.59	8.34	20.39	99.3	11.9	30.94	2.3	0.0133	0.0	1.10	17.5	0.543	0.005	0.009	0.001	0.25	220	20	0.00	0.20	0.00	0.02	0.02	0.00	3
FREM	0.67	0.33	7.03	18.18	76.8	0.0	0.00	1.0	0.0063	0.0	5.68	172.5	1.773	0.140	0.004	0.001	1.00	1000	10	0.03	0.03	0.00	0.03	0.03	0.01	5
GANS	1.38	0.71	8.12	19.04	84.4	21.4	47.64	1.6	0.2548	2.8	4.08	78.8	1.623	0.098	0.013	0.004	0.30	260	5	0.05	0.01	0.00	0.00	0.00	0.00	4
GANY	0.62	1.12	7.77	18.44	95.6	5.1	11.05	1.4	0.0809	9.0	11.15	70.0	2.000	0.055	0.059	0.008	1.00	400	80	0.16	0.64	0.00	0.16	0.24	0.04	5
GIB1	0.31	0.20	6.68	14.83	77.0	66.3	96.33	0.0	0.1599	18.8	0.90	235.0	2.200	1.855	0.003	0.003	0.25	150	100	1.00	0.00	0.00	0.05	0.00	0.00	2
GIB2	0.45	0.78	7.04	21.43	91.3	3.0	9.98	0.2	0.1459	18.3	5.57	163.3	4.263	0.317	0.083	0.028	2.00	500	20	0.16	0.00	0.00	0.04	0.00	0.00	2
GIBA	0.27	1.95	5.07	18.08	88.3	0.2	0.11	0.0	0.0686	19.8	5.05	385.0	2.250	0.070	0.004	0.005	1.50	450	35	0.07	0.07	0.00	0.11	0.18	0.00	4
GIBB	0.32	0.15	6.96	17.83	66.4	1.3	15.95	0.3	0.1626	15.0	1.40	360.0	1.900	0.640	0.006	0.000	6.00	800	90	0.05	0.05	0.00	0.05	0.81	0.00	4
GIN1	0.67	0.25	6.66	18.32	64.9	10.3	25.80	0.0	0.3714	17.0	0.95	770.0	3.300	3.750	0.002	0.007	2.00	600	75	0.15	0.11	0.00	0.04	0.45	0.00	4
GIN2	0.45	0.40	7.02	19.19	69.1	8.0	12.71	0.0	0.2123	5.3	2.27	906.7	2.900	1.523	0.094	0.035	0.70	300	50	0.03	0.01	0.00	0.10	0.35	0.00	4
GIN3	0.03	0.65	6.72	8.50	56.0	0.0	0.00	0.0	*	0.0	*	*	*	*	*	*	5.00	600	100	0.10	0.90	0.00	0.10	0.80	0.02	5

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
GIN4	0.67	1.49	7.72	18.57	61.4	6.3	3.26	0.0	0.3200	7.0	0.93	490.0	6.875	10.575	0.028	0.008	1.00	400	80	0.12	0.04	0.00	0.72	0.01	0.00	4
GIN5	0.92	0.31	7.88	18.98	90.5	9.4	0.67	0.0	0.1380	5.5	3.55	267.5	3.750	0.025	0.080	0.002	4.00	800	10	0.03	0.09	0.00	0.00	0.00	0.00	2
GINE	0.72	0.89	7.69	16.68	63.8	5.9	9.04	0.8	0.0118	3.8	2.53	166.3	1.113	0.228	0.006	0.003	0.50	300	60	0.06	0.03	0.00	0.06	0.48	0.00	4
GINJ	0.50	0.96	7.07	20.44	52.5	0.0	0.00	0.2	0.0302	8.5	0.37	963.3	3.067	0.367	0.002	0.000	6.00	1200	40	0.00	0.04	0.00	0.08	0.32	0.00	3
GINL	1.37	1.16	7.65	20.16	81.7	5.0	4.71	1.8	0.0602	6.9	3.80	930.0	2.700	0.400	0.009	0.003	18.00	1500	10	0.00	0.03	0.00	0.02	0.08	0.01	4
GINN	0.73	4.52	8.11	17.40	100.5	26.8	37.12	0.5	0.1064	28.5	39.00	60.0	1.420	0.020	0.012	0.003	0.50	1000	5	0.05	0.00	0.00	0.00	0.00	0.00	1
GLOV	0.67	4.03	7.62	16.50	87.3	0.5	15.64	0.7	0.0114	0.0	17.00	115.0	1.590	0.030	0.008	0.003	0.75	1000	75	0.11	0.00	0.00	0.68	0.00	0.00	2
GNAL	0.61	0.68	3.59	19.78	94.0	0.0	0.00	0.0	0.0245	40.0	0.55	7.5	4.120	0.005	0.001	0.000	110.00	3800	10	0.01	0.09	0.00	0.01	0.01	0.00	4
GNAR	0.12	0.64	7.12	20.13	27.2	3.3	14.01	0.0	1.7792	200.0	1.70	300.0	3.200	0.300	0.003	0.000	12.00	1400	80	0.56	0.24	0.00	0.01	0.00	0.00	2
GOBB	2.02	0.29	7.30	21.06	46.9	1.3	10.45	1.5	0.0000	0.0	2.13	61.3	1.325	0.048	0.018	0.003	1.00	300	20	0.01	0.19	0.00	0.00	0.01	0.00	5
GOEG	0.08	3.03	7.50	15.45	82.8	0.0	0.00	1.0	0.0382	50.0	3.75	185.0	1.700	0.180	0.003	0.000	2.00	1200	95	0.05	0.29	0.67	0.10	0.05	0.00	5
GOLD	1.61	1.83	8.98	18.11	108.1	14.3	23.57	0.3	0.0188	7.6	3.00	21.7	1.800	0.033	0.024	0.000	0.50	250	0	0.00	0.00	0.00	0.00	0.00	0.00	0
GOOD	1.01	0.76	5.38	19.39	66.2	0.1	0.07	0.8	0.0405	2.3	0.45	962.5	2.875	0.408	0.004	0.001	10.00	1400	15	0.00	0.03	0.00	0.03	0.08	0.02	4
GOOL	1.53	0.44	8.16	20.93	105.1	3.3	4.08	2.1	0.0398	0.0	5.98	35.0	1.283	0.028	0.022	0.001	60.00	3400	60	0.06	0.54	0.00	0.06	0.06	0.01	5
GOSS	0.37	0.58	8.83	17.13	120.3	62.5	107.19	0.0	0.0946	10.8	3.95	155.0	1.505	0.140	0.002	0.000	1.25	600	100	0.95	0.00	0.00	0.20	0.00	0.00	2
GOYA	0.70	5.64	7.62	17.04	82.2	0.0	0.00	0.6	0.0350	4.6	7.20	33.8	1.955	0.028	0.058	0.004	0.50	1000	75	0.00	0.00	0.00	0.38	0.53	0.00	2
GREE	0.06	2.44	5.67	20.57	97.0	85.0	32.21	0.0	0.0298	137.5	1.35	45.0	1.180	0.010	0.002	0.000	6.00	1400	50	0.00	0.33	0.08	0.15	0.00	0.00	3
GREY	0.19	1.32	7.49	16.70	113.0	82.5	76.20	0.0	0.2106	106.3	4.80	112.5	1.035	0.060	0.003	0.000	16.00	1600	60	0.24	0.00	0.00	0.30	0.06	0.03	4
GUNG	1.49	4.08	7.80	19.21	78.8	0.0	0.00	0.5	0.0100	2.1	12.70	47.5	1.105	0.008	0.005	0.002	0.50	300	10	0.00	0.00	0.00	0.01	0.10	0.00	2
GWEL	2.30	0.30	8.35	18.84	101.5	15.0	9.78	1.9	0.0400	5.1	0.88	11.3	0.745	0.015	0.009	0.001	20.00	2400	20	0.00	0.18	0.00	0.02	0.03	0.00	4
HAR1	0.35	0.18	6.91	16.60	60.5	55.8	14.88	0.0	1.1400	61.3	2.80	300.0	2.350	0.120	0.020	0.002	0.30	250	100	0.50	0.10	0.00	0.40	0.00	0.00	3
HAR2	0.07	15.97	9.18	19.04	141.6	51.0	66.41	0.6	0.0427	44.0	1.25	70.0	1.700	0.015	0.002	0.001	0.75	400	60	0.00	0.12	0.18	0.36	0.00	0.12	4
HAZE	0.89	1.54	8.64	18.54	100.1	0.7	0.08	0.3	0.2609	5.9	15.97	146.7	6.967	0.623	0.289	0.086	4.00	800	2	0.00	0.00	0.00	0.02	0.00	0.00	2
HEBB	0.14	0.66	6.72	13.53	61.7	18.3	0.36	0.0	0.0498	24.9	1.30	860.0	3.400	0.045	0.002	0.000	4.00	800	90	0.05	0.09	0.00	0.09	0.81	0.00	4
HEND	0.41	0.29	7.06	21.29	103.5	0.6	0.07	1.0	0.0704	4.9	4.50	287.5	1.855	0.188	0.020	0.007	0.50	1000	20	0.18	0.02	0.00	0.00	0.00	0.00	2
HERD	12.15	0.68	8.55	20.21	102.8	1.3	13.25	1.3	0.1078	9.4	1.80	32.5	1.200	0.020	0.012	0.003	250.00	8000	80	0.01	0.72	0.00	0.04	0.01	0.00	4
HOLM	0.19	0.59	7.22	18.85	58.4	0.3	0.13	0.0	1.3232	0.0	0.55	290.0	1.550	0.035	0.003	0.000	10.00	1200	100	0.00	0.10	0.00	0.80	0.20	0.00	3
HOPE	0.59	0.97	8.06	21.69	94.8	0.0	0.00	0.1	0.1302	15.2	2.03	180.0	5.200	1.015	0.032	0.004	0.75	300	25	0.20	0.03	0.00	0.03	0.00	0.00	3
HURS	0.56	4.03	8.91	20.27	105.7	0.1	0.06	0.0	0.9610	82.3	9.37	100.0	5.300	0.257	0.184	0.007	55.00	2900	10	0.09	0.00	0.00	0.01	0.01	0.01	5
HYDE	0.75	0.17	8.22	20.98	104.0	0.0	0.00	1.5	0.1421	0.0	2.48	27.5	0.813	0.053	0.017	0.000	2.00	600	30	0.00	0.02	0.00	0.30	0.03	0.00	3
JAME	0.37	0.49	6.80	16.38	17.9	5.0	0.13	0.5	0.3442	0.0	1.00	420.0	3.000	0.315	0.005	0.000	10.00	1500	99	0.00	0.89	0.00	0.05	0.10	0.00	3
JAND	0.97	0.35	7.34	21.51	97.1	2.6	1.75	0.8	0.0486	70.0	2.58	98.8	1.585	0.010	0.006	0.001	230.00	7000	50	0.05	0.45	0.00	0.03	0.03	0.00	4
JOHN	0.40	0.31	6.67	19.88	85.8	21.3	30.82	2.0	0.0026	2.8	2.38	362.5	1.558	0.108	0.006	0.005	0.50	1000	10	0.05	0.05	0.00	0.00	0.00	0.00	2
JOO1	0.97	0.61	8.04	19.68	85.6	3.0	18.69	1.8	0.1771	10.2	2.93	76.7	2.067	0.123	0.006	0.001	8.00	1200	10	0.05	0.02	0.00	0.02	0.01	0.00	4
JOO2	0.73	0.41	8.42	21.61	99.4	0.3	0.08	1.0	0.3593	25.1	12.63	75.0	2.258	0.245	0.116	0.007	20.00	2000	100	0.80	0.10	0.00	0.10	0.20	0.00	4
JOON	2.82	1.01	9.13	19.43	112.3	10.8	19.78	1.4	0.3436	0.4	2.00	32.5	2.800	0.025	0.017	0.001	550.00	12000	20	0.04	0.16	0.00	0.01	0.01	0.00	5

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
JULI	0.82	4.51	7.51	17.40	86.9	0.0	0.00	0.8	0.0422	0.0	2.63	33.8	1.043	0.008	0.008	0.001	0.50	1000	5	0.05	0.00	0.00	0.00	0.00	0.00	2
KARA	0.53	1.33	4.82	20.70	93.3	33.0	23.95	0.0	0.1287	110.0	1.25	137.5	2.200	0.030	0.005	0.001	338.30	7890	10	0.10	0.01	0.00	0.00	0.00	0.00	2
KARD	0.22	0.86	7.85	22.55	111.6	0.8	0.09	1.7	0.6272	4.2	5.10	156.7	2.133	0.110	0.016	0.005	0.50	1000	50	0.00	0.50	0.00	0.00	0.00	0.00	1
KARW	0.10	0.14	6.19	19.23	58.7	61.7	28.85	0.0	0.0652	55.0	0.50	855.0	3.000	1.550	0.014	0.007	1.50	400	100	0.60	0.40	0.00	0.00	0.00	0.00	2
KAWI	0.64	3.97	7.93	17.73	95.9	4.8	10.74	1.4	0.0066	2.2	14.73	50.0	1.010	0.008	0.007	0.003	0.20	240	20	0.00	0.01	0.00	0.02	0.18	0.00	5
KEMP	0.91	0.29	7.49	17.71	70.8	0.5	0.20	0.0	0.6059	3.3	1.65	137.5	1.183	0.068	0.019	0.007	16.30	1011	86	0.04	0.04	0.00	0.69	0.04	0.00	4
KEMS	0.29	0.62	8.66	17.32	127.6	78.0	37.01	0.0	0.5455	81.0	2.00	82.5	1.700	0.030	0.005	0.000	25.00	2000	30	0.29	0.02	0.00	0.24	0.02	0.00	4
KENT	2.09	0.47	7.15	18.09	70.1	0.0	0.00	1.1	0.0032	4.6	3.35	66.3	1.153	0.040	0.006	0.002	1.00	1000	15	0.00	0.06	0.00	0.02	0.08	0.00	3
KEOG	0.30	3.31	7.45	18.72	87.0	31.2	26.70	0.0	0.1601	37.5	1.85	230.0	1.650	0.055	0.001	0.000	16.00	1600	80	0.00	0.12	0.00	0.56	0.08	0.04	4
KING	0.38	1.56	7.22	15.55	103.8	7.5	9.76	0.5	0.1289	0.0	4.10	120.0	2.300	0.155	0.004	0.004	0.40	1000	30	0.30	0.00	0.00	0.03	0.00	0.00	2
KOGO	1.26	1.75	8.16	19.94	64.1	0.0	0.00	2.5	0.2063	0.8	1.93	280.0	6.425	0.175	0.014	0.007	12.00	1200	40	0.00	0.36	0.00	0.02	0.04	0.00	2
LAKE	0.35	0.19	7.17	16.32	64.3	24.0	46.05	0.0	0.4699	36.0	0.50	380.0	1.300	0.110	0.007	0.003	0.40	1200	100	0.30	0.60	0.00	0.20	0.10	0.05	5
LAKS	0.41	4.20	8.02	18.14	87.0	0.0	0.00	0.0	0.1897	118.7	1.30	346.7	4.233	0.080	0.014	0.001	2.28	1500	20	0.00	0.14	0.00	0.02	0.04	0.00	3
LANC	0.69	1.41	7.91	18.28	86.1	0.0	0.00	0.8	0.0065	2.6	2.53	90.0	0.798	0.043	0.003	0.003	1.00	460	10	0.01	0.10	0.00	0.00	0.01	0.00	4
LEED	0.38	0.49	7.57	14.25	63.9	19.0	28.74	0.5	0.1124	14.5	0.85	495.0	2.950	0.730	0.011	0.006	0.10	250	30	0.00	0.00	0.00	0.30	0.00	0.00	1
LIMA	0.23	8.65	8.25	17.90	109.5	19.5	20.72	0.3	0.2278	20.0	8.47	40.0	1.633	0.083	0.038	0.004	0.30	340	5	0.01	0.04	0.02	0.00	0.00	0.00	5
LMOG	0.33	9.69	8.16	21.25	121.9	0.0	0.00	0.9	0.0011	6.3	1.35	37.5	1.033	0.010	0.011	0.001	0.75	1000	0	0.00	0.00	0.00	0.00	0.00	0.00	0
LOCH	1.94	0.24	8.11	19.31	99.6	0.0	0.00	0.6	0.0058	0.0	0.75	13.8	0.343	0.003	0.002	0.000	250.00	3400	80	0.00	0.64	0.00	0.16	0.16	0.01	4
MANL	0.73	0.51	7.88	17.85	89.0	0.5	23.04	0.0	0.1826	23.0	2.30	52.5	1.295	0.043	0.095	0.005	6.00	1000	5	0.01	0.00	0.00	0.02	0.03	0.00	3
MANR	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	3.00	800	100	0.50	0.50	0.00	0.10	0.00	0.00	3
MANS	0.18	1.73	8.37	20.00	110.7	58.0	193.93	0.0	0.0494	33.8	0.60	45.0	1.175	0.020	0.001	0.000	8.00	1200	90	0.05	0.23	0.00	0.36	0.36	0.00	4
MARA	0.97	0.89	7.54	20.80	79.5	0.0	0.00	1.6	0.1554	6.3	3.73	170.0	1.925	0.293	0.047	0.007	3.50	1500	20	0.01	0.12	0.00	0.01	0.08	0.00	4
MARI	0.60	0.82	7.62	19.96	88.7	3.0	33.33	0.4	0.1437	115.1	1.60	103.3	5.500	0.030	0.005	0.000	127.00	4000	30	0.03	0.29	0.00	0.02	0.05	0.00	5
MARR	0.72	0.76	7.31	17.01	68.8	5.6	26.72	0.6	0.0287	1.1	14.50	82.5	1.725	0.093	0.007	0.002	0.30	260	80	0.08	0.72	0.00	0.08	0.20	0.00	4
MARY	0.86	2.60	8.30	21.28	108.7	9.4	14.01	0.8	0.2143	18.8	3.78	97.5	3.550	0.028	0.007	0.020	20.00	2000	10	0.00	0.01	0.00	0.08	0.02	0.00	3
MATH	0.38	1.71	7.53	16.74	63.0	0.2	0.11	0.0	0.0779	1.4	0.65	365.0	1.800	0.020	0.001	0.000	3.50	700	80	0.04	0.04	0.00	0.08	0.64	0.00	4
MAYC	2.66	6.59	8.98	20.89	110.5	0.0	0.00	1.0	0.0188	2.5	2.88	21.3	1.075	0.040	0.017	0.000	4.00	1200	1	0.01	0.00	0.00	0.00	0.00	0.00	1
MAYF	0.79	1.23	8.03	18.40	101.4	19.4	58.13	2.0	0.0293	0.9	10.30	80.0	0.830	0.075	0.008	0.005	0.30	500	5	0.05	0.00	0.00	0.00	0.00	0.00	1
MAYW	0.07	13.52	8.13	19.60	135.8	4.4	8.54	1.0	0.1602	14.4	2.45	60.0	1.200	0.095	0.026	0.002	1.00	110	95	0.05	0.10	0.86	0.01	0.01	0.01	6
MCDO	1.00	0.14	7.46	19.91	91.3	11.3	10.00	1.1	0.0212	3.0	1.28	25.0	0.673	0.015	0.014	0.002	3.00	700	5	0.01	0.04	0.00	0.01	0.00	0.00	3
MCLA	1.10	2.50	8.50	19.93	101.5	18.7	2.15	0.3	0.5682	78.4	4.73	163.3	5.267	0.103	0.024	0.007	170.00	5453	41	0.08	0.33	0.00	0.08	0.08	0.00	4
MEAL	0.93	1.19	7.07	19.76	83.2	0.7	1.38	0.7	0.1308	55.7	3.43	153.3	3.933	0.060	0.013	0.003	77.70	4074	65	0.01	0.33	0.00	0.13	0.01	0.00	4
MEAR	0.10	0.11	8.34	18.03	146.7	98.3	51.84	0.0	0.1833	140.0	1.45	195.0	3.000	0.700	0.016	0.006	2.00	400	100	0.80	0.20	0.00	0.10	0.05	0.00	4
MELA	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	1.00	400	90	0.63	0.05	0.00	0.45	0.45	0.01	5
MIL1	0.14	0.70	7.60	18.13	92.4	40.0	19.45	0.3	0.0719	66.3	0.45	810.0	4.800	0.840	0.004	0.002	0.50	300	20	0.16	0.00	0.00	0.00	0.06	0.00	3
MIL2	0.29	0.21	7.22	17.78	87.0	21.3	15.60	0.0	0.1212	45.0	0.75	770.0	2.750	1.695	0.005	0.003	1.00	500	70	0.70	0.00	0.00	0.01	0.01	0.00	3

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
MIL3	0.61	0.46	8.14	19.22	114.4	58.0	71.40	0.0	0.2732	22.2	1.65	215.0	3.050	0.485	0.004	0.000	1.00	400	25	0.25	0.00	0.00	0.00	0.00	0.00	1
MILS	1.04	0.67	6.76	14.54	27.5	60.7	39.50	0.0	0.0402	3.3	0.47	1400.0	2.440	0.337	0.006	0.002	1.00	300	100	0.00	0.00	0.00	0.00	1.00	0.00	1
MOGU	0.12	6.89	9.01	18.68	122.8	20.0	10.15	0.0	0.2803	87.5	14.60	190.0	5.250	0.495	0.021	0.015	3.00	800	0	0.00	0.00	0.00	0.00	0.00	0.00	0
MONG	1.34	0.41	8.55	19.89	87.2	0.0	0.00	1.0	0.2269	3.1	2.37	13.3	2.000	0.020	0.007	0.004	70.00	4500	5	0.01	0.04	0.00	0.01	0.00	0.00	4
MONI	0.98	0.34	7.85	18.34	94.4	16.6	12.20	0.1	0.1140	1.1	1.10	56.3	0.530	0.040	0.005	0.002	0.20	260	25	0.00	0.25	0.00	0.00	0.00	0.00	2
MOOR	0.36	0.78	7.62	20.07	94.6	37.5	42.10	0.0	1.3200	11.3	5.60	276.7	4.067	0.193	0.027	0.021	6.00	1000	75	0.00	0.23	0.00	0.30	0.23	0.01	4
MTBR	0.31	7.19	9.21	18.90	120.3	66.7	117.47	0.0	0.0461	85.8	1.60	92.5	1.600	0.025	0.003	0.000	15.00	2000	15	0.00	0.09	0.02	0.02	0.04	0.00	4
MUCR	0.18	0.26	5.48	16.33	48.5	25.0	46.02	0.0	0.0915	41.7	0.30	3200.0	6.450	4.750	0.001	0.005	3.00	600	70	0.07	0.18	0.00	0.49	0.01	0.00	4
MUSS	0.92	0.41	6.62	18.16	51.0	0.0	0.00	1.3	0.1352	1.9	4.25	342.5	1.950	0.048	0.006	0.003	1.00	300	10	0.00	0.01	0.00	0.00	0.10	0.00	4
NAMM	0.98	2.14	9.00	20.73	105.4	0.0	0.00	0.6	1.0956	8.6	13.00	80.0	4.225	0.098	0.085	0.010	67.60	3264	20	0.00	0.14	0.00	0.12	0.08	0.00	3
NEER	1.11	1.12	7.40	14.64	63.4	0.0	0.00	0.6	0.2434	0.0	1.75	140.0	2.250	0.190	0.001	0.002	35.00	2400	80	0.00	0.80	0.00	0.02	0.04	0.00	2
NGIB	0.32	0.32	7.34	18.70	74.6	0.0	0.00	0.4	0.0528	23.6	2.05	590.0	2.650	0.510	0.010	0.007	20.00	1600	100	0.80	0.10	0.00	0.15	0.10	0.00	4
NICM	0.44	0.47	6.07	16.72	57.7	2.4	0.32	0.0	0.0638	4.3	0.90	1250.0	4.200	1.605	0.003	0.000	2.00	900	40	0.04	0.12	0.00	0.04	0.26	0.00	4
NICO	0.47	0.28	7.15	18.48	55.5	20.8	45.82	0.0	0.0773	95.0	0.50	540.0	3.400	2.695	0.004	0.002	8.00	1200	100	0.90	0.01	0.00	0.05	0.05	0.00	4
NICS	0.35	0.52	6.72	19.20	74.9	4.0	18.25	0.4	0.1670	7.6	11.28	102.5	2.250	0.060	0.091	0.006	6.00	1400	60	0.12	0.18	0.00	0.06	0.36	0.00	4
NINE	1.46	0.16	4.23	19.39	77.4	4.4	31.70	0.1	0.6098	0.0	4.15	775.0	4.650	0.158	0.103	0.036	30.00	2350	80	0.00	0.56	0.00	0.24	0.04	0.00	3
NLAK	1.70	0.40	7.73	19.09	93.5	0.0	0.00	0.3	0.0330	4.6	5.83	51.3	1.775	0.013	0.042	0.003	50.00	2000	5	0.01	0.02	0.00	0.01	0.03	0.00	5
NOON	0.47	5.34	7.81	17.69	63.1	0.0	0.00	0.6	0.2005	1.4	20.03	98.3	1.767	0.040	0.017	0.004	0.10	220	15	0.00	0.02	0.00	0.02	0.12	0.00	3
NOWE	0.86	0.75	8.34	19.75	97.2	2.5	0.68	1.3	0.1070	133.1	1.70	22.5	1.500	0.062	0.009	0.006	25.00	3500	10	0.01	0.08	0.00	0.01	0.01	0.00	4
NROS	0.55	0.40	8.49	16.83	130.4	40.9	31.53	0.0	0.7736	7.7	8.17	126.7	3.133	0.143	0.170	0.012	0.50	500	100	1.00	0.00	0.00	0.01	0.15	0.00	2
OLDB	0.14	0.08	7.05	16.35	94.9	35.0	14.73	0.0	0.1088	52.5	39.00	190.0	2.450	0.030	0.010	0.002	0.25	200	70	0.60	0.00	0.00	0.00	0.11	0.00	2
PARR	0.22	10.43	7.87	20.52	119.8	8.3	3.40	0.5	0.0741	105.0	1.53	53.3	1.287	0.033	0.010	0.002	6.00	1000	90	0.27	0.27	0.32	0.05	0.00	0.00	4
PAU1	0.29	0.42	7.29	21.46	81.2	38.0	65.51	0.0	0.2424	28.0	1.25	340.0	1.950	1.950	0.002	0.002	0.75	300	20	0.06	0.14	0.00	0.00	0.00	0.00	2
PEHA	0.24	0.47	7.79	14.20	76.3	50.0	51.97	0.0	0.0026	105.0	6.25	300.0	3.850	0.480	0.005	0.005	1.00	400	100	1.00	0.05	0.00	0.02	0.00	0.00	3
PELI	0.31	15.75	9.21	16.58	106.1	81.7	101.83	0.3	0.0071	12.7	3.13	88.3	1.530	0.027	0.016	0.003	1.60	880	10	0.00	0.01	0.08	0.01	0.01	0.01	5
PEPP	0.80	1.03	7.63	19.13	83.7	79.4	241.71	1.5	0.0833	45.6	1.05	215.0	3.550	0.030	0.041	0.004	28.00	2200	75	0.15	0.38	0.00	0.08	0.30	0.00	4
PERR	0.58	0.35	8.82	24.44	112.4	10.7	14.42	1.3	0.0826	34.0	2.13	20.0	0.900	0.027	0.016	0.004	6.00	1500	20	0.00	0.20	0.00	0.01	0.01	0.00	3
PINB	1.00	1.64	7.17	17.29	81.1	0.0	0.00	1.0	0.0003	0.0	1.38	18.8	0.863	0.005	0.002	0.001	3.00	2000	15	0.03	0.01	0.00	0.05	0.06	0.00	4
PINE	1.52	0.16	6.41	19.59	64.9	0.0	0.00	1.3	0.0818	4.0	1.53	325.0	1.450	0.035	0.003	0.001	5.00	1000	40	0.00	0.02	0.00	0.24	0.12	0.04	4
PINR	0.14	0.79	8.18	19.43	119.4	36.3	62.13	0.5	0.0387	35.0	11.15	215.0	1.725	0.145	0.001	0.002	2.00	2040	5	0.04	0.00	0.00	0.01	0.01	0.00	3
PIPI	1.02	1.06	8.19	19.21	94.4	41.3	67.29	0.6	0.1405	39.7	4.23	88.8	3.775	0.020	0.012	0.002	50.00	3000	70	0.07	0.56	0.00	0.04	0.07	0.00	4
PUNC	0.97	0.88	7.97	18.66	80.6	0.0	0.00	1.4	0.0092	1.5	2.40	40.0	1.095	0.015	0.042	0.005	25.00	2000	75	0.15	0.49	0.00	0.19	0.04	0.02	5
PUNR	0.12	0.77	7.44	18.80	110.3	0.0	0.00	0.8	0.0067	4.0	6.65	275.0	2.550	0.115	0.002	0.001	0.50	1000	0	0.00	0.00	0.00	0.00	0.00	0.00	0
REGA	1.15	3.69	7.07	18.29	66.7	10.6	2.99	1.0	0.0102	1.3	11.08	43.8	0.965	0.023	0.005	0.001	3.00	1000	70	0.07	0.07	0.00	0.04	0.63	0.01	5
RIVD	1.10	0.33	6.53	16.99	64.9	0.0	0.00	0.9	0.0117	0.0	0.25	875.0	2.375	0.035	0.011	0.000	1.90	434	63	0.00	0.38	0.00	0.38	0.03	0.01	4
RIVF	0.87	0.18	6.84	17.21	79.1	0.0	0.00	1.1	0.0012	4.5	6.48	62.5	0.788	0.048	0.002	0.003	1.00	1000	90	0.00	0.05	0.00	0.23	0.63	0.05	4

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
ROBE	0.05	1.68	6.52	19.77	107.0	26.7	15.98	0.0	0.8002	117.7	13.00	70.0	1.300	0.060	0.008	0.009	1.00	500	20	0.20	0.00	0.00	0.00	0.00	0.00	1
ROCK	0.37	0.45	7.86	19.41	89.9	10.8	48.83	2.3	0.0163	17.3	0.65	12.5	1.900	0.013	0.004	0.002	1.00	900	2	0.02	0.00	0.00	0.00	0.00	0.00	1
ROGE	0.06	0.13	6.24	13.60	39.5	0.0	0.00	0.0	7.6178	100.0	0.70	495.0	2.450	1.300	0.005	0.002	9.00	1200	100	0.70	0.30	0.00	0.00	0.05	0.00	3
RONS	1.20	0.22	7.34	21.13	84.4	3.1	15.30	1.8	0.0662	1.8	1.90	13.8	0.828	0.013	0.008	0.001	1.00	300	1	0.01	0.00	0.00	0.00	0.00	0.00	2
ROSA	0.46	0.63	7.91	15.81	65.9	0.0	0.00	0.0	1.0156	8.1	12.33	138.3	14.300	1.547	0.230	0.051	0.50	300	80	0.04	0.04	0.00	0.01	0.76	0.00	4
SAND	0.42	1.54	5.38	19.10	50.4	2.5	0.46	0.0	0.2591	46.5	0.00	18300.0	5.767	21.233	0.005	0.008	10.00	1000	60	0.06	0.06	0.00	0.48	0.03	0.00	4
SCEE	0.21	22.84	7.61	17.15	96.2	30.8	21.06	0.0	0.2163	58.8	2.87	171.7	2.867	0.180	0.017	0.005	10.00	2200	80	0.00	0.16	0.56	0.16	0.08	0.08	5
SCEW	0.21	19.14	8.46	17.78	115.1	0.0	0.00	0.6	0.0363	7.4	2.07	118.3	2.967	0.603	0.024	0.003	0.50	210	20	0.00	0.20	0.00	0.00	0.00	0.00	2
SERD	0.56	0.33	7.52	20.26	100.5	15.0	16.20	1.4	0.0033	8.0	3.73	83.8	0.873	0.060	0.004	0.001	2.00	1000	30	0.03	0.26	0.00	0.02	0.00	0.00	3
SPEC	0.95	0.47	6.54	15.30	34.6	61.4	1.84	1.0	0.0002	0.0	4.53	320.0	4.033	0.270	0.017	0.004	80.00	3500	95	0.10	0.02	0.00	0.19	0.86	0.00	4
STAR	0.89	0.87	8.07	17.39	58.3	7.9	33.43	1.4	0.1845	9.4	1.57	108.3	1.833	0.033	0.008	0.002	4.00	800	10	0.00	0.00	0.00	0.08	0.02	0.00	3
STOK	0.13	0.38	6.68	16.85	99.1	41.3	43.84	0.0	0.1212	48.8	2.90	490.0	3.550	0.580	0.010	0.001	2.00	600	80	0.78	0.00	0.00	0.02	0.00	0.00	2
SWAN	0.76	0.62	7.34	17.66	99.4	9.3	12.53	1.4	0.0205	3.0	8.63	36.7	1.297	0.030	0.143	0.001	0.60	460	5	0.00	0.00	0.00	0.00	0.05	0.00	2
TALB	0.59	1.56	8.38	19.51	95.8	51.6	215.30	0.0	0.2297	1.5	2.47	213.3	2.467	0.020	0.004	0.001	3.00	600	40	0.00	0.16	0.00	0.24	0.00	0.00	2
TANG	0.18	8.81	6.76	23.08	114.0	83.8	83.71	0.0	0.6656	22.1	1.05	145.0	3.350	0.015	0.017	0.004	1.00	400	60	0.30	0.12	0.00	0.12	0.24	0.00	4
TAWA	0.06	0.27	6.71	18.20	69.6	10.0	0.64	0.0	0.4669	23.8	0.90	1075.0	4.300	1.370	0.002	0.018	1.00	400	100	1.00	0.10	0.00	0.20	0.20	0.00	4
THOL	0.81	1.97	8.14	20.06	98.1	10.0	194.38	0.1	0.2093	107.8	5.10	173.3	4.767	0.127	0.113	0.022	250.00	6000	15	0.00	0.14	0.00	0.01	0.02	0.00	3
THOM	0.25	1.78	8.02	21.33	100.8	1.8	0.18	1.0	0.1265	3.5	8.30	440.0	6.300	0.590	0.033	0.007	0.40	1000	5	0.03	0.03	0.00	0.00	0.00	0.00	3
THOS	0.57	0.70	8.82	19.20	110.9	24.2	17.49	0.0	1.3168	6.5	122.40	296.7	10.300	0.370	0.135	0.001	2.00	600	10	0.00	0.01	0.00	0.09	0.01	0.00	4
USWA	0.80	3.50	7.56	18.61	85.8	5.0	3.92	1.0	0.0416	2.5	2.60	288.8	1.868	0.368	0.005	0.002	0.50	500	1	0.01	0.01	0.00	0.00	0.00	0.00	2
WALL	0.25	3.81	8.06	22.46	106.2	4.2	7.28	0.0	0.3263	46.0	5.50	250.0	2.400	0.400	0.005	0.001	9.00	1200	40	0.00	0.00	0.00	0.28	0.12	0.00	3
WANN	0.91	32.14	8.97	21.69	119.8	60.0	117.29	0.0	0.1302	41.3	13.05	62.5	5.545	0.073	0.047	0.015	124.00	9668	50	0.03	0.03	0.00	0.25	0.05	0.20	5
WART	0.28	0.62	5.81	20.30	84.8	26.8	125.67	0.3	0.0285	0.0	1.65	355.0	1.600	0.055	0.007	0.001	6.00	1400	30	0.12	0.09	0.00	0.03	0.15	0.00	4
WATE	0.48	8.76	7.68	20.41	103.1	0.0	0.00	1.5	0.0104	8.3	3.58	52.5	0.885	0.030	0.015	0.002	1.00	400	30	0.03	0.27	0.03	0.03	0.03	0.01	6
WCOR	0.90	0.74	5.52	18.06	57.2	0.3	4.61	0.8	0.0510	38.5	0.28	1805.0	4.625	0.798	0.021	0.005	10.00	1000	40	0.00	0.01	0.00	0.36	0.04	0.00	3
WEEB	1.35	0.55	3.66	19.53	91.9	0.0	0.00	0.1	0.0115	1.4	1.35	10.0	1.850	0.013	0.021	0.001	1.00	600	5	0.00	0.03	0.00	0.01	0.01	0.00	4
WHIP	0.01	0.44	5.13	12.10	20.0	0.0	0.00	0.0	*	0.0	2.20	150.0	1.800	0.010	0.003	0.000	2.00	600	100	0.01	1.00	0.00	0.20	0.80	0.01	5
WHIT	0.32	0.23	7.09	19.96	80.9	26.0	18.74	0.2	0.5043	32.6	0.75	100.0	1.125	0.345	0.005	0.000	0.35	200	100	0.99	0.00	0.00	0.05	0.00	0.00	2
WIGI	0.33	0.14	7.10	16.15	91.3	75.0	106.27	0.0	0.0257	12.5	1.10	185.0	1.650	0.420	0.003	0.001	0.50	200	100	1.00	0.00	0.00	0.10	0.00	0.00	2
WILC	1.20	2.81	7.73	18.68	66.8	0.0	0.00	1.3	0.1258	1.9	2.08	215.0	3.500	0.545	0.046	0.024	1.50	2000	30	0.06	0.09	0.00	0.08	0.15	0.02	5
WILD	0.18	0.60	7.96	16.53	116.5	50.0	87.03	0.5	0.0425	3.3	10.20	155.0	1.175	0.110	0.005	0.005	0.20	1000	5	0.05	0.00	0.00	0.00	0.00	0.00	1
WILG	0.44	0.34	7.02	11.82	30.7	0.0	0.00	0.0	0.0404	0.0	0.55	90.0	0.675	0.010	0.004	0.000	10.00	1200	100	0.00	0.80	0.00	0.05	0.80	0.05	4
WILS	0.26	0.72	7.28	18.58	89.1	0.0	0.00	0.8	0.0029	37.2	4.83	176.7	2.733	0.460	0.006	0.003	6.00	1400	50	0.00	0.38	0.00	0.05	0.13	0.00	3
WRIG	0.16	7.09	9.30	21.12	127.9	60.0	27.71	0.0	0.0422	199.0	25.35	52.5	0.920	0.020	0.000	0.000	25.00	2000	5	0.02	0.03	0.00	0.01	0.00	0.00	3
WSWR	0.54	2.32	7.82	18.71	91.1	0.6	5.78	1.4	0.0148	2.3	10.05	20.0	0.965	0.013	0.018	0.002	1.00	300	20	0.00	0.02	0.00	0.18	0.00	0.00	2
YANG	1.50	0.85	8.82	19.24	86.1	0.0	0.00	0.1	0.0969	5.8	6.20	91.3	4.475	0.068	0.053	0.006	90.00	3100	10	0.00	0.03	0.00	0.01	0.01	0.07	4

Code	Depth	Salinity	Ph	Temp.	DO	Macro-cover	Macro-bmass	Fish abund.	Zoo-plank.	Wading zone	Turb-idity	Colour	Total-n	Total-p	Chl-a	Phaeo-phytin	Area	Shore-line	Veg. cover	Grass (%)	Reed/rush (%)	Samph. (%)	Shrub/bush (%)	Tree (%)	Dead tree (%)	Veg. types
YOND	1.53	0.21	7.59	19.39	88.3	4.3	1.89	0.7	0.0000	0.0	0.93	11.3	0.575	0.008	0.015	0.006	2.00	600	5	0.00	0.05	0.00	0.01	0.01	0.00	3
YOUN	0.55	0.27	7.18	20.08	73.6	21.7	15.21	0.3	0.0827	3.3	3.10	95.0	1.733	0.053	0.010	0.002	0.20	150	30	0.18	0.00	0.00	0.06	0.06	0.00	3
YUND	0.31	14.43	9.37	20.12	127.8	61.7	60.52	0.2	0.8991	93.3	0.85	37.5	0.925	0.015	0.001	0.000	15.00	2300	40	0.00	0.04	0.08	0.20	0.02	0.06	5

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
ABER	0	0	0	0	5	2	St	18.00	7	1.00	0.15	0.35	0.15	0.00	0.00	0.00	0.00	0.00	2	1	p
ADEN	0	5	10	0	5	1	Ir	2.00	6	2.38	1.50	3.50	0.30	0.90	0.00	0.15	0.15	0.00	3	4	e
AIPS	0	100	10	0	2	4	Ir	9.00	8	1.89	12.80	3.20	0.13	0.13	0.00	5.12	10.24	0.13	8	4	bp
AIRD	0	0	0	0	5	1	Si	29.00	5	1.22	0.30	0.45	0.03	0.00	0.00	0.27	0.00	0.00	8	2	r
ALCO	0	100	25	0	3	1	Ir	9.50	8	2.28	0.76	14.35	0.08	0.30	0.00	0.45	0.00	0.00	1	2	p
ALEX	1	10	10	50	4	0	St	1.00	8	2.18	0.25	4.75	0.00	0.18	0.00	0.10	0.00	0.03	1	2	r
ALFR	0	50	10	0	4	1	Ir	0.00	8	2.20	3.50	1.50	0.00	0.70	2.45	0.35	0.35	0.00	9	4	e
AMIE	1	100	20	0	2	0	Li	25.00	8	1.65	0.15	0.85	0.00	0.00	0.00	0.03	0.12	0.01	7	2	r
ASHF	0	50	50	0	5	0	Ir	5.50	7	3.43	3.60	0.40	0.18	1.80	0.72	1.08	0.36	0.04	9	4	e
AUST	0	0	0	0	5	1	Ro	0.05	2	2.24	6.00	0.00	0.90	0.90	0.00	0.60	4.80	0.30	8	4	e
BALD	1	0	0	0	5	0	Ov	7.50	5	1.62	3.00	3.00	0.60	2.40	0.00	0.00	0.15	0.00	4	4	p
BALL	0	0	0	0	5	1	Ir	17.00	4	2.61	18.00	2.00	0.90	1.80	0.00	7.20	9.00	0.00	8	4	bp
BALP	1	0	0	0	5	3	Ov	13.00	8	1.00	0.10	4.90	0.00	0.10	0.00	0.00	0.00	0.00	1	2	bp
BAMD	0	0	0	0	5	2	St	31.00	3	1.41	1.00	0.00	1.00	0.00	0.00	0.10	0.10	0.00	7	1	bp
BAML	0	50	50	10	4	1	Ro	29.00	8	1.34	2.01	38.10	0.10	0.20	0.00	1.80	0.00	0.00	7	4	bp
BAMW	0	0	0	0	5	0	Ir	32.00	2	1.10	1.00	0.00	1.00	0.00	0.00	0.05	0.00	0.00	2	1	bp
BANG	0	100	200	50	2	0	Ov	5.00	4	1.55	34.20	3.80	0.00	30.78	0.00	1.71	6.84	0.00	4	*	sb
BARL	0	0	0	0	3	0	Ro	34.75	8	1.53	10.35	25.35	0.52	0.52	0.00	1.04	0.00	8.28	7	4	bp
BARS	1	50	10	0	3	2	Ir	3.00	8	2.19	20.47	2.53	0.00	0.00	0.00	1.02	10.24	8.19	8	4	b
BAYS	0	70	10	0	4	1	El	5.00	8	3.27	0.60	3.40	0.03	0.15	0.00	0.30	0.24	0.03	7	2	e
BEEL	0	0	0	0	4	0	Ro	32.50	8	1.38	6.73	32.87	0.07	0.34	0.00	0.00	0.00	0.00	7	2	bp
BEEN	0	25	50	0	5	2	Ov	7.50	5	3.79	0.30	2.70	0.09	0.06	0.00	0.09	0,12	0.00	7	2	p
BEES	0	0	0	0	2	0	Ro	25.00	4	1.55	3.00	1.00	0.60	0.15	0.00	2.70	0.00	0.00	8	4	b
BELM	0	0	0	0	5	1	Li	4.00	8	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	1	*	e
BENG	1	100	200	0	4	1	Ir	12.50	4	1.60	12.00	4.00	9.00	3.00	0.00	0.00	0.00	0.00	3	5	bp
BIBR	0	70	10	0	5	1	Ov	5.50	8	2.88	6.75	128.25	0.00	1.35	0.00	3.38	2.03	0.34	7	4	sb
BIGC	0	50	50	0	3	2	Ro	3.30	8	2.04	12.00	8.00	0.60	9.60	0.00	2.40	1.80	0.00	5	6	s
BIND	0	0	0	0	5	1	Ir	55.00	2	1.22	0.90	0.10	0.81	0.00	0.00	0.00	0.09	0.00	7	*	d
BLAC	0	0	0	0	5	0	Ro	5.50	8	1.50	9.34	5.26	0.00	0.00	0.00	7.48	1.40	0.47	8	4	bp
BLAL	0	50	100	30	3	0	Ov	4.50	8	3.75	6.00	54.00	0.00	1.80	2.40	1.80	0.60	0.30	1	4	r
BLUE	0	10	5	0	5	4	Ov	1.00	8	1.96	1.05	5.95	0.26	0.11	0.00	0.00	0.00	0.74	7	4	b
BLYT	0	0	0	0	3	0	Ov	22.00	7	2.56	1.50	8.50	0.30	0.15	0.00	1.05	0.30	0.03	7	4	b
BODK	0	10	10	5	4	1	El	0.30	7	2.06	2.50	2.50	0.50	2.00	0.25	0.25	0.00	0.00	4	4	e
BOGG	0	80	100	30	2	0	Ir	0.05	3	2.13	2.80	1.20	0.14	0.28	1.96	0.14	0.42	0.03	9	4	e
BOOG	1	25	5	0	4	1	Ov	1.50	8	1.34	5.20	7.80	0.00	0.26	0.00	0.52	4.68	0.00	8	4	b
BRO2	0	0	0	0	5	0	Ir	10.25	6	1.04	3.60	0.40	3.60	0.00	0.00	0.00	0.07	0.00	2	5	p

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
BULL	0	20	15	0	5	1	Ir	0.00	8	2.43	0.30	2.70	0.00	0.12	0.00	0.03	0.15	0.00	7	2	e
CAMP	0	0	0	0	5	0	El	11.50	4	1.47	6.00	0.00	5.40	0.30	0.00	0.30	0.60	0.00	7	5	bp
CANC	0	0	0	0	5	1	Ov	3.00	8	1.00	0.30	0.70	0.00	0.30	0.00	0.00	0.00	0.00	4	2	r
CANF	0	75	20	0	4	1	Si	3.00	8	1.77	0.20	1.80	0.03	0.03	0.00	0.00	0.16	0.00	7	2	r
CANW	0	0	0	0	4	1	Ir	0.05	6	1.51	4.25	0.75	0.43	3.83	0.43	0.09	0.00	0.00	4	4	e
CARA	1	30	40	0	2	1	Ir	4.50	8	2.36	24.00	36.00	0.00	16.80	0.00	4.80	7.20	0.24	5	6	s
CARE	0	0	0	0	5	1	Ro	4.00	8	1.00	0.15	0.85	0.00	0.15	0.00	0.00	0.00	0.00	4	2	s
CARI	0	0	0	0	5	0	Li	2.00	7	1.10	0.04	0.36	0.00	0.04	0.00	0.00	0.00	0.00	3	2	p
CARR	0	0	0	0	5	0	Li	2.00	5	1.00	0.18	0.02	0.18	0.00	0.00	0.00	0.00	0.00	2	1	bp
CARS	0	100	40	10	2	0	Li	1.00	6	2.18	6.40	1.60	0.64	0.32	0.00	1.60	5.12	0.32	7	4	bp
CHAS	0	50	100	20	2	2	Ir	31.50	8	3.00	89.38	19.62	8.94	8.94	0.00	35.75	35.75	0.89	8	6	bp
CHIT	0	80	10	0	4	0	El	45.00	6	2.11	80.08	62.92	0.00	0.00	0.00	32.03	48.05	4.00	8	6	d
CLAR	0	25	100	0	4	3	Ro	2.00	7	2.39	8.10	9.90	0.41	5.67	0.00	0.81	0.81	1.62	4	4	s
CLIB	0	80	10	0	4	1	St	5.00	8	1.00	0.05	0.45	0.05	0.00	0.00	0.00	0.00	0.00	2	3	r
CLIS	0	75	10	0	3	1	El	4.00	6	1.23	40.50	4.50	2.03	2.03	0.00	36.45	0.00	0.00	8	6	sb
COD1	0	0	0	0	5	1	Li	8.50	5	1.00	0.20	0.00	0.20	0.00	0.00	0.00	0.00	0.00	2	1	sb
COD2	0	0	0	0	5	0	Li	14.00	8	1.00	0.03	0.27	0.03	0.00	0.00	0.00	0.00	0.00	2	3	bp
COO1	0	0	0	0	5	1	Ir	32.50	4	1.62	4.00	1.00	2.80	0.40	0.00	0.40	0.04	0.00	6	5	bp
COO2	0	0	0	0	5	2	Ov	29.00	4	2.17	0.25	0.00	0.15	0.08	0.00	0.03	0.00	0.00	5	1	bp
COO3	0	0	0	0	5	1	Ir	28.00	3	1.23	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	2	*	bp
COOC	0	75	10	0	5	1	Si	16.50	8	2.70	0.10	0.90	0.02	0.02	0.00	0.02	0.06	0.00	7	2	r
COOD	0	0	0	0	5	1	St	2.75	7	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1	*	p
COOG	0	50	50	0	3	1	Ir	5.25	6	2.09	1.75	0.75	0.18	1.40	0.00	0.18	0.35	0.02	5	4	s
COOO	0	95	50	65	3	1	Ov	4.50	7	1.22	36.00	684.00	3.60	32.40	0.00	0.00	0.00	0.00	1	6	q
COOS	0	70	150	25	3	0	Ov	27.00	7	2.19	1.80	10.20	0.00	0.54	0.00	0.36	1.44	0.00	6	4	bp
COPO	0	0	0	0	5	1	Ov	7.00	7	1.92	0.08	2.43	0.03	0.00	0.00	0.05	0.00	0.00	1	2	b
COR1	0	0	0	0	4	1	Ov	8.75	4	1.55	6.00	0.00	5.40	1.20	0.00	0.30	0.00	0.00	3	5	sb
COR2	0	0	0	0	5	0	Ov	13.00	4	1.32	6.00	0.00	5.70	0.60	0.00	0.30	0.00	0.00	3	5	bp
COR3	0	80	10	0	4	0	El	13.50	6	1.37	1.50	0.00	1.35	0.15	0.00	0.08	0.02	0.00	3	1	bp
CORX	0	0	0	0	5	1	Li	11.00	8	1.00	0.08	0.68	0.08	0.00	0.00	0.00	0.00	0.00	2	1	bp
COWA	1	100	20	0	4	0	Li	17.00	8	3.57	0.15	0.35	0.03	0.03	0.00	0.03	0.06	0.00	6	2	r
CRAG	1	0	0	0	5	2	Ro	7.50	8	1.22	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.00	1	*	p
CRAM	0	0	0	0	4	0	Ov	24.00	8	1.50	0.19	0.56	0.03	0.15	0.00	0.01	0.00	0.00	3	2	d
CREA	0	20	10	0	4	1	Si	9.50	8	2.56	0.10	1.90	0.00	0.03	0.00	0.01	0.05	0.01	1	2	r
CULC	0	0	0	0	3	1	Ov	21.50	4	1.48	19.00	1.00	18.05	1.90	0.00	1.90	0.38	0.00	6	5	b
CURT	1	0	0	0	5	0	Ir	1.50	8	1.34	0.04	0.71	0.03	0.00	0.00	0.00	0.00	0.00	1	3	b

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm- anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang- uineous suite
DEEP	0	0	0	0	5	0	Ov	27.50	7	1.22	0.90	5.10	0.00	0.09	0.00	0.81	0.00	0.00	7	2	bp
DEVI	0	75	10	0	4	0	Ov	6.00	8	1.57	2.34	0.78	0.00	0.12	0.00	0.35	1.76	0.02	8	4	bp
DIAM	1	45	180	90	3	0	Li	2.75	8	2.19	0.05	0.95	0.00	0.05	0.00	0.01	0.02	0.00	1	2	e
DILS	0	0	0	0	4	0	Ov	8.00	6	1.32	1.58	1.93	0.00	0.00	0.00	0.24	1.42	0.00	8	4	p
DUCK	0	0	0	0	5	1	St	15.00	8	2.00	0.01	0.99	0.01	0.01	0.00	0.00	0.00	0.00	1	3	p
EAGL	0	30	15	0	4	0	Ov	20.50	8	1.96	0.23	0.53	0.00	0.16	0.00	0.06	0.02	0.00	5	2	d
EASt	1	80	100	0	4	0	Ir	6.50	6	1.85	1.80	10.20	0.00	0.36	0.00	0.18	1.26	0.00	6	4	sb
ELLE	0	75	20	0	2	0	Ir	29.00	4	1.21	9.50	0.50	0.48	0.48	0.00	9.03	0.00	0.00	8	4	r
EVER	0	0	0	0	5	0	Ov	8.50	6	1.20	4.50	0.50	4.50	0.23	0.00	0.23	0.00	0.00	2	5	sb
FIGI	0	0	0	0	5	0	Li	5.00	4	1.22	0.64	0.16	0.58	0.00	0.00	0.06	0.00	0.00	7	*	r
FIS1	1	0	0	0	5	0	Ov	10.00	7	1.00	0.30	1.20	0.30	0.00	0.00	0.00	0.00	0.00	2	1	p
FIS2	0	0	0	0	5	0	Ir	9.25	4	1.00	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	2	1	p
FIS3	0	0	0	0	5	0	Ro	8.50	4	1.00	0.53	0.23	0.53	0.00	0.00	0.00	0.00	0.00	2	1	p
FIS4	1	20	10	0	5	0	Ov	6.75	6	2.19	0.08	1.43	0.02	0.05	0.00	0.02	0.00	0.00	1	2	bp
FISS	1	0	0	0	5	1	Ov	9.25	4	1.34	0.68	0.07	0.07	0.00	0.00	0.61	0.03	0.00	8	2	p
FOLM	0	0	0	0	5	1	St	8.50	8	1.22	0.02	1.68	0.00	0.02	0.00	0.00	0.00	0.00	1	3	p
FOLP	0	80	10	0	4	1	Li	8.50	7	2.17	0.60	1.40	0.00	0.18	0.00	0.06	0.36	0.00	6	2	p
FOOT	0	85	200	50	2	0	Ro	56.00	8	1.34	14.88	2.63	0.00	1.49	0.00	13.39	0.00	0.74	8	4	dp
FORL	0	0	0	0	5	0	Ov	11.25	5	1.10	9.00	0.00	9.00	0.00	0.00	0.00	0.45	0.00	2	5	b
FORR	0	75	100	30	2	2	Ov	15.00	6	2.07	37.20	210.80	1.86	26.04	0.00	1.86	11.16	0.00	5	6	bp
FORT	0	0	0	0	5	1	Ir	10.50	5	1.53	1.20	0.80	0.24	0.96	0.00	0.00	0.02	0.00	4	4	b
FREE	1	0	0	0	5	3	Li	0.10	8	1.41	0.05	0.20	0.00	0.05	0.00	0.01	0.01	0.00	3	2	e
FREM	0	80	30	0	5	1	Si	11.00	8	4.31	0.10	0.90	0.03	0.03	0.00	0.03	0.03	0.01	1	2	r
GANS	0	25	3	0	5	1	Li	5.50	8	1.44	0.02	0.29	0.01	0.00	0.00	0.00	0.00	0.00	1	3	r
GANY	0	80	50	10	3	1	Si	5.50	8	2.96	0.80	0.20	0.16	0.64	0.00	0.16	0.24	0.04	5	2	r
GIB1	0	0	0	0	5	1	Ro	12.00	4	1.10	0.25	0.00	0.25	0.00	0.00	0.01	0.00	0.00	2	1	p
GIB2	0	0	0	0	5	0	El	11.50	6	1.47	0.40	1.60	0.32	0.00	0.00	0.08	0.00	0.00	2	1	p
GIBA	0	100	50	30	3	0	Ov	10.75	5	3.43	0.53	0.98	0.10	0.10	0.00	0.16	0.26	0.00	7	2	b
GIBB	0	25	200	100	3	0	El	13.50	4	1.35	5.40	0.60	0.27	0.27	0.00	0.27	4.86	0.00	8	4	b
GIN1	0	80	20	0	4	0	Ir	28.00	6	2.35	1.50	0.50	0.30	0.23	0.00	0.08	0.90	0.00	8	4	bp
GIN2	0	0	0	0	3	0	Ro	20.00	7	1.73	0.35	0.35	0.02	0.00	0.00	0.07	0.24	0.00	8	2	b
GIN3	0	0	0	0	4	0	Ro	18.50	3	2.51	5.00	0.00	0.50	4.50	0.00	0.50	4.00	0.10	5	4	r
GIN4	0	0	0	0	4	0	Ro	17.50	8	1.48	0.80	0.20	0.12	0.04	0.00	0.72	0.01	0.00	8	2	b
GIN5	0	0	0	0	3	0	Ro	17.00	8	1.60	0.40	3.60	0.12	0.36	0.00	0.00	0.00	0.00	3	2	b
GINE	1	0	0	0	3	0	Ir	18.50	8	1.66	0.30	0.20	0.03	0.02	0.00	0.03	0.24	0.00	8	2	r
GINJ	0	100	200	100	1	0	Ro	23.00	5	1.75	2.40	3.60	0.00	0.24	0.00	0.48	1.92	0.00	8	4	bp

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
GINL	0	100	100	100	1	1	Ro	26.00	8	2.36	1.80	16.20	0.00	0.54	0.00	0.36	1.44	0.09	7	4	bp
GINN	0	0	0	0	5	0	Si	51.50	6	1.00	0.03	0.48	0.03	0.00	0.00	0.00	0.00	0.00	1	3	d
GLOV	0	75	20	0	3	0	Si	52.00	6	1.32	0.56	0.19	0.08	0.00	0.00	0.51	0.00	0.00	8	2	d
GNAL	0	60	150	30	3	2	Ro	13.00	6	1.47	11.00	99.00	1.10	9.90	0.00	0.55	0.55	0.00	3	6	b
GNAR	0	10	10	0	4	1	Ov	11.50	3	1.76	9.60	2.40	6.72	2.88	0.00	0.10	0.00	0.00	3	5	b
GOBB	0	75	5	0	4	1	Ov	5.00	8	1.26	0.20	0.80	0.01	0.19	0.00	0.00	0.01	0.00	3	2	e
GOEG	0	60	20	0	3	2	Ir	4.00	4	2.42	1.90	0.10	0.10	0.57	1.33	0.19	0.10	0.00	9	4	r
GOLD	0	0	0	0	5	0	Ir	6.00	8	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1	*	p
GOOD	0	100	200	100	1	0	Ov	6.00	8	2.94	1.50	8.50	0.00	0.30	0.00	0.30	0.75	0.15	6	4	bp
GOOL	1	100	10	0	2	1	Li	7.00	8	1.74	36.00	24.00	3.60	32.40	0.00	3.60	3.60	0.36	4	6	s
GOSS	0	0	0	0	5	0	El	5.75	4	1.40	1.25	0.00	1.19	0.00	0.00	0.25	0.00	0.00	7	1	y
GOYA	0	0	0	0	5	0	Si	45.00	8	1.95	0.38	0.13	0.00	0.00	0.00	0.19	0.26	0.00	8	2	d
GREE	0	100	200	100	3	0	Ir	0.50	4	2.26	3.00	3.00	0.00	1.95	0.45	0.90	0.00	0.00	9	4	e
GREY	0	50	150	50	3	0	Ir	1.50	4	2.61	9.60	6.40	3.84	0.00	0.00	4.80	0.96	0.48	8	4	e
GUNG	0	100	20	0	5	0	Li	12.00	8	1.10	0.05	0.45	0.00	0.00	0.00	0.00	0.05	0.00	7	2	r
GWEL	0	20	10	0	5	2	Ro	3.50	8	1.60	4.00	16.00	0.00	3.60	0.00	0.40	0.60	0.04	5	4	s
HAR1	0	0	0	0	5	0	Ir	1.50	4	2.38	0.30	0.00	0.15	0.03	0.00	0.12	0.00	0.00	7	1	e
HAR2	0	60	30	20	4	0	El	0.50	5	3.19	0.45	0.30	0.00	0.09	0.14	0.27	0.00	0.09	9	2	e
HAZE	0	10	10	0	5	0	Ro	13.00	7	1.47	0.08	3.92	0.00	0.00	0.00	0.06	0.02	0.00	1	2	bp
HEBB	0	25	20	0	4	0	Ir	11.50	3	1.59	3.60	0.40	0.18	0.36	0.00	0.36	3.24	0.00	8	4	b
HEND	0	0	0	0	5	2	St	13.00	8	1.22	0.10	0.40	0.09	0.01	0.00	0.00	0.00	0.00	2	1	bp
HERD	1	0	0	0	5	6	Ro	4.00	8	1.16	200.00	50.00	2.00	180.00	0.00	10.00	2.00	0.00	4	6	s
HOLM	0	0	0	0	4	1	El	17.50	4	1.75	10.00	0.00	0.00	1.00	0.00	8.00	2.00	0.00	8	4	bp
HOPE	0	0	0	0	5	1	Ro	5.50	8	1.52	0.19	0.56	0.15	0.02	0.00	0.02	0.00	0.00	2	1	sb
HURS	0	0	0	0	5	0	Ov	40.00	7	1.49	5.50	49.50	4.95	0.06	0.00	0.55	0.28	0.28	2	5	0.
HYDE	1	0	0	0	5	1	Ro	2.50	8	1.31	0.60	1.40	0.00	0.03	0.00	0.60	0.06	0.00	7	2	b
JAME	0	0	0	0	4	0	El	14.75	4	1.34	9.90	0.10	0.00	8.91	0.00	0.50	0.99	0.00	4	6	bp
JAND	0	0	0	0	4	0	Ro	10.50	8	1.47	115.00	115.00	11.50	103.50	0.00	5.75	5.75	0.00	4	6	b
JOHN	0	0	0	0	5	1	St	11.00	8	2.00	0.05	0.45	0.03	0.03	0.00	0.00	0.00	0.00	2	2	b
JOO1	0	25	75	0	4	1	El	6.00	7	2.43	0.80	7.20	0.40	0.12	0.00	0.12	0.04	0.00	2	1	s
JOO2	1	50	10	0	4	1	Ov	6.00	7	2.06	20.00	0.00	16.00	2.00	0.00	2.00	4.00	0.00	6	5	s
JOON	1	70	30	40	3	1	Li	5.50	8	1.80	110.00	440.00	22.00	88.00	0.00	5.50	5.50	1.10	5	6	s
JULI	0	0	0	0	5	0	Si	45.00	8	1.10	0.03	0.48	0.02	0.00	0.00	0.00	0.00	0.00	1	3	d
KARA	0	10	20	0	5	0	Ro	11.00	5	1.10	33.83	304.47	33.83	1.69	0.00	0.00	0.00	0.00	2	5	0.
KARD	0	0	0	0	5	1	St	9.00	6	1.00	0.25	0.25	0.00	0.25	0.00	0.00	0.00	0.00	4	2	p
KARW	0	0	0	0	5	0	Ov	11.50	3	1.92	1.50	0.00	0.90	0.60	0.00	0.00	0.00	0.00	4	1	bp

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
KAWI	1	50	100	0	3	0	Li	16.50	8	1.39	0.04	0.16	0.00	0.00	0.00	0.00	0.04	0.00	7	2	r
KEMP	0	25	30	0	4	0	Li	3.00	8	1.39	14.02	2.28	0.70	0.70	0.00	11.21	0.70	0.00	8	4	y
KEMS	1	100	200	100	2	1	Ov	3.50	5	2.21	7.50	17.50	7.13	0.38	0.00	6.00	0.38	0.00	7	4	r
KENT	0	15	25	0	4	1	Si	2.00	8	2.38	0.15	0.85	0.00	0.06	0.00	0.02	0.08	0.00	6	2	r
KEOG	0	50	25	25	3	0	Ir	4.50	5	1.90	12.80	3.20	0.00	1.92	0.00	8.96	1.28	0.64	8	4	r
KING	0	0	0	0	5	1	St	16.00	4	1.20	0.12	0.28	0.12	0.00	0.00	0.01	0.00	0.00	2	1	p
KOGO	0	50	50	25	4	1	Ov	6.00	8	1.34	4.80	7.20	0.00	4.32	0.00	0.24	0.48	0.00	4	4	sb
LAKE	1	0	0	0	5	0	Ir	8.50	5	3.11	0.40	0.00	0.12	0.24	0.00	0.08	0.04	0.02	5	2	bp
LAKS	1	0	0	0	5	0	Ro	13.50	7	1.85	0.46	1.82	0.00	0.32	0.00	0.05	0.09	0.00	5	2	b
LANC	0	50	20	0	4	0	Li	7.50	8	1.24	0.10	0.90	0.01	0.10	0.00	0.00	0.01	0.00	3	2	r
LEED	0	0	0	0	5	1	El	7.00	4	1.00	0.03	0.07	0.00	0.00	0.00	0.03	0.00	0.00	7	2	r
LIMA	0	0	0	0	5	1	El	1.00	6	2.27	0.02	0.29	0.00	0.01	0.00	0.00	0.00	0.00	1	3	e
LMOG	0	0	0	0	5	0	St	70.00	8	0.00	0.00	0.75	0.00	0.00	0.00	0.00	0.00	0.00	1	*	d
LOCH	1	50	180	100	3	1	Ir	5.20	8	2.03	200.00	50.00	0.00	160.00	0.00	40.00	40.00	2.00	5	6	s
MANL	0	0	0	0	5	1	Ro	4.50	8	2.17	0.30	5.70	0.03	0.00	0.00	0.09	0.18	0.00	1	2	sb
MANR	0	0	0	0	5	1	El	4.50	0	2.37	3.00	0.00	1.50	1.50	0.00	0.30	0.00	0.00	4	4	q
MANS	0	0	0	0	5	2	El	4.50	5	3.14	7.20	0.80	0.36	1.80	0.00	2.88	2.88	0.00	6	4	q
MARA	0	30	10	0	4	1	El	8.75	8	2.30	0.70	2.80	0.04	0.42	0.00	0.04	0.28	0.00	5	2	p
MARI	0	80	20	0	2	0	Ro	9.00	7	1.69	38.10	88.90	3.81	36.20	0.00	1.91	5.72	0.38	5	6	b
MARR	0	100	10	0	3	0	Si	6.50	8	2.04	0.24	0.06	0.02	0.22	0.00	0.02	0.06	0.00	5	2	r
MARY	0	20	10	0	5	4	Ir	14.00	8	1.64	2.00	18.00	0.00	0.20	0.00	1.60	0.30	0.00	7	4	bp
MATH	0	70	20	0	3	0	Ir	10.00	5	1.53	2.80	0.70	0.14	0.14	0.00	0.28	2.24	0.00	8	4	b
MAYC	1	0	0	0	5	0	Ir	2.00	8	1.00	0.04	3.96	0.04	0.00	0.00	0.00	0.00	0.00	1	3	e
MAYF	0	50	2	0	5	2	St	4.00	8	1.00	0.02	0.29	0.02	0.00	0.00	0.00	0.00	0.00	1	3	r
MAYW	0	0	0	0	2	0	Li	0.05	5	1.42	0.95	0.05	0.05	0.10	0.86	0.01	0.01	0.01	9	4	e
MCDO	1	0	0	0	5	4	Ir	0.50	8	1.89	0.15	2.85	0.03	0.11	0.00	0.02	0.00	0.00	1	2	b
MCLA	0	80	80	10	3	0	Ov	0.75	7	2.58	69.70	100.30	13.94	55.76	0.00	13.94	13.94	0.00	5	6	sb
MEAL	0	25	20	0	2	1	Ov	2.00	7	1.79	50.51	27.20	0.51	25.25	0.00	10.10	0.51	0.00	5	6	sb
MEAR	0	20	10	0	4	1	Ir	2.00	3	1.91	2.00	0.00	1.60	0.40	0.00	0.20	0.10	0.00	5	1	bp
MELA	0	100	200	50	2	0	Li	19.00	0	3.12	0.90	0.10	0.63	0.05	0.00	0.45	0.45	0.01	8	*	b
MIL1	0	0	0	0	5	0	Ov	5.00	4	1.69	0.10	0.40	0.08	0.00	0.00	0.00	0.03	0.00	7	1	bp
MIL2	0	0	0	0	5	1	Ov	6.00	4	1.04	0.70	0.30	0.70	0.00	0.00	0.01	0.01	0.00	2	1	bp
MIL3	0	0	0	0	5	0	Ro	9.00	5	1.00	0.25	0.75	0.25	0.00	0.00	0.00	0.00	0.00	2	1	p
MILS	0	0	0	0	5	0	Ro	5.00	7	1.00	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	8	4	bp
MOGU	0	0	0	0	4	0	Ov	55.00	4	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	1	*	dp
MONG	1	0	0	0	5	3	Ro	5.00	8	1.58	3.50	66.50	0.35	2.80	0.00	0.35	0.07	0.00	1	4	s

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
MONI	0	0	0	0	5	0	Ir	8.00	8	1.02	0.05	0.15	0.00	0.05	0.00	0.00	0.00	0.00	3	2	bp
MOOR	0	50	30	0	4	1	Ir	7.50	6	3.00	4.50	1.50	0.00	1.35	0.00	1.80	1.35	0.05	6	4	p
MTBR	0	75	50	0	4	0	Ov	1.50	6	2.49	2.25	12.75	0.00	1.35	0.23	0.23	0.56	0.00	5	4	s
MUCR	1	0	0	0	4	0	Ro	26.50	3	2.00	2.10	0.90	0.21	0.53	0.00	1.47	0.02	0.00	6	4	bp
MUSS	1	0	0	0	4	0	Ir	19.00	8	1.25	0.10	0.90	0.00	0.01	0.00	0.00	0.10	0.00	7	2	bp
NAMM	0	100	150	50	3	0	Ov	35.00	8	2.86	13.52	54.08	0.00	9.46	0.00	8.11	5.41	0.00	5	6	0.
NEER	0	40	20	30	4	1	Ir	5.00	5	1.14	28.00	7.00	0.00	28.00	0.00	0.56	1.40	0.00	4	6	s
NGIB	1	25	75	0	5	2	Ir	13.75	5	1.94	20.00	0.00	16.00	2.00	0.00	3.00	2.00	0.00	6	5	b
NICM	0	30	15	0	5	1	El	14.25	5	2.48	0.80	1.20	0.08	0.24	0.00	0.08	0.52	0.00	6	2	bp
NICO	0	0	0	0	5	1	Ir	14.00	4	1.25	8.00	0.00	7.20	0.08	0.00	0.40	0.40	0.00	2	5	bp
NICS	0	75	10	0	4	2	El	4.00	8	2.88	3.60	2.40	0.72	1.08	0.00	0.36	2.16	0.00	6	4	r
NINE	0	50	200	100	2	0	Ov	5.50	8	1.89	24.00	6.00	0.00	16.80	0.00	7.20	1.20	0.00	5	6	bp
NLAK	0	70	30	0	4	0	Ov	5.50	8	3.37	2.50	47.50	0.25	0.75	0.00	0.50	1.25	0.13	1	4	sb
NOON	0	50	100	50	2	0	Li	13.00	7	1.52	0.02	0.09	0.00	0.00	0.00	0.00	0.01	0.00	7	2	r
NOWE	0	90	200	50	2	1	Ro	4.75	8	1.81	2.50	22.50	0.25	2.00	0.00	0.25	0.25	0.00	3	4	s
NROS	0	0	0	0	5	0	Li	1.25	7	1.32	0.50	0.00	0.50	0.00	0.00	0.01	0.08	0.00	7	1	y
OLDB	0	0	0	0	5	1	Ir	9.50	4	1.34	0.18	0.08	0.15	0.00	0.00	0.00	0.03	0.00	7	1	p
PARR	0	50	5	0	3	1	Ir	4.00	6	3.28	5.40	0.60	1.62	1.62	1.89	0.27	0.00	0.00	9	4	e
PAU1	0	0	0	0	5	0	Ov	8.00	5	1.72	0.15	0.60	0.05	0.11	0.00	0.00	0.00	0.00	3	2	p
PEHA	0	0	0	0	5	0	Ir	6.00	4	1.14	1.00	0.00	1.00	0.05	0.00	0.02	0.00	0.00	2	1	p
PELI	0	50	15	0	3	0	El	0.50	6	2.12	0.16	1.44	0.00	0.02	0.13	0.02	0.02	0.02	9	2	e
PEPP	0	100	30	0	4	0	Ov	8.00	8	3.13	21.00	7.00	4.20	10.50	0.00	2.10	8.40	0.00	5	6	sb
PERR	1	0	0	0	5	1	Ov	2.75	7	1.20	1.20	4.80	0.00	1.20	0.00	0.06	0.06	0.00	3	4	s
PINB	0	90	5	0	5	1	Si	9.75	8	3.08	0.45	2.55	0.09	0.02	0.00	0.16	0.18	0.00	7	2	r
PINE	0	75	100	0	3	0	Ro	2.00	8	2.38	2.00	3.00	0.00	0.10	0.00	1.20	0.60	0.20	7	4	b
PINR	1	0	0	0	5	1	El	4.75	4	1.52	0.10	1.90	0.08	0.00	0.00	0.01	0.01	0.00	1	1	r
PIPI	0	80	180	80	4	1	Ov	3.50	8	1.66	35.00	15.00	3.50	28.00	0.00	1.75	3.50	0.00	5	6	s
PUNC	1	0	0	0	5	1	Ov	1.00	8	2.59	18.75	6.25	3.75	12.19	0.00	4.69	0.94	0.38	5	6	q
PUNR	0	50	5	0	5	1	St	15.75	4	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1	*	bp
REGA	1	100	50	20	3	0	Li	34.00	8	1.64	2.10	0.90	0.21	0.21	0.00	0.10	1.89	0.04	6	*	r
RIVD	0	100	200	100	1	0	Ir	10.50	8	2.20	1.20	0.70	0.00	0.72	0.00	0.72	0.06	0.01	6	2	b
RIVF	0	80	10	0	4	1	Si	14.50	8	1.98	0.90	0.10	0.00	0.05	0.00	0.23	0.63	0.05	8	4	r
ROBE	0	0	0	0	5	0	Ov	0.10	3	1.00	0.20	0.80	0.20	0.00	0.00	0.00	0.00	0.00	2	1	e
ROCK	1	0	0	0	5	1	St	2.50	8	1.00	0.02	0.98	0.02	0.00	0.00	0.00	0.00	0.00	1	3	q
ROGE	0	0	0	0	4	0	Ir	7.00	2	1.89	9.00	0.00	6.30	2.70	0.00	0.00	0.45	0.00	3	5	bp
RONS	1	0	0	0	5	1	Ov	4.00	8	1.02	0.01	0.99	0.01	0.00	0.00	0.00	0.00	0.00	1	3	b

Code	Islands	Perc. buff.	Buff. width	Buff. pristine	Disturb.	Drains	Geometry type	Distance coast	Perm-anence	Simpson diversity	Closed water (ha)	Open water (ha)	Grass (ha)	Reed/ rush (ha)	Samphire (ha)	Shrub/ bush (ha)	Tree (ha)	Dead tree (ha)	Veg. complex	Veg. Upgma	Consang-uineous suite
ROSA	0	0	0	0	5	0	Ro	1.00	7	1.24	0.40	0.10	0.02	0.02	0.00	0.00	0.38	0.00	8	2	e
SAND	0	80	30	0	2	0	Ov	27.00	6	1.66	6.00	4.00	0.60	0.60	0.00	4.80	0.30	0.00	6	4	bp
SCEE	0	30	30	0	4	1	Ir	0.05	6	2.86	8.00	2.00	0.00	1.60	5.60	1.60	0.80	0.80	9	4	e
SCEW	0	0	0	0	5	1	Li	0.25	5	1.02	0.10	0.40	0.00	0.10	0.00	0.00	0.00	0.00	3	2	e
SERD	0	0	0	0	5	1	Si	10.50	8	1.36	0.60	1.40	0.06	0.51	0.00	0.03	0.00	0.00	3	2	r
SPEC	0	90	75	0	3	1	Ov	6.00	7	1.73	76.00	4.00	7.60	1.52	0.00	15.20	68.40	0.00	8	6	sb
StAR	0	50	200	100	2	1	Ir	0.50	7	1.39	0.40	3.60	0.00	0.00	0.00	0.32	0.06	0.00	7	2	s
StOK	0	0	0	0	5	0	Ir	12.00	4	1.04	1.60	0.40	1.57	0.00	0.00	0.03	0.00	0.00	2	1	bp
SWAN	0	0	0	0	3	1	Li	16.50	7	1.10	0.03	0.57	0.00	0.00	0.00	0.00	0.03	0.00	1	2	r
TALB	0	100	10	0	4	0	Ov	9.00	7	1.92	1.20	1.80	0.00	0.48	0.00	0.72	0.00	0.00	6	2	sb
TANG	0	100	200	100	1	0	Ir	21.00	4	3.45	0.60	0.40	0.30	0.12	0.00	0.12	0.24	0.00	6	1	b
TAWA	0	0	0	0	5	0	Ir	32.00	4	2.06	1.00	0.00	1.00	0.10	0.00	0.20	0.20	0.00	6	1	bp
THOL	0	100	100	90	2	2	Ro	5.00	7	1.34	37.50	212.50	0.00	33.75	0.00	1.88	3.75	0.00	5	6	sb
THOM	0	0	0	0	5	1	St	4.50	6	2.19	0.02	0.38	0.01	0.01	0.00	0.00	0.00	0.00	1	3	bp
THOS	1	0	0	0	5	0	Ir	4.50	6	1.37	0.20	1.80	0.00	0.02	0.00	0.18	0.01	0.00	7	2	bp
USWA	0	0	0	0	5	0	Li	27.00	8	2.00	0.01	0.50	0.00	0.00	0.00	0.00	0.00	0.00	1	*	r
WALL	0	0	0	0	4	0	Ir	30.00	5	1.76	3.60	5.40	0.00	0.00	0.00	2.52	1.08	0.04	8	4	bp
WANN	0	100	100	30	4	0	El	59.00	8	2.85	62.00	62.00	3.10	3.10	0.00	31.00	6.20	24.80	8	6	dp
WART	0	100	100	25	4	0	Ov	15.50	4	3.31	1.80	4.20	0.72	0.54	0.00	0.18	0.90	0.00	6	4	b
WATE	0	50	50	90	3	1	Ir	7.00	8	2.08	0.30	0.70	0.03	0.27	0.03	0.03	0.03	0.01	6	2	e
WCOR	1	30	20	0	4	0	Ro	11.50	8	1.27	4.00	6.00	0.00	0.08	0.00	3.60	0.40	0.00	8	4	bp
WEEB	1	0	0	0	5	1	Ir	5.50	8	2.49	0.05	0.95	0.00	0.03	0.00	0.01	0.01	0.00	1	2	s
WHIP	0	50	200	50	2	0	Li	18.00	2	2.43	2.00	0.00	0.02	2.00	0.00	0.40	1.60	0.02	5	*	bp
WHIT	0	0	0	0	5	0	Ov	10.50	5	1.10	0.35	0.00	0.35	0.00	0.00	0.02	0.00	0.00	2	1	p
WIGI	0	0	0	0	5	0	Ro	9.50	4	1.20	0.50	0.00	0.50	0.00	0.00	0.05	0.00	0.00	7	1	bp
WILC	1	100	50	50	3	1	Si	3.00	8	3.80	0.45	1.05	0.09	0.14	0.00	0.11	0.23	0.02	6	2	e
WILD	0	0	0	0	5	1	St	7.00	4	1.00	0.01	0.19	0.01	0.00	0.00	0.00	0.00	0.00	1	3	r
WILG	0	100	150	90	2	0	Ro	4.50	5	2.25	10.00	0.00	0.00	8.00	0.00	0.50	8.00	0.50	6	*	s
WILS	0	0	0	0	4	3	Ir	0.05	6	1.91	3.00	3.00	0.00	2.25	0.00	0.30	0.75	0.00	5	4	e
WRIG	0	0	0	0	5	2	Ro	15.00	5	2.38	1.25	23.75	0.50	0.63	0.00	0.13	0.00	0.00	1	1	bp
WSWR	1	0	0	0	3	0	Li	24.75	8	1.22	0.20	0.80	0.00	0.02	0.00	0.18	0.00	0.00	7	2	r
YANG	0	67	100	0	4	1	Ro	6.00	8	1.98	9.00	81.00	0.00	2.25	0.00	0.45	0.45	6.30	7	4	sb
YOND	0	100	180	100	1	0	Li	5.00	8	1.41	0.10	1.90	0.00	0.10	0.00	0.01	0.01	0.00	4	2	s
YOUN	0	0	0	0	5	0	Ro	9.00	6	2.27	0.06	0.14	0.04	0.00	0.00	0.01	0.01	0.00	7	3	p
YUND	0	75	50	5	3	1	Ir	2.50	6	3.08	6.00	9.00	0.00	0.60	1.20	3.00	0.30	0.90	9	4	e

Appendix 6 Preferences of waterbird species for classes of each environmental variable as determined by chi-square contingency table analysis. Numbers in parenthesis indicate number of classes in each variable, with the preferred class indicated for each species. Species marked with (*) had few occurrences and did not always satisfy the statistical requirements of the test. Refer to Chapter 5 (Tables 5.6 and 5.7) for summary and class ranges for each variable (Geometry types: EL = elongate, IR = irregular, LI = linear, OV - ovoid, RO = round, SI = sinuous and ST = straight)

	Apel	Auck*	Augb	Ausb*	Back*	Blag*	Brag*	Bast	Bbar*	Bbid	Bfop	Blag*	Btnh	Bwst	Cast*	Cate*
Area (4)	4	4	3	4	4	2	2	4	2	4	4	4	4	4	2	2
Shoreline (4)	4	4		4	4	3	3	4	4	4	4	4	4	4	3	3
% veg cover (4)	3	3		3	3	1	3	2	3			3			3	4
Veg types (4)		4		2	3	1	3		4	3		3			3	4
Island P/A (2)	P	A		A	A	A	A		A			A			A	A
Buffer-width (4)	3	4		4	4	1	2	4	2			3			2	1
Perc buffered (4)	2	4		4	3	1	3		3	2		3		3	2	1
Buff. pristine (3)			2		3	2	1	1	2	1			1		2	1
No. drains (3)			1		3	3	1	2		2	3		1		3	2
Geometry (7)	OV	OV	OV	RO	OV	OV	IR	RO	LI	RO	OV	RO		OV	IR	RO
Disturbance (4)			2		1	1	4	3		1			1	2		3
Distance to coast (4)	2	1		3	3	3	1		1			1	4		1	1
Permanence (4)		2	2	2	2	3	3		3	3		2			3	1
Open water ha (4)	4	4	4	4	4	3	3	4	4	4	4	4	4	4	3	2
Grass ha (4)			4		1	3	1	1		1			4		4	1
Reeds/rushes ha (4)	4	4		4	4	2	2	4	2	4	3	4		3	2	2
Samphire ha P/A (2)	P	A		A	A	A	P		P	A		A		P	A	A
Shrubs/bushes ha (4)	3	3	4	3	3	1	2		2	4	4	3	4	4	2	3
Trees ha (4)			4		4	4	2	2		4	4		4		4	2
Dead trees ha P/A (2)	P	A		A	A	A	A		P			A			A	P
Closed water ha (3)	3	3	3	3	3	2	2	3	3	3	3	3	3	3	1	2
Veg complexes (9)	9	5		5	5	2	9		9			5			1	8
% grass (3)		2		1	2	1	1	2	1			1			1	2
% reeds/rushes (3)	3	2		2	3	2	2		2	2		2		2	3	2
% samphire P/A (2)		A		A	A	A	P		A	A		A		P	A	A
% shrubs/bushes (3)		2		2	2	1	2		2			2	3		2	2
% trees (3)	2	2	2	2	2	2	2		2	2		2			2	3
% dead trees P/A (2)		A		A	A	A	A		P			A			A	P
Turbidity (4)		3	3	3	3	4	1		4	3	2	3		4	1	
Colour (4)	1	3	2	3	3	1	1		1	2		3		2	1	
Total N (4)		4		4	4	2	3	4	1	4	4	2	4	4	2	
Total P (4)		2		3	3	1	1		2	2	2	1			1	

	Chtl	Coms*	Coot	Cret*	Crew	Curs*	Dart	Dumo	Eare*	Exot	Fait*	Fred*	Gank	Gcgb	Gloi*	Grec	Grkn*	Grte
Area (4)	4	2	3	2	4	4	4	4	4		2	2	4	4	4	4	2	4
Shoreline (4)	4	3	4	2	4	4	4		4		3	3	4	4	4	4	3	4
% veg cover (4)		2		3		3			1	2	3	4			3		3	
Veg types (4)	4	3	3	3		3			1		3	3			4		3	4
Island P/A (2)		A	P	A		A		P	P	P	A	A			A	P	A	P
Buffer-width (4)		1		2		3	2		1	2	2	4	3		3	2	2	4
Perc buffered (4)		1		3		3	2	2	1	2	3	1	2		3	2	3	2
Buff. pristine (3)	1		1		1	2	1			1	1	1	1			1		1
No. drains (3)	2		1		2	3	2		3	3	2	2	1			1	3	2
Geometry (7)		OV	OV	IR		OV			ST		IR	EL	OV	RO	RO		IR	
Disturbance (4)	4		4		1	3	1	3		4		3	3			1		3
Distance to coast (4)		4		1		2	1	2	2	2	1	3			4	2	1	1
Permanence (4)		3	2	3	3	2	3	3	3	3	3	2		3	2	3	3	3
Open water ha (4)	4	3	3	3	4	4	4	3	4	3	3	4	4	4	4	4	3	4
Grass ha (4)	2		1		1		1			2		1	2	4		4		1
Reeds/rushes ha (4)	4	2	4	2	4	4	3	3	3		2	2	4	4	4	4	2	3
Samphire ha P/A (2)		A	A	P		A			A		P	A	P		A	P	P	P
Shrubs/bushes ha (4)		1	4	2	4	2	4	3	1		2	2	4	4	3	4	2	3
Trees ha (4)	4	4	2	4	2	4	2		2	2	2	2	4		4	4	4	2
Dead trees ha P/A (2)	P	A		A		A	P		A		A	A		P	A	P	A	P
Closed water ha (3)	3	1	3	2	3	3	2		2		2	3	3	3	3	3	2	3
Veg complexes (9)		1	5	9	4	5	7		1	7	9	6			4	5	9	
% grass (3)		1	3	1		2	1	1	2	1	1	2			2	1	1	1
% reeds/rushes (3)		2	2	2	3	2	2	2	1		2	2			3		2	2
% samphire P/A (2)		A		P		A			A		P	A	P		A		P	P
% shrubs/bushes (3)		2	2	2		2		2	1	2	2	2	2		2		2	2
% trees (3)		2	2	2	2	2		2	1	2	2	3			2	2	2	
% dead trees P/A (2)	P	A		P		A	P	P	A		A	A		P	A	P	A	P
Turbidity (4)		1	3	1	2	1			2		1	1			1		1	
Colour (4)		2		1		3		2	1	1	1	4		1	3		1	1
Total N (4)		4	2	2		4			3		2	3			4	2	2	
Total P (4)		4		1		1		2	2	2	1	4			3	2	1	

	Apel	Auck*	Augb	Ausb*	Back*	Blag*	Brag*	Bast	Bbar*	Bbid	Bfop	Blag*	Btnh	Bwst	Cast*	Cate*	Chtl	Coms*	Coot	Cret*	Crew	Curs*	Dart	Dumo	Eare*	Exot	Fait*	Fred*	Gank	Gcgb	Gloi*	Grec	Grkn*	Grte
Chl-a (4)	4	4		4	4	3	2	4	2	4	4	4		4	2			3	3	2		4			1		2	2	4		3		2	3
Phaeophytin (4)		4		4	4	2	2	4	2		4	4		4	3			1		2		4			2		2	4		1	4		2	
Depth (4)	4	3	4	2	3	4	1	3	1	4		2			1			4	4	1	4	1	4	4	1	4	1		1	4		4	1	4
Salinity (5)	5	2	1	3	3	1	5	5	3		3	3		5	4			4	1	4	1	3	4	1	1	1	4		5		2		4	3
pH (6)	5	4	6	4	4	3	4	5	4	5	5	4		5					5	4	6	5	5	6	4		4		5	5		5	4	5
Temperature (4)	4	4	4	1	4	3	4	4	4	4	4	4	4	4				4	2	3	4		4	4	2	2	4		4	4	4		4	4
DO (5)	5	4		4	4	4	4		4		4	4		4				5		4				1	2		4		4	4		4	4	4
Macrocover (4)		1		1	4	1	1		1	2	1	1							2	1			1		1	1	1	2		2		1	1	
Macrobiomass (4)		1	4	1	4	1	1		1		1	1		1					4	1	4		1		1	1	1	4				1	1	
Fish abundance (4)		1		1	1	3	2		1			2		1						1	4		4	4	3	2	2			3			2	4
Zooplankton (4)		4	4	3	3	4	3		4	4	4	1	4	4	1				4	1				2	1	2	1		2				1	
Wading zone (4)	4	4	2	4	4	2	3	4	1	1	4	4	3	4	3				1	3	1	4	1	1	3	1	3		4		4	1	3	
Season (4)	3	3	4	3	3	3	3	3	2	2	3	1	3	3		2		2	2	1	2	3	3		1			2	3	3				3
UPGMA veg groups (6)	6	6		6	6	5	4	6	6	6	6	6	6	6	2	4	6	2	6	4	6	6	4	2	3	2	4	4	6	6	6	6	4	6
Total number of significant preferences	27	-	17	-	-	-	-	20	-	29	22	-	14	30	-	-	10	-	30	-	24	-	26	26	-	25	-	-	23	21	-	28	-	29

	Gryp*	Gytl	Hard	Hhgb	Lgop*	Libc	Ligd	Lith*	Lite	Lots*	Lpic	Maha	Mand	Mars*	Musd	Ospy*	Pabd	Pchn	Pead	Pecs*	Piec*	Pioy*	Pusn	Rcap	Rekn*	Rens*	Rkdo	Rnav	Rnhn	Rosl*	Rutu*	Saci	Shel
Area (4)	2	4	4	4	4	4	4	4		4	1	4		4	4	2			4	4	2	1	4	4	2	4	4	4	3	3	2	4	4
Shoreline (4)	3	4	4	4	3	4	4	4	4	4	1	4		4	4	3			4	4	3	1	4	4	3	3	4	4	4	4	3	4	4
% veg cover (4)	3				2			2		3	4			3		1				2	3	2			3	2		2		3	3		
Veg types (4)	3			3	4			3	4	3				3	3	3				3	3	3			3	3		3	3	3	3		
Island P/A	A				A			A		A			P	A		A				A	A	A			A	A				A	A		
Buffer-width (4)	2			4	1	2	2	4		3	1	4		4	4	2				4	2	2	2		2	3		4	2	2	2	2	
Perc buffered (4)	3				1	3	3	3		3	1	4	2	4	2	3				3	2	3	2		3	3		3	2	3	3	2	
Buff. pristine (3)	1			2	1			2		1		2	1	2	2	3				1	1	1		2	1	1		2		1	1		
No drains (3)	2		3		1	2	3	3		2				3		2				2	2	2	2	3	2	2			2	2	2		
Geometry (7)	IR	RO	OV	OV	OV			OV		OV		OV		RO	RO	IR		OV	RO	RO	IR	LI	OV	OV	IR	OV	OV	RO		EL	IR	IR	OV
Disturbance (4)	3			2	4		1	1		3		2		1	3	2	3			3	3	3	3		3	2		2	3	2	3	3	
Distance to coast (4)	1				4	2		3	1	3				1	2	2			4	3	2	1	2		1	3	4			4	1		
Permanence (4)	3	2	3		2	3		2		2	3		3	2	3	3	3	2		3	3	3	3		3	2				3	3		
Open water ha (4)	3	4	4	4	4	4	4	4		4	3	4		4	4	3		1	4	3	3	3	4	4	3	3	4	4	4	4	3	4	4
Grass ha (4)	1			4	3		3	3		4		3		4	4	1		4		1	2	1		3	1	1		3		3	1		4
Reeds/rushes ha (4)	2		4		2	4	4	4	4	3	2	4		4	4	2			4	3	3	2	4	4	2	2	4	4		3	2	3	
Samphire ha P/A (2)	P				A		P	A	P	A			A	A		P				A	A	P			P	A				A	P		
Shrubs/bushes ha (4)	2		4	4	3	4	4	3		4	4	4		3	4	3			4	2	2	1	4		2	3	3	3	4	3	2	4	
Trees ha (4)	2		4	4	2		4	4	4	4		4		4	4	1			4	2	1	2	4		2	2	4	4	4	1	2	4	
Dead trees ha P/A (2)	A				P	P		A	P	A	P			A	P	A		A		A	A	A			A	A				P	A	P	
Closed water ha (3)	2	2	3	3	2	3	3	3	3	3		3		3	3	2		3	3	2	2	2	3	3	2	2	3	3	3	3	2	2	3
Veg complexes (9)	9	8			2		9	5	9	5				5	5	1				7	4	9	5		9	5			8	8	9		
% grass (3)	1				2	2		2		1	1		2	1	1	1		3		1	1	1	1		1	1			1	2	1	1	
% reeds/rushes (3)	2			2	2		3	2		2	2	3		3	2	2				2	2	2	3		2	2				2	2	3	
% samphire P/A (2)	P				A		P	A	P	A			A	A		P				A	A	P			P	A				A	P		
% shrubs/bushes (3)	2			3	2	3		2		2	3	3		2	3	2				2	2	2	2		2	2		2		3	2	2	
% trees (3)	2		2	2	2		2	2		2				2	2	1				2	2	1	2		2	2		2	3	1	2	2	
% dead trees P/A (2)	A				P	P		A	P	A	P			A		A				P	A	A			A	A				P	A	P	
Turbidity (4)	1			3	3		2		1	3		3		3		1			3	1	1	1	3		1	1	3						
Colour (4)	1	2	2	2	3	2			1	3				3		1		3	2	3	2	1		1	1	1							
Total N (4)	2	4		4	4	2			3	4				4	4	2	2	4	4	4	2	2			3	4	4	4				2	4
Total P (4)	1	4		4	4		2		3	3				3		1			4	3	3	1	2		1	1							
Chl-a (4)	2	4	4	4	4	3			2	4				4	4	2			4	3	2	2			2	3	4	4				3	4
Phaeophytin (4)	2	4		4	1				1	4				4		1		4	4	4	3	2			2	1	4	4					4
Depth (4)	1	3	4	4	2	4	4	3		4	4	4	4	2	4	1	4	3	4	4		1	4	1	1	1			3	2	1	2	3

	Gryp*	Gytl	Hard	Hhgb	Lgop*	Libc	Ligd	Litb*	Lite	Lots*	Lpic	Maha	Mand	Mars*	Musd	Ospy*	Pabd	Pchn	Pead	Pecs*	Piec*	Pioy*	Pusn	Rcap	Rekn*	Rens*	Rkdo	Rnav	Rnhn	Rosl*	Rutu*	Saci	Shel
Salinity (5)	4	3			2	3		2	5	3			3	3	1	3	1		3	2	4	4	1	3	5	3	3	5		3	2		5
pH (6)	4	5	5	5	5	5	6	5		4	6	6	3	5	5	4	5		5	6		4	6	5	4	5	5	5		5	4	6	5
Temperature (4)	4		2		3	4	2	4		4	4			4	2	3	2	4	4	4		4		4	4		3			4	2	4	
DO (5)	4	5			4			4		4				4		3		5	5	4		4		4	4		4	4	1	4	3	5	4
Macrocover (4)	1				1	1		4		1			2	1	2	1		4		1		1	2		1			1		2	1		4
Macrobiomass (4)	1				1	1		3		1	4	4		1		1		4		1		1			1			1		2	1	4	
Fish abundance (4)	2	1		1	1	4		1		1				1		1			1	4		1			2		1		4	4	1	4	1
Zooplankton (4)	1	4	4	4	4			2		3		4		4	4	1			4	2	2	1	2		3		4			3	2		4
Wading zone (4)	3	3	1		3		1	1		4	1	1	2	4	1	3		4		1		3	1	4	3	4	4	4	2	3	3		4
Season (4)		2	2	2	3	2	2	3		3	2		2	3	2		4	2	3	3				3	3	3		1	2	3	2	3	2/4
UPGMA veg groups (6)	4	4	6	5	5	4	6	6	6	6	4	6		6	6	4		5	6	4	4		6	6	4	6	6	6	6	6	4	4	5
Total number of significant preferences	-	21	20	27	-	27	25	-	-	-	21	22	13	-	33	-	8	18	24	-	-	-	28	18	-	-	21	28	20	-	-	27	19

	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse*	Wfhn	Whit*	Woos	Wwgt*	Ybsl	Total number of significant preferences
Area (4)	4	4	4	4	4	4	4	1	4	4	4	4	41
Shoreline (4)	4	4	4	4	4	4	4	1	4	4	4	4	40
% veg cover (4)			2				3		2		3		5
Veg types (4)					3		3		3		2		10
Island P/A (2)							A		A		A		6
Buffer width (4)							3		4		4	3	18
Perc buffered (4)			2				2		4		4	3	21
Buff pristine (3)							2		2		3	2	11
No drains (3)			3	1		3	1		3		3		15
Geometry (7)	OV					OV	OV		OV	OV	RO		25
Disturbance (4)							1		1		1		12
Distance to coast (4)			2	3		2	2		3		3		16
Permanence (4)	2					3	2	2	2		2		21
Open water ha (4)	4	4	4	1	4	4	4	2	4	4	4	4	43
Grass ha (4)	4	3		4		4	2		1	4	1		14
Reeds/rushes ha (4)	3	4	3		4	4	4		4	3	4	3	34
Samphire ha P/A (2)			P	A			A		A		A	P	13
Shrubs/bushes ha (4)	4			4	4	4	4		3		3	4	32
Trees ha (4)	4			4	4	4	4		4	4	4	4	27
Dead trees ha P/A (2)			P				A		A		A	P	14
Closed water ha (3)	3	3	2	3	3	3	3	2	3	3	3	3	41
Veg complexes (9)			9	8			5		5		5		14
% grass (3)			1				2		1		1		16
% reeds/rushes (3)					3	2	3		2		2		17
% Samphire P/A (2)			P	A			A		A		A	P	10
% shrubs/bushes (3)							2		2		2		14
% trees (3)		2	2		2	2	2		2	2	2		21
% dead trees P/A (2)			P				A		A		A	P	12
Turbidity (4)		3					3			3			12
Colour (4)	2	3		3		2	3		3	3			18
Total N (4)	4	4		4			4	4	4	4		4	22
Total P (4)	4	3	2	4		2	3	3	3	3			15
Chl-a (4)		4		4		4	4	4	4	4		4	22
Phaeophytin (4)	4	4		4			4		4	4		4	14
Depth (4)	3		4	2		4	3		3		3		38
Salinity (5)		3	5	2			3	4	3	3	2	3	36

	Shov	Shts	Sigl	Snki	Spck	Swan	Wbse*	Wfhn	Whit*	Woos	Wwgt*	Ybsl	Total number of significant preferences
pH (6)	5	5	5	5	2	5	1	5	5	5	5	5	42
Temperature (4)		4		4			4	4	3	4	3		32
DO (5)		4	5		1	4	1	4	4		4	4	24
Macrocover (4)	3		1	4	2	4	1		1		3	4	21
Macrobiomass (4)	4		1		4	4	1		1		4		19
Fish abundance (4)							1		2		1		15
Zooplankton (4)	4		2	4		4	4	2	4		4		25
Wading zone (4)		4		4	1	4	4	4	4	4	4	4	39
Season (4)	2/4	3		3		4	3	2		3	1		39
UPGMA veg groups (6)	5	6	4	5	6	6	6		6	5	6	6	42
Total number of significant preferences	21	-	25	26	16	26	-	15	-	-	-	23	

Appendix 7 Preferences of breeding species of waterbird to classes of environmental variables, as determined by chi-square contingency table analysis. Number of classes in each variable are in parenthesis, with the preferred class indicated for each species (p<0.05). Species marked (*) had insufficiency occurrences for the test to be performed. Refer to Chapter 5 (Tables 5.8 and 5.9) for summary and class ranges for each variable (Geometry types: EL, elongate; OV, ovoid).

	Augb	Bbid	Coot	Dart	Dumo	Gytl	Hard	Lpic	Mand	Musd	Pabd	Pead	Pusn	Shel	Swan	Wfhn	Ybsl	Total number of significant preferences
Area (4)		4	3	*			4	3		4			4		4		*	7
Shoreline (4)		4		*						4	1		4		4		*	5
% vegetation cover (4)				*													*	0
Number of vegetation types (4)		4		*								4					*	2
Islands (P/A)	P	P		*			P			P					P		*	5
Buffer width (4)				*							2						*	1
Percent buffered (4)				*													*	0
Drains (3)	3	3	3	*	3						3		3		3		*	7
Buffer pristine (3)				*		1		2							2		*	3
Geometry type (7)			OV	*											OV	EL	*	3
Disturbance (4)	4			*								3					*	2
Distance to coast (4)	2			*		3					2		2		2		*	5
Permanance (3)	3			*		2					3						*	3
Open water area (4)		4	4	*						4	3		4		4	3	*	7
Grass cover (ha) (4)				*											4		*	1
Reed/rush cover (ha) (4)		3		*				3		4			4		3		*	5
Samphire cover (ha) (P/A)				*													*	0
Shrub/bush cover (ha) (4)		4		*				4		3		4			4		*	5
Tree cover (ha) (4)		4	4	*	2					4		4			4	4	*	7
Dead tree cover (ha) (P/a)				*							P	P			P		*	3
Closed water area (ha) (3)		3		*				3		3					3		*	4
Vegetation complexes (9)			5	*	4					5		8	4				*	5
UPGMA vegetation groups (6)		5		*	4			4		6			6		6		*	6
Grass cover (%) (3)				*	1								2				*	2
Reed/rush cover (%) (3)				*						3			3				*	2
Samphire cover (%) (P/A)			A	*													*	1
Shrub/bush cover (%) (3)			2	*				3		2		3					*	4
Tree cover (%) (3)		2	2	*	2					2	2	3			2	3	*	8
Dead tree cover (%) (P/A)				*													*	0
Turbidity (4)		*	1	*			*									*	*	1
Colour (4)		*		*			*									*	*	0
Total-N		*		*			*									*	*	0

	Augb	Bbid	Coot	Dart	Dumo	Gytl	Hard	Lpic	Mand	Musd	Pabd	Pead	Pusn	Shel	Swan	Wfhn	Ybsl	Total number of significant preferences
Total-P		*		*			*			1						*	*	1
Chl-a (4)		*		*			*									*	*	0
Phaeophytin (4)		*	4	*		4	*				4		4			*	*	4
Depth (4)			4	4	4	3				4	4	3	4		3			9
Salinity (5)			1														3	2
pH (6)	6			2	6						6		6		6			6
Temperature (4)	4	4	3	3	4	3	4		2		2		2		2			11
D.O. (5)			5	1				1				1					5	5
Macrocover (4)															4		4	2
Macrobiomass (4)			4						3						3			3
Fish abundance (4)	4	4	4	3	3		3			4	4							8
Wading zone (4)	1							1		1			1					4
Zooplankton (4)			1												4			2
Total number of significant preferences	9	14	18	5	10	6	4	9	2	17	13	10	15	0	22	4	3	

Appendix 8 Banding sites, their latitude and longitude, and the species and number of birds colour-marked

Site	Lat.	Long.	No. of birds	Species
Shenton Park	31 57	115 48	190	Pacific Black Duck
Lake Monger	31 55	115 49	7	Pacific Black Duck
McDougall Park	32 00	115 51	68	Pacific Black Duck
Perth Zoological Gardens	31 58	115 51	170	Pacific Black Duck
Mary Carroll Park	32 05	116 00	52	Pacific Black Duck
Emu-Ballajura Lakes	31 50	115 53	8	Pacific Black Duck
Loch Mcness	31 32	115 40	66	Pacific Black Duck
Joondalup Lake	31 45	115 47	155	Pacific Black Duck
Corio Swamps	32 32	115 52	204	Straw-necked Ibis
				Great Egret
				Yellow-billed Spoonbill
				Australian White Ibis
McCarleys Swamp	33 37	115 28	296	Straw-necked Ibis
				Great Egret
				Yellow-billed Spoonbill
				Australian White Ibis
				Rufous Night Heron
Barraghup Swamp	32 33	115 47	44	Yellow-billed Spoonbill
Chittering Lake	31 26	116 05	6	Yellow-billed Spoonbill
Lake Needonga	31 24	116 05	36	Great Egret
				Australian White Ibis
Booragoon Swamp	32 02	115 50	4	Australian White Ibis
Rosamel Swamp	33 11	115 43	9	Australian White Ibis
Australind Nature Reserve	33 17	115 42	36	Great Egret
Gibb Road Swamp	32 09	115 54	2	White-faced Heron
Clifton Road Swamp	32 49	115 43	4	Australian White Ibis
Perry Lakes	31 56	115 47	36	Pacific Black Duck
Hazelmere Lakes	31 54	116 00	27	Pacific Black Duck
				Australian Shelduck
				Grey Teal
Hyde Park	31 56	115 51	54	Pacific Black Duck
Ariti Avenue	31 44	115 48	63	Pacific Black Duck
Lake Clifton	32 50	115 41	59	Pacific Black Duck
Mogumber Farm Dam	31 02	115 50	8	Australian Shelduck
Cowalla Road Swamp	31 16	115 38	59	Pacific Black Duck
Caro Swamp	30 44	115 29	35	Straw-necked Ibis
Vasse River	33 39	115 20	3	White-faced Heron
Crackers Swamp	30 55	115 34	128	Straw-necked Ibis

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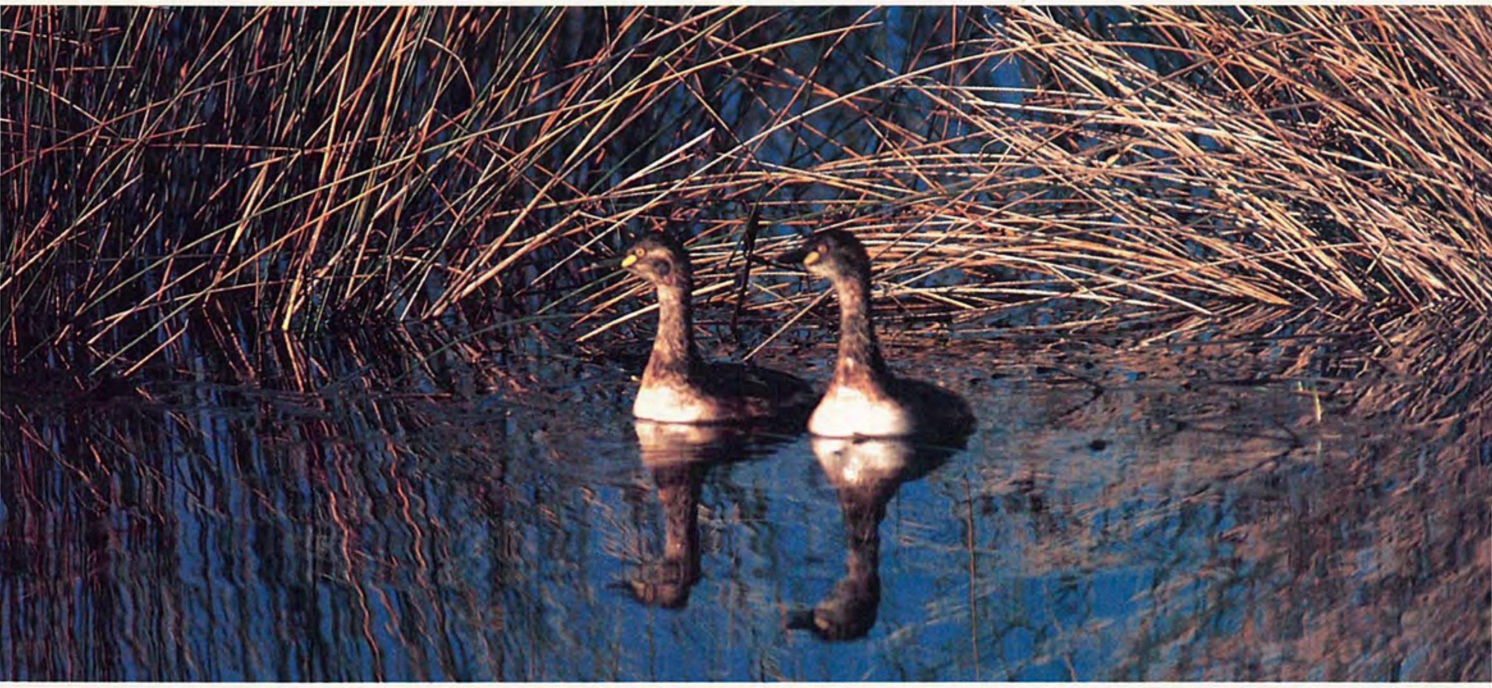

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