STUDY OF THE USE BY WATERBIRDS OF THE FLOODPLAINS OF THE VASSE AND WONNERUP ESTUARIES

PHASE 1 REPORT

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INTRODUCTION

The Vasse and Wonnerup Estuaries begin on the outskirts of the town of Busselton and extend approximately 10 kms to the north-east. Although recognised as being of great conservation value and one of the few sites in Western Australia listed under the Ramsar Convention on Wetlands of International Importance, they have been greatly modified by factors such as flood control and a long history of grazing by cattle and horses. They are also under increasing pressure from urban development.

The conservation value of this wetland area rests mainly on its importance for waterbirds and it has been included in surveys such as the 1981-1985 studies conducted by the Royal Australasian Ornithologists Union (Jaensch *et al.* 1988). Over 75 species of waterbirds have been recorded on the estuaries and numbers sometimes exceed 30,000. Numbers of waterbirds are highest in summer, when water levels are low and many other wetlands are dry; but many thousands of waterbirds are present from autumn through to spring. In winter and spring, the site is of importance for breeding waterfowl, in particular the Black Swan (Lane 1990).

While there is no question about the importance of the wetlands for waterbirds, little is known about how the waterbirds are using them. Almost all surveys of waterbirds on the estuaries have consisted of counts with opportunistic records of breeding, but little information has been collected on what wetland habitat the birds were in or what they were doing there. Such detailed information is becoming important as patterns of landuse around the estuaries change with growth of the Busselton urban area.

The estuaries do not have discrete boundaries as they can be 2 km wide in winter and virtually dry in summer. They include broad areas of seasonally-inundated floodplain supporting pasture, samphire *Halosarcia* spp. and *Salicornia* spp., sedgelands and remnants of once-extensive paperbark *Melaleuca* spp. woodland. On much of the Wonnerup and parts of the Vasse, these floodplains are subject to grazing, while some of the Vasse floodplains are being developed for urbanization. Future proposals for urban development are to be expected as much of the wetland system is privately owned.

The purpose of this study is therefore to gather data on patterns of usage of the two estuaries by waterbirds, paying particular emphasis on waterbird usage of floodplain areas. In addition, the study aims to gather information on the impact of disturbance upon waterbirds. Such information is needed to guide management and development in the area without compromising the conservation value of the site. Phase 1 of this study involved a review of literature and the design and initiation of a programme of field work.

Phase 2 of the study will involve the completion of the field programme, the analysis of results and the preparation of a final report, including recommendations.

METHODS

The project began in May 1994 with an initial review of literature to determine the most appropriate approach to the collection of data. Field trips then took place over the periods: 7-11 June, 9-13 August and 3-7 October 1994. Data collection for the survey of floodplain usage by waterbirds and for the impact of disturbance upon waterbirds was combined on these field trips.

The usage of floodplains by waterbirds

Because of seasonal variation in water level and the gentle slope of the land around most of the wetland area, it is difficult to define the extent of the floodplains around the Vasse and Wonnerup Estuaries. While the upper limit of flooding and therefore of the floodplains is at *ca.* AHD 1.5 m, the lower limit of the floodplains is less easily recognised. Around part of the Vasse Estuary, there are lines of vegetation which mark the limits of the main basin of the estuary, but such natural disjunctions are not always present and are absent from most of the Wonnerup Estuary. Therefore, the floodplain survey was based upon a suite of 47 sites, some of which included open water of the estuaries (these areas of open water may be dry in summer). This suite of sites covered all wetland habitat types around the estuaries and represented an almost total coverage of the wetland system. Individual sites included discrete pools in paddocks, open areas in samphire and areas of distinct vegetation types such as samphire, pasture, sedgeland and so on. The same route was taken on each survey of a site and the time and duration of each survey were recorded. Site descriptions were prepared on the first survey and were updated on subsequent visits, noting vegetation type and condition, water level, grazing and any changes due to human activities.

This approach to the surveys made it possible to record the presence and abundance of waterbirds in different habitat types in a way that could be compared between surveys. Thus, when records of waterbirds were made, the numbers in each habitat type were noted. In addition, the activities of the waterbirds were recorded. For each record of a species of bird (which could be a single bird or a flock) there was therefore a record of the habitat and the activity. Appendix 1 presents the field data sheet and habitat and activity codes being developed for this project.

Most data collection took place in daylight, but some night-time surveys using light-enhancing binoculars were undertaken. The aim of these was to determine the abundance and activity of waterbirds at night and focussed on one site in samphire of the Vasse Estuary.

The principal approach to the analysis of these data will be the Log/Linear test for association. This is a non-parametric test which can be used to determine the significance of associations between variables such as the abundance of a waterbird species, its activity, vegetation type, time of year; and so on.

The impact of disturbance upon waterbirds

A preliminary review of the literature revealed that the study of disturbance is complicated by factors such as the nature of the disturbance, the nature of the response, the activity of the birds, the presence of several species of birds, season, weather and habituation. Therefore, to gather some useful data, it was decided to adopt a simple approach which minimized the variation in those factors that could be controlled.

The bulk of data on disturbance was collected opportunistically during surveys of the floodplain usage study. As birds were approached during this study, the distance at which they altered behaviour and the distance at which they moved away were recorded. In addition, note was made of the time, weather, nature of the disturbance (usually an approach by one person), the numbers of birds, presence of other species, activity and habitat. Some opportunistic records were also made when members of the public were seen to approach waterbirds. Some of these records include disturbance by an unleashed dog. Appendix 1 presents the field data sheet being developed for this project.

Disturbance data were also collected by walking (2-3 people) along the development line of the Port Geographe residential development on the northern side of the Vasse Estuary. This development line crosses several areas of samphire and seasonally-inundated pools and, when the project is complete, will be the route for a road and dual use pathway. There is therefore the potential to repeat these surveys after development and to look at the responses of birds which are becoming habituated to the presence of people.

It has also been proposed to record the response of waterbirds to disturbance at other sites in the region where habituation is already a factor. Opportunities for such additional surveys have not yet arisen, however.

The Log/Linear test for association is suitable for the analysis of disturbance data to test for associations between variables such as species, activity, vegetation type, distance at change of behaviour; and so on. Sets of data collected at sites and under conditions which are sufficiently similar to be regarded as replicates can also be analysed with the parametric ANOVAR.

RESULTS

The usage of floodplains by waterbirds

While the final report after Phase 2 of this project will present and analyse the results, it is considered appropriate to summarize the data collected to date (Table 1) and mention some of the trends which are beginning to emerge.

On all field trips, the majority of birds have been in fringing habitats rather than on the open water of the estuaries. Details of habitats and activities have yet to be analysed, but there have been conspicuous concentrations of feeding and roosting birds in pools on grazed paddocks, pools within flooded samphire, in channels within flooded vegetation and in very shallow embayments along the shoreline. Roosting birds have also been concentrated on raised ridges and points adjacent to the open water of the estuary. Of 16 broods of Pacific Black Ducks observed in October, all but one were on the western end of the Vasse Estuary.

A single night-time survey found larger numbers of ducks, including Australasian Shovelers, foraging amongst flooded samphire than had been seen during the day. Further night-time surveys are required to assess the significance of this observation.

One species, the Cattle Egret, had not previously been recorded on the Vasse Wonnerup system, although a record such as this, which is outside the normal range of the species, is of little significance unless it indicates a change in the distribution of the species. The highest counts obtained for several species, including Yellow-billed Spoonbill, Straw-necked Ibis and Australasian Shoveler, are greater than those presented by Jaensch *et al.* (1988), although more recent data may be available.

Two species (Black Swan and Australian Shelduck) were recorded breeding in August, while these and an additional 7 species (Black Duck, Australasian Shoveler, Grey Teal, White-faced Heron, White-fronted Chat, Eurasian Coot and Australasian Grebe) were recorded breeding in October. Compared with the number of birds present in October, the number of broods observed (Black Swans - 81; Pacific Black

Duck - 16; Australian Shelduck - 5; Australasian Grebe and Eurasian Coot - 4; Grey Teal - 3; White-fronted Chat - 2; and Australasian Shoveler and White-faced Heron - 1) was lower than had been expected.

The impact of disturbance upon waterbirds

Data on the response of waterbirds to disturbance were collected on 21 species (Table 2). Although detailed analyses have not been carried out and too few events have been recorded for most species to warrant analysis, some general trends have become apparent. There were great differences in the response of species to disturbance and also differences within species under different circumstances. For example, the Grey Teal was very wary whereas the Pacific Black Duck and Black-winged Stilt could be approached closely. Black Swans responded to disturbance at a greater distance when feeding on land than when on the water. The presence of wary species, such as the Grey Teal, tended to make all birds more cautious when present in a mixed species flock. The size of a single-species flock may also be significant, with large flocks responding to disturbance at greater distances than small flocks.

DISCUSSION

The total numbers of waterbirds recorded on the Vasse and Wonnerup Estuaries in 1994 are higher than values for the same months presented by Lane (1990). This may be due to poor winter rains in inland, southern Western Australia, resulting in waterbirds which would normally be on wetlands in this region congregating on coastal wetlands such as the Vasse-Wonnerup system.

The data collected so far demonstrate the importance of fringing vegetation to waterbirds on the wetland system. Some differences in abundance and usage between different vegetation types are becoming apparent, but these patterns may change with changes in water level and the presence of migratory species of birds. It is similarly too early to draw conclusions as to the impact upon waterbirds of land management practices around the estuaries.

The data being collected on the responses of waterbirds to disturbance should form a baseline for future reference on the Vasse-Wonnerup and other wetlands. On the basis of personal experience with waterbirds in other areas, those of the Vasse and Wonnerup Estuaries appear to be shy of people.

Phase 2 of this project will see the continuation of the field sampling programme. Far greater numbers of birds than encountered so far should be recorded in the summer months and changing patterns of usage with lowering water levels

should be observed. Additional night-time surveys will also be conducted.

REFERENCES

Jaensch, R.P., Vervest, R.M. and Hewish, M.J. (1988). Waterbirds in Nature Reserves of South-Western Australia 1981-1985: Reserve Accounts. Royal Australasian Ornithologists Union, Report No. 30.

Lane, J. (1990). Swamped with Birds. Landscope, autumn 1990. W.A. Department of Conservation and Land Management.

Table 1. Summary of waterbird numbers recorded on the Vasse and Wonnerup Estuaries; June, August and October 1994. Two values are given for each species. The first value is the number of birds observed in fringing vegetation, on pools within fringing vegetation or on the shore of the open water of the estuary. The second value, given in italics, is the number of birds observed on the open water of the estuary more than 10 m from the shore or from fringing vegetation. Birds seen during a field trip but not recorded on a survey site are indicated (+).

Species		June		Aug		Oct	
Podicepididae (grebes)							
Hoary-headed Grebe	*Poliocephalus poliocephalus*	+	+	7	*12*	–	*30*
Australasian Grebe	*Tachybaptus novaehollandiae*	1	–	8	*1*	10	–
Pelecanoididae (pelicans)							
Australian Pelican	*Pelecanus conspicillatus*	+	+	9	*3*	3	*3*
Anhingidae (darters)							
Darter	*Anhinga melanogaster*	–	–	+	–	1	–
Phalacrocoracidae (cormorants)							
Pied Cormorant	*Phalacrocorax varius*	–	–	–	–	3	9
Little Black Cormorant	*Phalacrocorax sulcirostris*	1	–	2	*60*	20	*40*
Little Pied Cormorant	*Phalacrocorax melanoleucos*	2	–	12	*32*	25	–
Ardeidae (herons and egrets)							
Pacific Heron	*Ardea pacifica*	–	–	–	–	2	–
White-faced Heron	*Ardea novaehollandiae*	184	*1*	39	–	96	–
Cattle Egret	*Ardeola ibis*	–	–	2	–	–	–
Great Egret	*Egretta alba*	6	–	33	–	25	–
Little Egret	*Egretta garzetta*	–	–	1	–	–	–
Plataleidae (ibis and spoonbills)							
Glossy Ibis	*Plegadis falcinellus*	–	–	1	–	–	–
Australian White Ibis	*Threskiornis molucca*	15	–	22	–	30	–
Straw-necked Ibis	*Threskiornis spinicollis*	+	+	749	–	8	–
Yellow-billed Spoonbill	*Platalea flavipes*	2	*12*	141	–	27	–
Anatidae (ducks, geese and swans)							
Black Swan	*Cygnus atratus*	883	*99*	553	*674*	964	*1064*
Australian Shelduck	*Tadorna tadornoides*	220	*8*	153	*56*	1366	*388*
Pacific Black Duck	*Anas superciliosus*	1710	*70*	407	*188*	1385	*138*
Grey Teal	*Anas gibberifrons*	1557	*450*	1308	*1337*	1276	*100*
Australasian Shoveler	*Anas rhynchotis*	59	–	373	*115*	68	–
Pink-eared Duck	*Malacorhynchus membranaceus*	–	–	100	–	–	–
Hardhead	*Aythya australis*	–	–	–	–	7	*13*
Maned Duck	*Chenonetta jubata*	–	–	33	–	78	–
Musk Duck	*Biziura lobata*	+	+	11	*26*	–	*7*
Pandionidae (osprey)							
Osprey	*Pandion haliaetus*	1	–	–	–	–	–

Species		June		Aug		Oct	
Accipitridae (kites, hawks and eagles)							
White-bellied Sea Eagle	*Haliaeetus leucogaster*	–	–	1	–	1	–
Marsh Harrier	*Circus aeruginosus*	2	–	2	–	6	–
Rallidae (crakes and rails)							
Buff-banded Rail	*Rallus philippensis*	–	–	1	–	–	–
Spotless Crake	*Porzana tabuensis*	–	–	1	–	2	–
Dusky Moorhen	*Gallinula tenebrosa*	–	–	1	–	1	–
Purple Swamphen	*Porphyrio porphyrio*	1	–	6	–	6	–
Eurasian Coot	*Fulica atra*		1	12	*180*	16	*100*
Charadriidae (lapwings and plovers)							
Red-capped Plover	*Charadrius ruficapillus*	–	–	60	–	65	–
Recurvirostridae (stilts and avocets)							
Black-winged Stilt	*Himantopus himantopus*	106	*54*	400	–	568	–
Banded Stilt	*Cladorhynchus leucocephalus*	633	*250*	–	–	–	–
Red-necked Avocet	*Recurvirostra novaehollandiae*	11	*588*	2	–	10	–
Scolopacidae (sandpipers)							
Wood Sandpiper	*Tringa glareola*	–	–	–	–	15	–
Common Sandpiper	*Tringa hypoleucos*	–	–	–	–	1	–
Greenshank	*Tringa nebularia*	9	*1*	22	–	34	–
Sharp-tailed Sandpiper	*Calidris acuminata*	–	–	–	–	3	–
Red-necked Stint	*Calidris ruficollis*	2	–	–	–	–	–
Curlew Sandpiper	*Calidris ferruginea*	60	–	–	–	–	–
Laridae (gulls and terns)							
Silver Gull	*Larus novaehollandiae*	5	–	–	–	54	–
Caspian Tern	*Hydroprogne caspia*	+	+	–	–	–	–
Crested Tern	*Sterna bergii*	+	+	+	+	+	+
Sylviidae (old world warblers)							
Clamorous Reed-Warbler	*Acrocephalus stentoreus*	–	–	–	–	1	–
Little Grassbird	*Megalurus gramineus*	2	–	4	–	15	–
Ephthianuridae (chats)							
White-fronted Chat	*Ephthianura albifrons*	88	–	32	–	116	–
Totals		5470	*1540*	4411	*2689*	6308	*1892*

Table 2. Numbers of disturbance events recorded for each species in June, August and October 1994.

Species	Number of events in: June	Aug	Oct	Total
Australian Pelican	-	1	-	1
White-faced Heron	5	-	2	7
Great Egret	-	4	1	5
Australian White Ibis	-	-	5	5
Straw-necked Ibis	-	1	-	1
Yellow-billed Spoonbill	-	5	1	6
Black Swan	9	8	4	21
Australian Shelduck	6	3	3	12
Pacific Black Duck	15	17	14	46
Grey Teal	5	9	7	21
Australasian Shoveler	-	6	-	6
Pink-eared Duck	-	1	-	1
Purple Swamphen	1	-	-	1
Eurasian Coot	1	-	-	1
Red-capped Plover	2	-	-	2
Black-winged Stilt	5	7	14	26
Banded Stilt	3	-	-	3
Red-necked Avocet	1	-	-	1
Greenshank	-	-	1	1
Curlew Sandpiper	1	-	-	1
White-fronted Chat	-	2	3	5
Totals	54	64	55	173

APPENDIX ONE. Field data sheets and codes.

FIELD DATA SHEET
VASSE-WONNERUP PROJECT; FLOODPLAIN USAGE

Site No.:_____ Date:_____ Time:_____

Notes:_____

_____

_____

_____

Weather: T__

R__

W__

C__

Spp.	N	Habitat	Activity	Spp.	N	Habitat	Activity

Additional notes:_____

_____

_____

_____

CODES FOR COMPLETION OF DATA SHEETS

Species.

AuGb	Australasian Grebe	Ospy	Osprey
HhGb	Hoary-headed Grebe	WbSE	White-bellied Sea-Eagle
APel	Australian Pelican	MaHa	Marsh Harrier
Dart	Darter	BbaR	Buff-banded Rail
PieC	Pied Cormorant	SpCr	Spotless Crake
LPiC	Little Pied Cormorant	DuMh	Dusky Moorhen
LBlC	Little Black Cormorant	PuSh	Purple Swamphen
PcHn	Pacific Heron	Coot	Eurasian Coot
WfHn	White-faced Heron	RcaP	Red-capped Plover
CatE	Cattle Egret	BwSt	Black-winged Stilt
GrtE	Great Egret	BdSt	Banded Stilt
LitE	Little Egret	RnAv	Red-necked Avocet
GloI	Glossy Ibis	WooS	Wood Sandpiper
AuWI	Australian White Ibis	ComS	Common Sandpiper
StnI	Straw-necked Ibis	Gank	Greenshank
YbSb	Yellow-billed Spoonbill	ShtS	Sharp-tailed Sandpiper
BlkS	Black Swan	RenS	Red-necked Stint
AShd	Australian Shelduck	CurS	Curlew Sandpiper
PaBD	Pacific Black Duck	SiGu	Silver Gull
GyTl	Grey Teal	CasT	Caspian Tern
AuSh	Australasian Shoveler	CtdT	Crested Tern
PeaD	Pink-eared Duck	ClRW	Clamorous Reed-Warbler
Hard	Hardhead	LiGb	Little Grassbird
MusD	Musk Duck	WfoC	White-fronted Chat

Activity. L - loafing (inactive on water)
R - roosting (inactive on land)
P - perched (inactive on tree or post)
F - foraging (actively feeding or searching)
O - overhead (flying through site; not foraging)
B - breeding observed (give number of broods (n) and number in broods (x_1). eg. 3B;4,5,3)

Habitat. OWE - open water of estuary
ESS - estuary shore/shallows (10 m of shore)
pSa - pool within *Salicornia* (including <5% cover)
pHa - pool within *Halosarcia* (including <5% cover)
pPa - pool within pasture
fSa - flooded *Salicornia*
fHa - flooded *Halosarcia*
dSa - dry *Salicornia*
dHa - dry *Halosarcia*
Pas - pasture (dry or damp but not pools)
Ru - rushes (eg. *Typha, Baumea*)
Se - sedges (eg. *Juncus*, tall grasses)
BS - bare shoreline
Ot - other (describe _____)

Weather. Temp.: T1 - cool (<20°C); T2 - mild (20-30°C);
T3 - hot (>30°C).
Rain : R0 - none; R1 - occasional showers;
R2 - regular rain.
Wind : W0 - gentle (<5 kph); W1 - (5 - 20 kph);
W2 - strong (>20 kph).
Cloud: C0 - none-<10%; C1 10-50%; C2 - >50%.

FIELD DATA SHEET
VASSE-WONNERUP PROJECT; DISTURBANCE STUDY

Date:_____ Weather: T__ ; R__ ; W__ ; C__ .

Species	Site	Time	N	Act.	Hab.	Type of disturb	Distance (m) alert	flight

Notes: _____

_____

_____

_____

_____

NB: Use codes as for floodplain usage survey.
With mixed flocks, record response of each species but indicate that the species are together with brackets.