Aquatic Research Laboratory
The University of Western Australia

Survey of the Macroinvertebrate Fauna and Water Chemistry of Permanent Lakes of the South Coast of Western Australia

Report 22
July 1992

Date: July 1992

Note that Boat Harbour Lake 1 in this
report is part Lake 3 of Jaensch. and
of Robinson. Lake 3 is Lake 1 and
Lake 4 is also part Lake 3

Cover photo: Lake Quitjup a shallow brown water meso-eutrophic lake.

Survey of the Macroinvertebrate Fauna and Water Chemistry of Permanent Lakes of the South Coast of Western Australia

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Cover photo: Lake Quitjup a shallow brown water meso-eutrophic lake.

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INTRODUCTION

This report details the results of a survey of invertebrate fauna, water chemistry and components of fish fauna of 23 wetlands on the south coast of Western Australia. It forms part of a biological survey of permanent wetlands on Crown Land, from Cape Naturaliste to Albany, by the Western Australian Department of Conservation and Land Management with funding from the Australian National Parks and Wildlife Service.

Limnological studies on the south-coast of Western Australia have mainly been restricted to the temporary wetlands (Bayly, 1982; Christensen 1982; Pusey & Edward, 1990 (a), (b)) although Pusey and Edward, 1990 (a) did include two permanent pools in their study. Recently a survey of aquatic invertebrates in three lakes in the Two Peoples Bay area has been completed by Storey *et al.* (in press). This present survey of permanent wetlands was designed so that the combined results from this study, and from surveys of flora (C.J. Robinson, 1992) and fish (R.P. Jaensch, 1992) will provide a database to;

1. determine the conservation significance of each wetland,

2. develop future management programmes for the wetlands and

3. allow comparison with the database for wetlands of the Swan Coastal Plain presently being developed by the Department of Conservation and Land Management, the Water Authority of Western Australia, the Environmental Protection Authority and the Land and Water Resources Research and Development Corporation.

MATERIALS AND METHODS

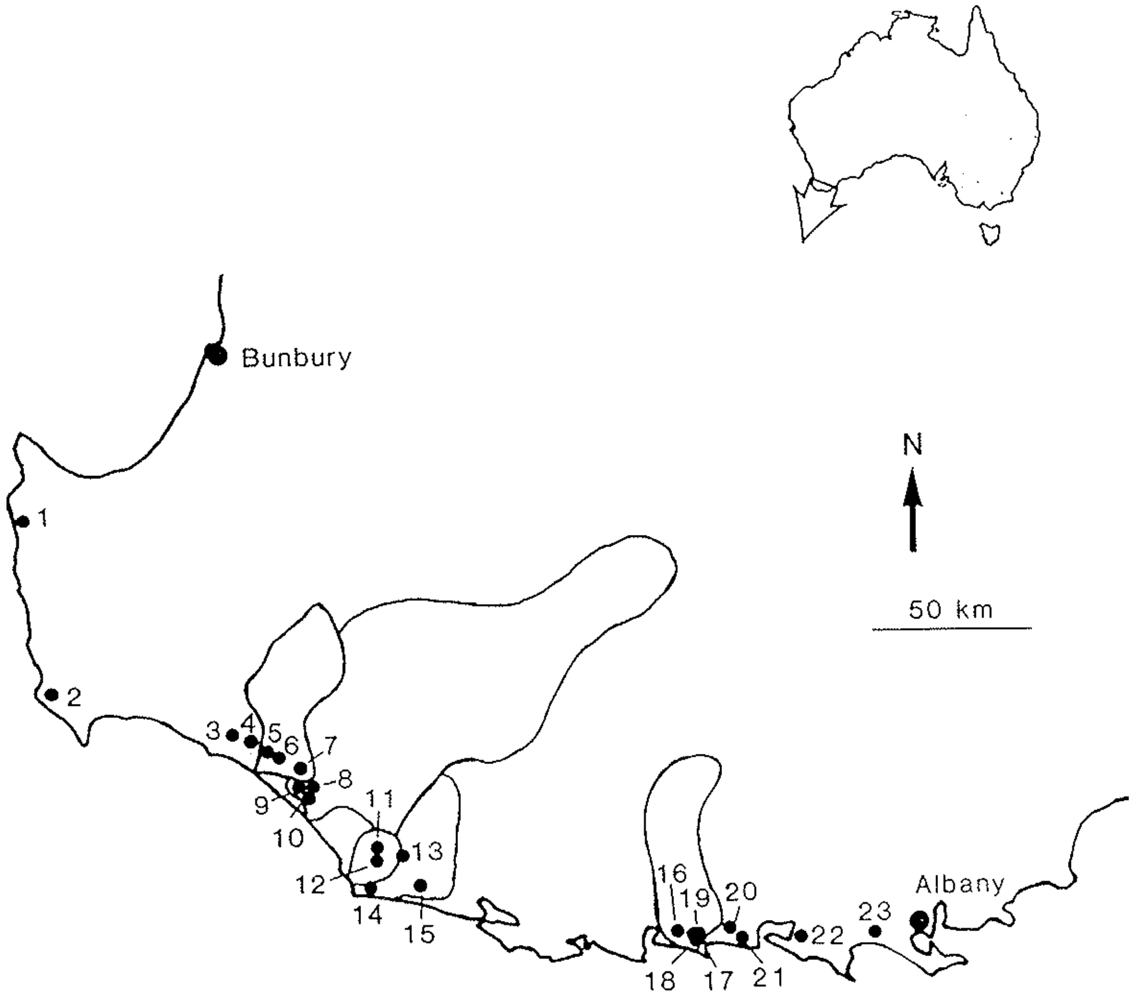
Study sites

Twenty three permanent lakes in the south of Western Australia were studied. All lakes were located on Crown Land within 20 km of the coast between Cape Naturaliste and Albany (Figure 1, Table 1, Plates 1-6). Several of the lakes were not officially named and in this report are referred to as follows:

Pool south of Moses Rock Road, Willyabrup - Moses Pool.
Lake near junction of Charley and Dunes Roads, Pemberton - Charley Lake.
Lake north east of Windy Harbour - Windy Harbour Lake.
Group of lakes near Boat Harbour Road, Denmark;
  Eastern lake - Boat Harbour Lake 1
  Western lake - Boat Harbour Lake 3
  Northern lake - Boat Harbour Lake 4.

Table 1. Grid map references for the lakes studied.

Lake	Latitude	Longitude
Moses Pool	33° 45' 48" S	115° 00' 06" E
Lake Davies	34° 13' 20" S	115° 01' 58" E
Lake Quitjup	34° 22' 58" S	115° 35' 40" E
Lake Jasper	34° 24' 40" S	115° 40' 59" E
Lake Wilson	34° 25' 39" S	115° 43' 00" E
Lake Smith	34° 25' 45" S	115° 43' 26" E
Charley Lake	34° 30' 21" S	115° 49' 28" E
Yeagarup Lake	34° 32' 43" S	115° 52' 14" E
Neanup Swamp	34° 32' 47" S	115° 51' 32" E
South Yeagarup Lake	34° 33' 08" S	115° 51' 58" E
Doggerup Lake	34° 43' 03" S	116° 03' 36" E
Lake Samuel	34° 43' 55" S	116° 03' 26" E
Lake Florence	34° 44' 03" S	116° 05' 57" E
Windy Harbour Lake	34° 50' 00" S	116° 02' 25" E
Lake Maringup	34° 50' 00" S	116° 11' 55" E
Owingup Swamp	34° 59' 56" S	117° 03' 57" E
Boat Harbour Lake 1	35° 01' 01" S	117° 05' 59" E
Boat Harbour Lake 3	35° 01' 01" S	117° 05' 17" E
Boat Harbour Lake 4	35° 00' 53" S	117° 05' 46" E
Lake 12046	34° 59' 56" S	117° 13' 23" E
Lake Williams	35° 01' 00" S	117° 16' 03" E
Lake Saide	35° 02' 34" S	117° 28' 24" E
Lake Powell	35° 01' 14" S	117° 44' 16" E



Key to lake numbers:

1	Moses Pool
2	Lake Davies
3	Lake Quitjup
4	Lake Jasper
5	Lake Wilson
6	Lake Smith
7	Charley Lake
8	Yeagarup Lake
9	Neanup Swamp
10	South Yeagarup Lake
11	Doggerup Lake
12	Lake Samuel
13	Lake Florence
14	Windy Harbour Lake
15	Lake Maringup
16	Owingup Swamp
17	Boat Harbour Lake 1
18	Boat Harbour Lake 3
19	Boat Harbour Lake 4
20	Lake 12046
21	Lake Williams
22	Lake Saide
23	Lake Powell

Figure 1. Map of the locations of the lakes showing approximate river catchments where appropriate (photographs of the lakes can be found in Robinson, 1992).

Sampling regime

Two main sampling trips were undertaken, in winter (25 June - 2 July) and spring (4 - 13 November) 1991. Fifteen lakes were sampled during the winter trip and six of these, located across the geographical range of the survey, were re-sampled in spring, together with an additional six lakes. Charley Lake and Lake Williams, which were inaccessible during previous trips due to CALM dieback quarantine restrictions, were sampled in early summer (18 & 19 December). These latter samples are considered spring samples as the typical hot/dry summer conditions had not commenced. The sampling regime is detailed in Table 2.

Table 2. Sampling regime for the 23 lakes studied. √ indicates when the lake was sampled.

Lake	Winter	Spring
Moses Pool		√
Lake Davies	√	√
Lake Quitjup	√	
Lake Jasper	√	
Lake Wilson	√	
Lake Smith	√	√
Charley Lake		√
Yeagarup Lake	√	√
Neanup Swamp		√
South Yeagarup Lake		√
Doggerup Lake	√	√
Lake Samuel		√
Lake Florence		√
Windy Harbour Lake	√	
Lake Maringup	√	√
Owingup Swamp		√
Boat Harbour Lake 1	√	
Boat Harbour Lake 3	√	
Boat Harbour Lake 4	√	
Lake 12046	√	
Lake Williams		√
Lake Saide	√	
Lake Powell	√	√

Plate 1. Moses Pool a small clear water oligo-mesotrophic pool.

Plate 2. Lake Smith a shallow black water oligo-mesotrophic lake.

Plate 3. Charley lake a deep black water meso-eutrophic lake.

Plate 4. Lake 12046 a brown water meso-eutrophic lake.

Plate 5. Lake Saide a shallow clear water eutrophic lake.

Plate 6. Lake Powell a shallow brown water eutrophic lake.

Environmental parameters

The methods used are summarised in Table 3.

Table 3. Environmental parameters, methods of measurement, units of precision and acronyms used in this report.

Parameter	Method	Precision	Acronym
Lake surface area	calculated from map		SA
Temperature	mercury thermometer, Yeo-Kal 602 Hamon salinity/temperature bridge	0.5 °C 0.5 °C	Temp
Dissolved oxygen	Nester portable meter	0.1 mg/l	DO
pH	Kane-May KM 7001 portable pH meter	0.1 pH unit	pH
Depth	graduated line	0.05 m	Depth
Colour	lab. analysis	5 APHA units	Col
Turbidity	lab. analysis	0.1 NTU	Turb
Total dissolved solids	lab. analysis	1 mg/l	TDS
Anions & cations	lab. analysis	0.4 mg/l	chemical symbols
Total nitrogen	lab. analysis	0.01 mg/l	N
Total phosphorus	lab. analysis	0.01 mg/l	P
Chlorophyll (a)	spectrophotometry	0.01 µg/l	Chloro
Benthic organic matter	weight after ashing	0.01 %	BOM

The surface area of lakes was estimated from enlarged photocopies of 1:50000 maps. Each lake area was cut out and passed through a Delta-T™ Area Meter.

Temperature, dissolved oxygen and pH were measured a few paces from the shore at each lake. Depth was recorded on two intersecting transects, where possible, representing length and width of the lakes for those accessible to a boat. At these lakes, vertical profiles of dissolved oxygen and temperature were recorded to determine any stratification. The ratio of surface to bottom readings for temperature and dissolved oxygen was used as a measure of stratification in statistical analyses. A ratio of one therefore indicated no stratification.

Undisturbed water samples were taken in new, rinsed plastic bottles for analyses for colour, turbidity, total dissolved solids, anions and cations. Water samples for total nitrogen and phosphorus determinations were filtered in the field through a 0.22 μm millipore filter using a 50 ml syringe. Standard laboratory methods were used for these analyses.

The lakes were classified according to their nutrient status Wetzel (1975) (Table 4). Where nitrogen and phosphorus were in different categories, the lakes were classified according to the 'limiting' nutrient.

Table 4. Classification of the trophic status of lakes on the basis of nutrient concentrations (based on Wetzel 1975).

Category	Total P (μg/l)	Total N (μg/l)
ultra-oligotrophic	< 5	< 250
oligo-mesotrophic	5 - 10	250 - 600
meso-eutrophic	10 - 30	300 - 1100
eutrophic	30 - 100	500 - 15000
hyper-eutrophic	> 100	> 15000

Samples were also taken for chlorophyll (a) and phaeophytin determinations. A measured volume (near 1 l) of water was filtered through a Whatman™ GF/C filter to remove cells containing chlorophyll which was stabilized with a few drops of a saturated solution of magnesium carbonate. The filter was folded, blotted between gauze swabs and placed in a plastic bag on ice and out of the light before being stored frozen. In the laboratory, chlorophyll (a) and phaeophytin were measured using the method described in Strickland and Parsons (1968).

At each lake a 10 cm deep core-sample of the benthic material was collected in a vertical sided vial with 13.2 cm^2 lid opening. In the laboratory, these samples were thoroughly dried at 40°C, weighed, placed in a muffle furnace at 450°C for at least 8 h, allowed to cool in a desiccator, and re-weighed to determine the percent organic content.

Macroinvertebrates

The methodologies for collecting fauna were designed to sample all aquatic habitats, with the aim of recording the maximum number of species from each lake.

Benthic samples

From each lake, six random replicate benthic samples were taken with a 72 cm^2 core sampler to 10 cm depth. Samples were immediately preserved in 5 % formalin.

In the laboratory, the organic fraction was separated by water elutriation and washed through a 250 μm sieve. The fauna was removed from the organic fraction under a dissecting microscope at x6 magnification. All individuals were identified to the lowest taxon possible, usually species, either by the use of keys or by matching specimens to an extensive voucher collection at the Aquatic Research Laboratory, The University of Western Australia. Several groups (i.e. the Chironomidae, Calanoida, Ostracoda and Cladocera) were forwarded to specialist taxonomists for further identification. An estimate of abundance for each species was made according to the following categories; < 50 (uncommon), 50 - 500 (common) and > 500 (abundant) individuals. Each taxa was assigned a unique six-digit numeric identifier for computer analyses and for maintenance of the voucher collection.

Qualitative sweep samples

A 110 μm mesh standard FBA,[1] D - net was used to collect two-minute qualitative sweep samples from the benthos and amongst the macrophytes from the littoral margin of each lake. Samples were preserved in 5 % formalin and in the laboratory were processed (using a 110 μm sieve), identified and categorised as for the benthic samples. Tadpoles, when collected, were also removed and identified.

Zooplankton samples

Plankton was sampled with a 110 μm mesh plankton net attached to a standard FBA, D - net frame held just below the water surface. Two samples were taken from each lake; the first was standardised to a 50 m trawl for biomass determination and the second, shorter trawl, for identification of the plankton species. Each sample was preserved with 5 % formalin in a 100 ml plastic vial.

Biomass was determined by weighing the samples after drying to constant weight at 40 °C. The taxa were identified and abundance categories estimated as above.

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[1] Freshwater Biological Association (Cumbria, U.K.)

Fish

Sweep sampling using 1 mm mesh standard FBA D nets was conducted to collect the fish fauna. Specimens collected were identified and immediately returned to the water. The fish fauna from each lake is described in greater detail in Jaensch (1992).

Data analyses

Ordination and classification techniques are routinely used to extract relationships in complex ecological data (Gauch and Whittaker 1972, Gauch 1982). Typically underlying gradients are subsequently correlated to environmental factors (e.g. Rabeni & Gibbs 1980, Storey *et al.* 1990, Bunn & Davies 1992) or seasons (e.g. Furse *et al.* 1984). The collapsing of large data matrices by multivariate techniques into smaller units or onto environmental gradients greatly simplifies the interpretation of the final results.

Factor analysis

Principal components analysis (PCA) was used to illustrate the pattern of co-occurrence of the physico-chemical/morphological parameters measured. This technique is used to reduce a complex data-set to a few, underlying "factors". The identification of underlying factors greatly simplifies the description and understanding of complex phenomena. The PCA incorporates four steps:

1. A correlation matrix of the independent variables is calculated.
2. Factors are extracted to represent the matrix.
3. Factors are rotated to make them more interpretable.
4. Factor scores for each sample (lake) can be computed for further analyses.

This analysis was performed using the SPSS/PC advanced statistics procedure "FACTOR".

Classification

The species information from each lake was classified by a polythetic divisive multivariate technique (Two-Way INdicator SPecies ANalysis; TWINSPAN, Hill 1979a). Subsequent groupings formed by TWINSPAN were correlated to environmental parameters by Multiple Discriminant Analysis (MDA) (Norusis 1986) using the SPSS/ PC$^+$ version DSCRIMINANT. This analysis was performed between each TWINSPAN division.

Ordination

Detrended correspondence analysis (DECORANA, Hill, 1979a) was used to ordinate the lakes on the basis of macroinvertebrate community structure. DECORANA orders samples along an axis of similarity, where the lakes closest together on each axis have a more similar macroinvertebrate community structure than those further apart. This analysis was terminated after two axes were generated.

RESULTS AND DISCUSSION

Environmental parameters

The 23 lakes studied ranged in surface area from 0.0013 km^2 (Moses Pool) to over 4 km^2 (Lake Jasper). The majority of the lakes were less than 1 km^2 in surface area (Table 5). The deepest lakes were Yeagarup and Jasper, both over 10 m. Many of the larger surface area lakes were shallow, ranging between about 0.8 m and about 1.3 m for Lake Powell and Owingup Swamp respectively (Figure 2). The different morphologies of the lakes will reflect the different geologies and origins of the systems.

Water colour was highly variable between lakes, ranging from < 5 APHA units at Moses Pool to 740 APHA units at Lake Williams. The lakes can be visually classified as black, brown and clear corresponding to three APHA unit categories (Table 6).

The pH ranged from 4.40 at Lake Florence to 8.64 at Lake Davies. The values of pH were highly negatively correlated with colour (correlation coefficient $r=-0.83$, $n=29$, $p<0.001$), where the more acidic lakes had higher APHA values. This reflects the high humic/tannic content of these darker waters. The majority of these lakes are lying on acid peat flats, the source of the humic material. Lake colour was also highly correlated to water temperature ($r=0.51$, $n=29$, $p<0.01$) due to dark water absorbing more solar radiation than clear water.

Water temperatures between lakes ranged from 9.2 - 15 °C in winter and 12 - 24 °C in summer. Temperature stratification was only recorded in Charley and Yeagarup Lakes in spring and reflected the normal case for deep water lakes with colder hypolimnetic water (Table 7). In contrast, lakes Maringup and Jasper were stratified in winter, with warmer hypolimnetic water. This can be attributed to the low turbidity of the water allowing the lake benthos to absorb solar radiation.

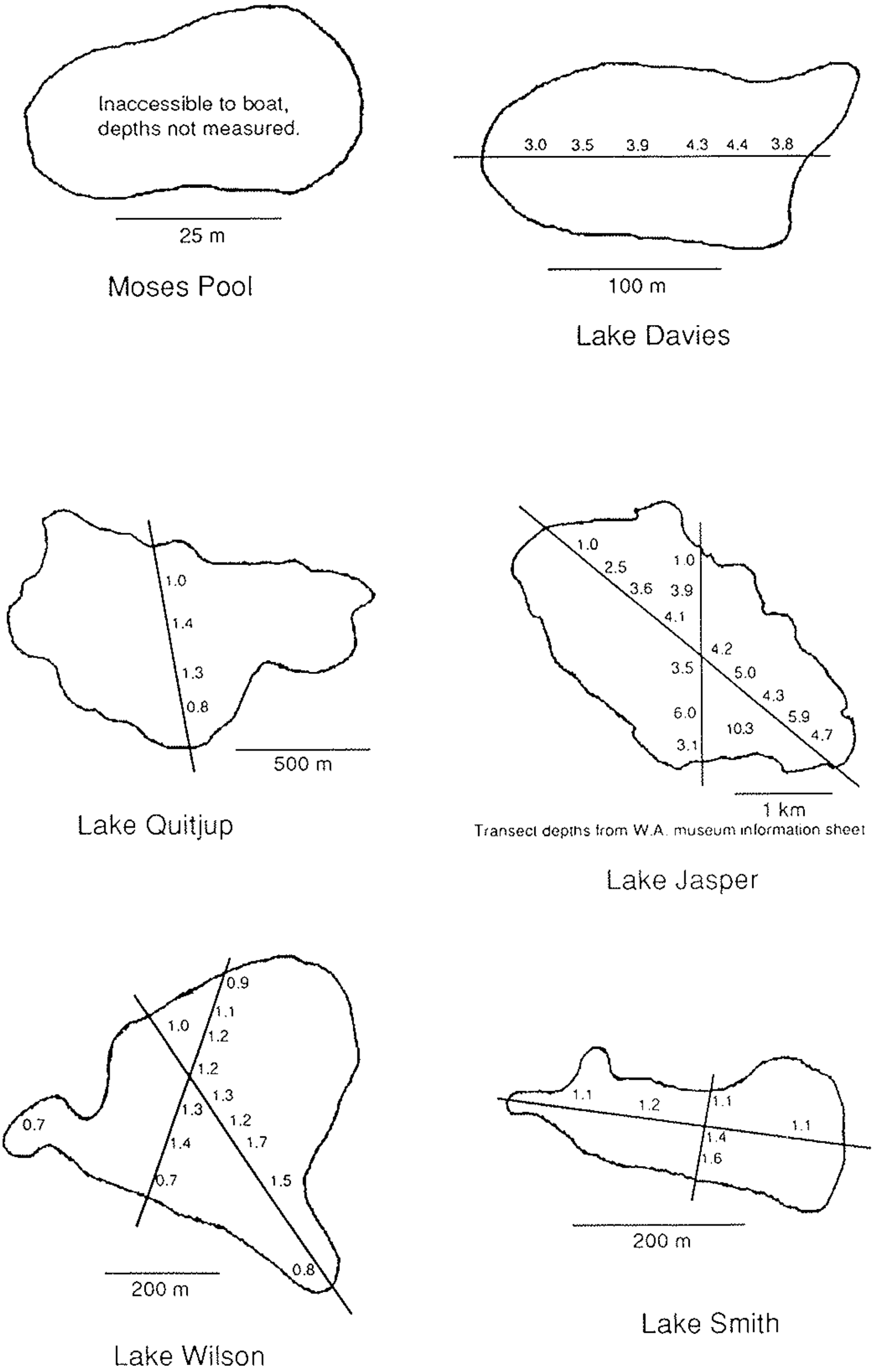
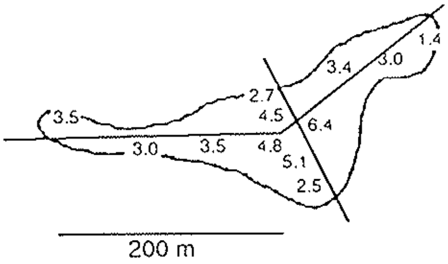
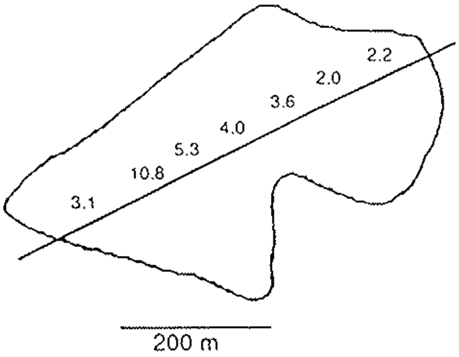


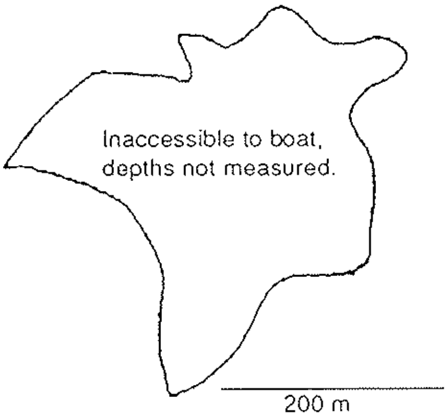
Figure 2. Diagram of each lake showing transects of depth (m).



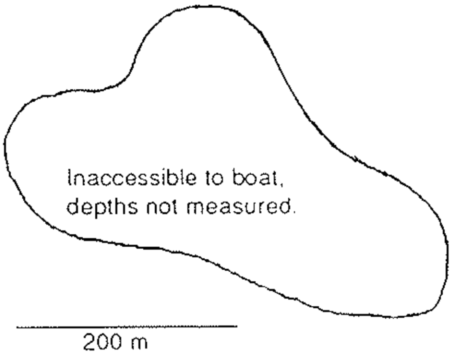
Charley Lake



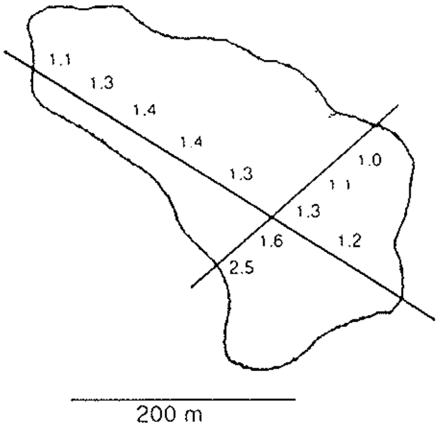
Yeagarup Lake



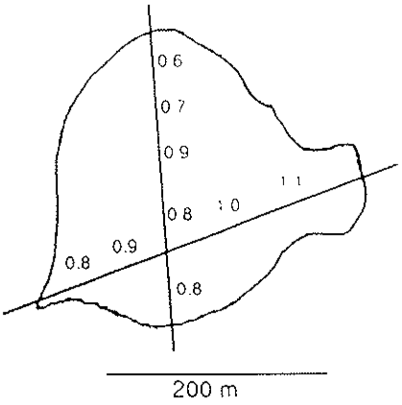
Neanup Swamp



South Yeagarup Lake

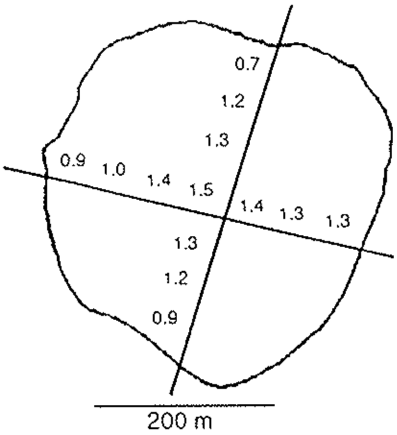


Doggerup Lake

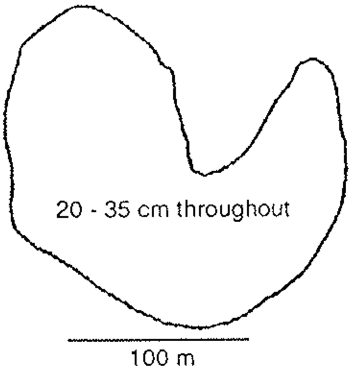


Lake Samuel

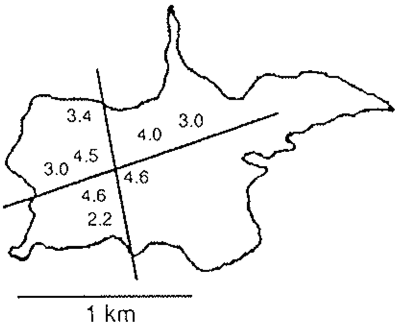
Figure 2 (cont.). Diagram of each lake showing transects of depth (m).



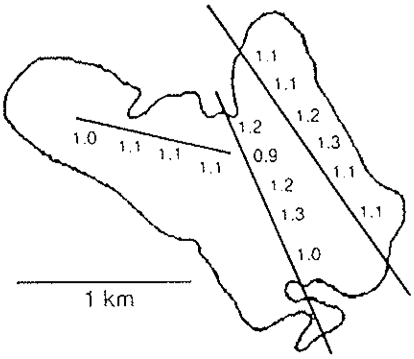
Lake Florence



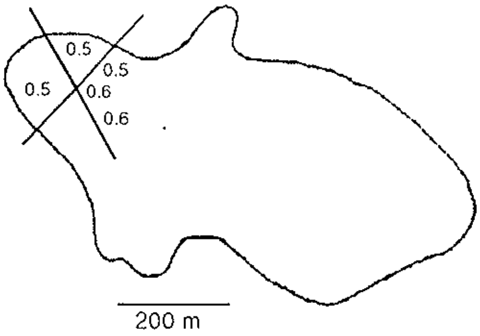
Windy Harbour Lake



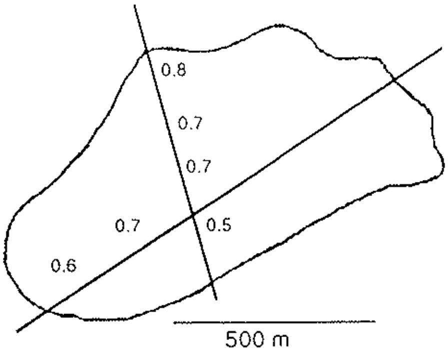
Lake Maringup



Owingup Swamp

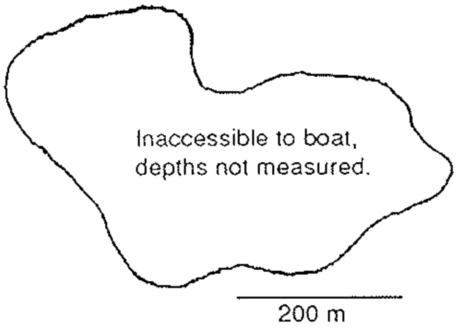


Boat Harbour Lake 1

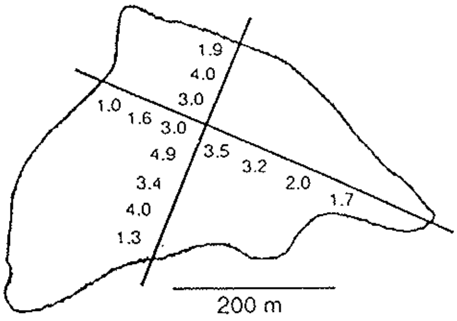


Boat Harbour Lake 3

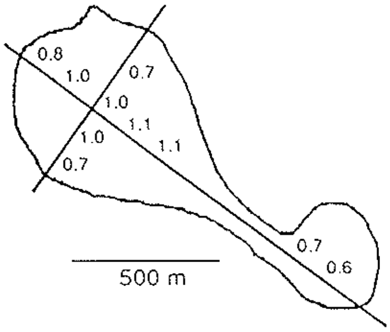
Figure 2 (cont.). Diagram of each lake showing transects of depth (m).



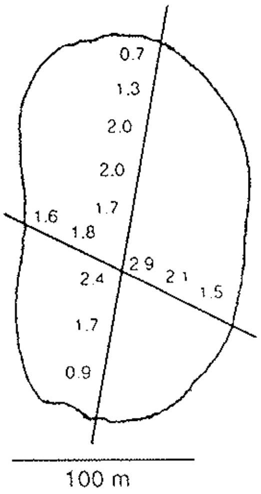
Boat Harbour Lake 4



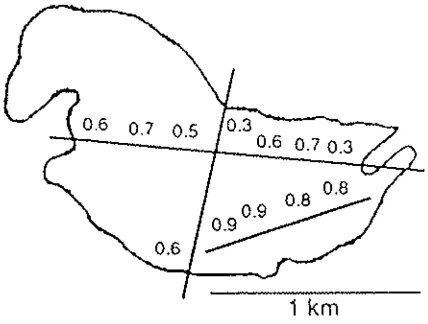
Lake 12046



Lake Saide



Lake Williams



Lake Powell

Figure 2 (cont.). Diagram of each lake showing transects of depth (m).

Table 5. Environmental information collected for each lake/occasion. W=winter, S=spring, ‡ unable to carry meter to lake.

Lake	Season	SA (km^2)	Temp surface (°C)	DO surface (mg/l)	pH	Na (mg/l)	K (mg/l)	Ca (mg/l)	Mg (mg/l)	Cl (mg/l)
Moses Pool	S	0.0013	18.0		8.30	131.73	4.3	48.50	17.01	200.65
Lake Davies	W	0.0116	13.1	11.1	8.64	474.74	11.7	30.46	84.56	814.64
Lake Davies	S	0.0116	17.0	11.4	8.60	424.86	9.8	32.46	78.25	720.70
Lake Quitjup	W	0.7261	12.2	12.4	7.53	70.81	1.6	1.60	6.80	113.79
Lake Jasper	W	4.3751	10.7	12.5	7.52	67.59	2.1	8.42	6.32	107.41
Lake Wilson	W	0.1731	12.0	12.5	5.55	51.73	1.2	1.20	4.62	84.02
Lake Smith	W	0.0450	13.2	12.4	4.70	45.29	0.6	<0.40	3.89	72.32
Lake Smith	S	0.0450	16.0	11.1	4.50	31.27	0.7	<0.40	2.67	48.92
Charley Lake	S	0.0260	24.0	7.8	6.50	39.31	0.8	1.30	3.30	72.32
Yeagerup Lake	W	0.1697	11.5	13.8	7.05	34.49	0.9	6.01	3.65	54.59
Yeagerup Lake	S	0.1697	15.2	12.8	6.80	33.11	1.0	5.21	3.40	57.78
Neanup Swamp	S	0.0833	16.0	‡	6.40	34.71	1.1	8.02	2.92	54.24
South Yeagerup Lake	S	0.0610	12.3	‡	6.70	26.21	1.0	43.69	3.65	41.12
Doggerup Lake	W	0.0831	10.8	12.3		34.26	1.1	<0.40	3.40	52.82
Doggerup Lake	S	0.0831	18.0	9.8	5.20	36.09	0.8	<0.40	2.92	58.49
Lake Samuel	S	0.0667	17.5	11.2	4.70	36.32	0.7	<0.40	3.40	62.75
Lake Florence	S	0.1044	18.0	10.4	4.40	35.40	0.9	<0.40	2.92	51.76
Windy Harbour Lake	W	0.0186	9.2	13.7	6.47	82.07	2.0	4.41	9.96	124.43
Lake Maringup	W	1.3602	9.7	12.0	7.58	64.14	1.9	26.05	7.29	102.81
Lake Maringup	S	1.3602	15.8	11.5	7.90	54.49	1.7	22.04	6.08	86.85
Owingup Swamp	S	1.7886	19.5	11.2	7.40	340.48	1.5	17.64	58.08	717.15
Boat Harbour Lake 1	W	0.2507	13.5	12.5	8.00	150.12	4.1	29.26	18.71	245.31
Boat Harbour Lake 3	W	0.4235	14.5	12.2	8.10	241.40	6.2	48.10	27.70	407.32
Boat Harbour Lake 4	W	0.1097	12.5	12.4	8.05	149.66	5.6	20.44	23.09	246.02
Lake 12046	W	0.1014	10.3	12.9	7.70	182.31	16.9	22.04	16.77	250.63
Lake Williams	S	0.0211	21.5	8.0	5.80	139.78	46.9	7.30	13.30	235.74
Lake Saide	W	0.4125	13.0	12.7	8.40	150.35	6.6	99.80	22.60	245.31
Lake Powell	W	1.3973	15.0	11.8	8.10	291.51	10.1	29.66	28.92	492.05
Lake Powell	S	1.3973	19.0	11.0	7.10	211.05	6.2	25.25	22.36	363.72

Table 5 (cont.). Environmental information collected for each lake/occasion. W=winter, S=spring, * below detection.

Lake	Season	TDS (mg/l)	Col (APHA units)	Turb (NTU)	Chloro (a) (µg/l)	N (mg/l)	P (mg/l)	BOM (%)
Moses Pool	S	492	<5	0.3	0.58	5.80	<0.01	2.47
Lake Davies	W	1626	10	0.4	0.64	1.10	0.01	1.92
Lake Davies	S	531	10	0.4	1.53	0.83	<0.01	1.29
Lake Quitjup	W	145	110	0.9	0.42	0.56	0.01	0.73
Lake Jasper	W	142	15	0.8	2.56	0.69	0.01	1.16
Lake Wilson	W	137	170	0.7	1.07	0.46	0.02	0.16
Lake Smith	W	68	380	0.4	0.43	0.70	0.01	1.24
Lake Smith	S	23	530	0.9	0*	0.70	<0.01	3.44
Charley Lake	S	44	310	0.4	0.97	0.64	0.01	11.25
Yeagerup Lake	W	102	180	3.0	0.41	0.55	0.01	3.62
Yeagerup Lake	S	233	260	0.7	0.19	0.55	<0.01	2.24
Neanup Swamp	S	195	240	0.8	0.80	0.73	<0.01	0.18
South Yeagerup Lake	S	207	100	2.6	0*	0.43	<0.01	44.82
Doggerup Lake	W	<1	300	0.4	0.53	0.52	0.01	17.31
Doggerup Lake	S	213	330	0.4	0.20	0.55	0.01	0.43
Lake Samuel	S	246	470	1.1	1.78	0.79	0.01	66.04
Lake Florence	S	168	630	0.7	0.39	0.89	0.01	1.42
Windy Harbour Lake	W	265	340	0.9	4.84	1.00	0.05	72.20
Lake Maringup	W	132	20	0.3	0.62	0.61	0.01	7.40
Lake Maringup	S	152	55	0.3	0.40	0.48	<0.01	17.10
Owingup Swamp	S	1227	220	0.6	3.59	0.69	0.01	0.61
Boat Harbour Lake 1	W	468	70	0.4	3.24	0.92	0.01	87.10
Boat Harbour Lake 3	W	722	20	0.5	2.45	1.40	0.01	43.82
Boat Harbour Lake 4	W	474	65	0.6	4.82	0.83	0.01	44.68
Lake 12046	W	434	110	1.7	3.72	0.82	0.02	46.42
Lake Williams	S	367	740	0.3	1.07	1.70	0.43	0.37
Lake Saide	W	755	80	1.3	14.41	0.90	0.04	1.22
Lake Powell	W	53 ?	220	12.0	12.71	1.50	0.47	0.87
Lake Powell	S	800	190	3.1	3.29	0.97	0.12	1.60

Table 6. Classification of lakes according to colour measurements in APHA units; < 100 = clear, 100 - 300 = brown, > 300 = black.

Lake	Classification	Colour (APHA units)
Moses Pool	clear	<5
Lake Davies	clear	10
Lake Quitjup	brown	110
Lake Jasper	clear	15
Lake Wilson	brown	170
Lake Smith	black	380 - 530
Charley Lake	black	310
Yeagarup Lake	brown	180 - 260
Neanup Swamp	brown	240
South Yeagarup Lake	brown	100
Doggerup Lake	black	300 - 330
Lake Samuel	black	470
Lake Florence	black	630
Windy Harbour Lake	black	340
Lake Maringup	clear	20 - 55
Owingup Swamp	brown	220
Boat Harbour Lake 1	clear	70
Boat Harbour Lake 3	clear	20
Boat Harbour Lake 4	clear	65
Lake 12046	brown	110
Lake Williams	black	740
Lake Saide	clear	80
Lake Powell	brown	220 - 190

Table 7. Temperature (°C) profiles in lakes where stratification occurred. W=winter, S=spring.

Lake	Season	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m
Jasper	W	10.7	10.7	10.5	10.2	10.2	10.2	10.2	10.2	11.5	12.2	
Charley	S	24.0	19.5	18.5	18.0	18.0	18.0	18.0				
Yeagarup	S	15.2	15.2	15.0	15.0	14.7	12.7	12.5	12.0	12.0	12.0	
Maringup	W	9.7	9.7	9.7	9.7	9.7	12.2					

Stratification of dissolved oxygen occurred in five lakes, however only Charley Lake, showed anoxic conditions at the water/substrate interface (Table 8). Apart from this isolated case, all measured levels of dissolved oxygen in the lakes would not be considered deleterious to basic biological processes.

Table 8. Dissolved oxygen (mg/l) profiles in lakes where DO stratification occurred. W=winter, S=spring.

Lake	(season)	0 m	1 m	2 m	3 m	4 m	5 m	6 m	7 m	8 m	9 m	10 m
Davies	(W)	11.1	10.9	10.9	9.7	9.9	9.9					
Jasper	(W)	12.5	12.6	12.6	12.7	12.8	12.8	13.0	13.0	13.0	12.2	4.5
Wilson	(W)	12.5	10.5									
Charley	(S)	7.8	6.4	4.1	3.4	1.3	0.9	0.6				
Boat Harbour 3	(W)	12.2	9.2									
Williams	(S)	8.0	8.0	8.0	5.0							

Salinity categories of the lakes were based on the Water Authority of Western Australia (1989a) classification for potable surface water. The majority of the lakes were fresh, however Boat Harbour Lake 3, Lake Saide and Lake Powell was classified marginal, with Lake Davies and Owingup Swamp brackish (Table 9). However, biologically all the lakes can be considered fresh as they lie well below the limnologically accepted 3 mg/l upper limit for freshwater (Bayly & Williams, 1973).

Four lakes (Windy Harbour, Williams, Saide and Powell) were classified as eutrophic (Table 10). The other lakes were either oligo-mesotrophic or meso-eutrophic. Lakes sampled in winter generally had higher levels of phosphorus, probably from run-off of winter rainfall, elevating them into the meso-eutrophic category. Human activity as a possible cause of elevated nutrient status should be considered for all of the eutrophic lakes as this is certainly the case for Lake Powell (Morrissy 1970, Water Authority of Western Australia 1989b).

Table 9. Salinity categories[1] of the lakes. W=winter, S=spring.

Lake	Season	TDS (ppt)	Category	Cation Dominance
Moses Pool	S	0.492	fresh	Na > Ca > Mg > K
Lake Davies	W	1.626	brackish	Na > Mg > Ca > K
Lake Davies	S	0.531	marginal	Na > Mg > Ca > K
Lake Quitjup	W	0.145	fresh	Na > Mg > Ca = K
Lake Jasper	W	0.142	fresh	Na > Ca > Mg > K
Lake Wilson	W	0.137	fresh	Na > Mg > Ca = K
Lake Smith	W	0.068	fresh	Na > Mg > K > Ca
Lake Smith	S	0.023	fresh	Na > Mg > K > Ca
Charley Lake	S	0.044	fresh	Na > Mg > Ca > K
Yeagarup Lake	W	0.102	fresh	Na > Ca > Mg > K
Yeagarup Lake	S	0.233	fresh	Na > Ca > Mg > K
Neanup Swamp	S	0.195	fresh	Na > Ca > Mg > K
South Yeagarup Lake	S	0.207	fresh	Ca > Na > Mg > K
Doggerup Lake	W	<0.001	fresh	Na > Mg > K > Ca
Doggerup Lake	S	0.213	fresh	Na > Mg > K > Ca
Lake Samuel	S	0.246	fresh	Na > Mg > K > Ca
Lake Florence	S	0.168	fresh	Na > Mg > K > Ca
Windy Harbour Lake	W	0.265	fresh	Na > Mg > Ca > K
Lake Maringup	W	0.132	fresh	Na > Ca > Mg > K
Lake Maringup	S	0.152	fresh	Na > Ca > Mg > K
Owingup Swamp	S	1.227	brackish	Na > Mg > Ca > K
Boat Harbour Lake 1	W	0.468	fresh	Na > Ca > Mg > K
Boat Harbour Lake 3	W	0.722	marginal	Na > Ca > Mg > K
Boat Harbour Lake 4	W	0.474	fresh	Na > Mg > Ca > K
Lake 12046	W	0.434	fresh	Na > Ca > K > Mg
Lake Williams	S	0.367	fresh	Na > K> Mg > Ca
Lake Saide	W	0.755	marginal	Na > Ca > Mg > K
Lake Powell	W	0.053	fresh	Na > Ca > Mg > K
Lake Powell	S	0.800	marginal	Na > Ca > Mg > K

1. Salinity categories are based on the Water Authority of Western Australia (1989a) classification for surface water where; fresh=<0.5 ppt (TDS), marginal=0.5-1.0 ppt (TDS), brackish=1.0-5.0 ppt (TDS), and saline=>5.0 ppt (TDS).

Table 10. Trophic status classification of lakes based on Wetzel (1975) (see Table 4). W=winter, S=spring.

Lake	Season	Classification	'Limiting' nutrient
Moses Pool	S	oligo-mesotrophic	P
Lake Davies	W	meso-eutrophic	
Lake Davies	S	oligo-mesotrophic	
Lake Quitjup	W	meso-eutrophic	
Lake Jasper	W	meso-eutrophic	
Lake Wilson	W	meso-eutrophic	
Lake Smith	W	meso-eutrophic	
Lake Smith	S	oligo-mesotrophic	P
Charley Lake	S	meso-eutrophic	
Yeagarup Lake	W	meso-eutrophic	
Yeagarup Lake	S	oligo-mesotrophic	
Neanup Swamp	S	oligo-mesotrophic	P
South Yeagarup Lake	S	oligo-mesotrophic	
Doggerup Lake	W	meso-eutrophic	
Doggerup Lake	S	meso-eutrophic	
Lake Samuel	S	meso-eutrophic	
Lake Florence	S	meso-eutrophic	
Windy Harbour Lake	W	eutrophic	
Lake Maringup	W	meso-eutrophic	
Lake Maringup	S	oligo-mesotrophic	
Owingup Swamp	S	meso-eutrophic	
Boat Harbour Lake 1	W	meso-eutrophic	
Boat Harbour Lake 3	W	meso-eutrophic	P
Boat Harbour Lake 4	W	meso-eutrophic	
Lake 12046	W	meso-eutrophic	
Lake Williams	S	eutrophic	N
Lake Saide	W	eutrophic	
Lake Powell	W	eutrophic	N
Lake Powell	S	eutrophic	

The typical ratio of total N : total P within the tissue of aquatic algae and macrophytes is 7:1 (Wetzel, 1975). In Moses Pool, Lake Smith, Neanup Swamp, and Boat Harbour Lake 3 the ratios were greater than 70:1 and therefore phosphorus can be considered the 'limiting' nutrient. In contrast, Lake Williams and, in winter Lake Powell, the ratio was less than 4:1, indicating nitrogen was the more 'limiting' nutrient.

Turbidity measured as NTU ranged widely, but showed no obvious association with individual lakes. Turbidity and chlorophyll were highly correlated ($r=0.61$, $n=29$, $p < 0.01$) and since turbidity is a measure of suspended particles in the water column, the high turbidity values probably reflect the amount of algal cells.

Values of chlorophyll (a) ranged from 0.19 µg/l Yeagarup in spring, to 14.41 µg/l in Lake Saide in winter. The lower values of chlorophyll (a) were consistently recorded during spring. Based on Wetzel (1975) classification using chlorophyll (a) levels, the trophic status of most of the lakes can be classified as oligotrophic. The only exceptions were lakes Powell, Saide, 12046, Boat Harbour 1, Boat Harbour 4, Windy Harbour and Owingup Swamp which were meso-eutrophic.

Phaeophytin is the breakdown product of chlorophyll and is useful to determine the extent and cyclic nature of any algal blooms. In this study, phaeophytin was estimated from chlorophyll (a) values but showed no obvious association with chlorophyll (a) or the lakes.

Benthic organic matter is a measure of the proportion of detrital to inorganic material in the substrate of lakes. This value ranged from 0.16% in Lake Wilson to 87% in Boat Harbour Lake 1. This represents a large range and reflects both differences in the nature of the catchments and possibly the patchy distribution of organic material within the lakes themselves (see Table 5, particularly the values for the six re-sampled lakes).

Macroinvertebrates

Species composition

A total of 209 taxa[2] belonging to 6 phyla were recorded from the lakes and a systematic list is presented in Appendix 1. This total will be substantially higher when the Nematoda and Annelida species are identified.

PRIMITIVE PHYLA

The Cnidaria were poorly represented with *Hydra* sp. only being recorded from four lakes.

Platyhelminthes were represented by a single species of Dugesiidae in Lake Powell and *Temnocephala* sp. (an ectocommensal on Decapod crustaceans) which were only occasionally recorded.

Both Nematoda and Annelida were common fauna in all the lakes and comprise a number of species, however the taxonomy is difficult, requiring specialist identification.

MOLLUSCA

Bivalves were represented by *Westralunio carteri* and a small unidentified species only collected from Lake Powell. Mature specimens of *W. carteri* were present in lakes Maringup, South Yeagarup and Boat Harbour 3 and shells only were collected from Yeagarup Lake.

Within the Gastropoda, the limpet *Ferrissia petterdi* and the snail ?*Physastra* sp. were common. *Ferrissia petterdi* has a widespread distribution in Australia indicated by the type locality being Launceston, Tasmania and is commonly found in both lotic and lentic waters (Wilson and Stoddart, 1980). *Physastra* is a common lentic water genus. The provisionally identified *Glacidorbis* sp. is of interest because the genus is typically associated with lotic waters (Bunn *et al.*, 1989).

ATHROPODA

Arthropoda comprised 92 % of the total taxa with the Insecta being dominant. Of the Insecta recorded, only Coleoptera and Hemiptera have aquatic adult stages.

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[2] A "taxa" is the lowest taxonomic unit, usually species, the individual could be identified to, although in some cases this was Genus, Family or Phylum.

ARACHNIDA

The Acarina, water mites, were well represented yet not an abundant component of the fauna in all lakes except Moses, Davies, Owingup and Saide. Water mites are recognised as being common in vegetated, fresh standing waters however there are no useful taxonomic keys for species identification. Until information on their biology is available their usefulness for interpreting ecological patterns is therefore limited.

CRUSTACEA

Cladocera were a conspicuous component in the lakes and were represented by 13 species. In most lakes they were not abundant, except for lakes Maringup (in winter) and Jasper where *Bosmina meridionalis* reached high numbers and lakes 12046 and Powell where the large zooplankton biomass (Table 12) can be attributed to *Daphnia carinata*. *D. carinata* is the dominant species of Cladocera in the eutrophic lakes on the Swan Coastal Plain.

The Copepoda were represented by three groups; the Cyclopoida, Harpacticoida and Calanoida. Identifications of the Cyclopoida and Harpacticoida are unavailable and have been recorded as single taxa although a number of species will be involved. Cyclopoids were present in all lakes but harpacticoids were not so widely distributed and both were usually in low abundance. Among the Calanoida, the genus *Calamoecia* was well represented. *C. tasmanica* was the most widely distributed species, being present in 19 of the lakes and usually in high abundance. *C. attenuata* was less widely distributed and generally less abundant. *Calamoecia* are considered to be perennial, multivoltine copepods in permanent waters (I.A.E. Bayly, pers. comm.). It should also be noted that *C. tasmanica* (Smith) s.l. in this report includes the two forms *C. tasmanica* and *C. tasmanica subattenuata* described from Western Australia (Bayly, 1992). The absence of *Calamoecia* from lakes Saide and Powell is of interest and may reflect human activity in these lakes with consequent eutrophication. However the geological history of the lake should also be considered, as the only record of the euryhaline species *Gladioferens imparipes* was from Lake Powell indicating a recent past connection with the sea. The genus *Hemiboeckella*, represented by two species, was collected from few lakes. This genus is usually found in littoral areas of lakes. *Hemiboeckella* species are not normally perennial, are winter hatchers and are more characteristic of temporary pools (I.A.E. Bayly, pers. comm.).

Ostracods were an important component of the lake fauna both in terms of numbers of species and abundances. Ten species were recorded, but there were no obvious patterns to their distributions. The most commonly collected species was *Gomphodella* aff. *maia* which appeared to be mainly associated with the black water acidic lakes. *Candonocypris novaezelandiae* is a cosmopolitan species in the south Pacific and common in the littoral areas of lakes in detrital material. It is often associated with eutrophic water (De Deckker, 1981) and was only recorded from lakes 12046 and Powell. *Newnhamia fenestra* was found in Neanup Swamp and Charley Lake and is a planktonic species, in contrast to the majority of ostracods which are generally benthic.

Isopods were rare, only a single phreatoicid species being recorded from Owingup Swamp and Lake Williams.

Five species of Amphipoda were recorded, with *Austrochiltonia subtenuis* the most common and usually very abundant. *Austrochiltonia* is a widely distributed euryhaline genus in southern Australia (Bayly and Williams, 1973) and *A. subtenuis* is a dominant species both in the wetlands of the Swan Coastal Plain (Davis and Rolls, 1987) and disturbed lower rivers (Bunn and Davies, 1992). *Perthia acutitelson* was present in the majority of the lakes but in low abundance. This species is often recorded in uplands streams of the northern jarrah forest (Bunn *et al.*, 1986 and Storey *et al.*, 1990).

The decapod crustacea were represented by the shrimp *Palaemonetes australis* and three freshwater crayfish *Cherax quinquecarinatus* (gilgie), *C. tenuimanus* (marron) and *C. destructor* (yabbie). *P australis* is the only freshwater shrimp in south-western Australia, with a wide distribution in all types of inland water. *Cherax* were recorded from most lakes with no co-occurrence of species. *C. destructor* was only found in Owingup swamp and Lake Williams and is an introduced eastern Australian species considered to be able to out-compete endemic *Cherax* species.

INSECTA

The Ephemeroptera were uncommon with the exception of *Tasmanocoenis tillyardi*. *T. tillyardi* is common in lower river systems on the Swan Coastal Plain (Aquatic Research Laboratory, 1987) and has been proposed as a biological indicator of excessive sedimentation when found in upland stream systems (Bunn *et al.*, 1986).

Thirteen species of Odonata were collected from seven families; Aeshnidae, Libellulidae, Corduliidae, Synthemidae, Gomphidae, Lestidae and Megapodagridae. Species were collected in low numbers and showed no obvious association with lake type. Dragonflies are predaceous and the numbers of species collected within wetlands has been used to confer a measure of environmental "health" as many trophic links supporting predators, are being maintained (Davis *et al.*, 1987). Dragonflies are rarely found in polluted waters (Watson, 1962) and Davis & Rolls (1987) suggest they may be absent from highly eutrophic waters.

Five of the species collected; *Austrogomphus lateralis*, *Hemigomphus armiger*, *Lathrocordulia metallica*, *Hesperocordulia berthoudi* and *Synthemis cyanitincta* are considered permanent-stream species (Watson 1962, Watson *et al.* 1991). Only six of the species are considered by Watson (1962) to be lake species, with the remaining two; *Austrolestes annulosus* and *Orthetrum caledonicum* with a wide tolerance range, inhabiting many, varied aquatic systems. Several of the species collected are considered endemic and restricted to the extreme south-west of Western Australia, including *Hesperocordulia berthoudi* and *Lathrocordulia metallica*

Seven taxa of aquatic hemipteran were collected, however most of the individuals could only be identified to Genus, limiting further interpretation. Members of the Hemiptera are typically predaceous, occurring predominantly in the lake margins in vegetation.

Chironomidae were a dominant element, comprising 51 species, representing 25 % of the total taxa recorded from the lakes. However species were usually low in abundance. The biology of the family is diverse, with most species being detrital browsers but also including a number of predatory species. Lentic and lotic species were present. Typical lentic species included *Procladius villosimanus, Coelopynia pruinosa, Kiefferulus intertinctus, Dicrotendipes ?conjunctus, Polypedilum nubifer, Chironomus* aff. *alternans* and *Chironomus occidentalis*. These are common Australia-wide species (Edward, 1986) and are associated with the eutrophic lakes of the Swan Coastal Plain in Western Australia (Pinder *et al.*, 1991). Typical lotic species included *?Zavrelimyia* sp., *Orthocladiinae* sp. V43, *Cricotopus annuliventris, Nilothauma* sp., *Riethia* spp. and *Aphroteniella filicornis* (Storey and Edward, 1989). A feature of the Chironomidae was the 16 species previously only recorded from permanent upland streams of the jarrah and karri forests. Of interest is *Aphroteniella filicornis,* the usual habitat of which is the lower order streams throughout Australia however it has been recorded in perched acid, dune lakes on Fraser Island, Queensland (Cranston and Edward, 1992). The species only occurred in the acid dark water lakes in this study.

Apart from the Chironomidae, the only other major Diptera Family collected were Ceratopogonidae, represented by 8 taxa. They were generally uncommon except for Ceratopogonidae sp. G which was common in Lake Powell during both collecting trips.

Trichoptera comprised 13 taxa representing a diverse fauna of what is considered a typical lotic group (Hynes, 1970). All species except Leptoceridae sp. F, sp. H and sp. I, have previously been recorded in upland streams of the northern jarrah forest (Aquatic Research Laboratory 1988). These leptocerids may be true lentic species.

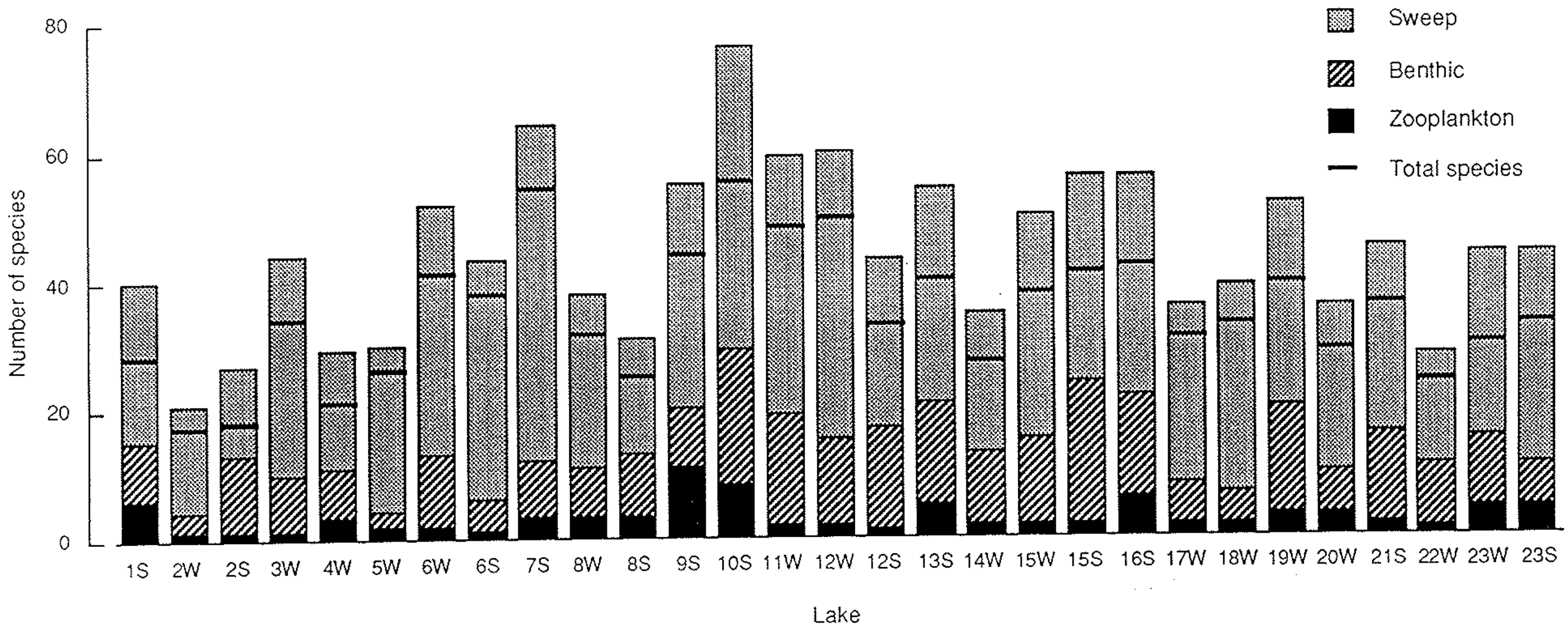
Twenty-one taxa of aquatic beetle were collected, dominated by the Dytiscidae with thirteen species in both larval and adult stages. Dytiscids are predatory as larvae and adults. The adults are strong fliers and can colonise other areas if local conditions deteriorate. The most commonly collected dytiscid in the lakes, *Sternopriscus browni*, is a common species in upland streams of the jarrah forest (Storey *et al.*, 1990) indicating a wide tolerance to environmental conditions.

Species richness

The number of macroinvertebrate species collected from each lake ranged from 17 in Lake Davies (winter) to 54 and 55 species in lakes Charley and South Yeagarup respectively (Figure 3). Species richness was high compared to the more nutrient enriched wetlands of the Swan Coastal Plain (Davis & Rolls, 1987), particularly as in this latter study the sampling was conducted seasonally, substantially increasing the total species list.

In re-sampled lakes, there was little difference in species richness between seasons:

Lake	Winter	Spring
Davies	17	18
Smith	41	38
Yeagarup	32	25
Doggerup	48	49
Maringup	38	41
Powell	30	33



Key to lake numbers:
1 Moses Pool
2 Lake Davies
3 Lake Quitjup
4 Lake Jasper
5 Lake Wilson
6 Lake Smith
7 Charley Lake
8 Yeagarup Lake
9 Neanup Swamp
10 South Yeagarup Lake
11 Doggerup Lake
12 Lake Samuel
13 Lake Florence
14 Windy Harbour Lake
15 Lake Maringup
16 Owingup Swamp
17 Boat Harbour Lake 1
18 Boat Harbour Lake 3
19 Boat Harbour Lake 4
20 Lake 12046
21 Lake Williams
22 Lake Saide
23 Lake Powell

Figure 3. Macroinvertebrate species richness (total number of taxa identified from the benthic, sweep and zooplankton samples) for each lake. W=winter, S=spring. The total species bar is shown, indicating that some species were collected from many habitats (benthic, plankton and sweep samples).

Correlations between environmental parameters and species richness (Table 11) showed the importance of salinity, where lakes with lowest salinities had higher species' richness (Figure 4). The higher salinities, although very small (i.e. maximum = Lake Davies in winter with 1.6 ppt), appears sufficient to cause a localised loss of some, presumably less-tolerant species. No other environmental parameters were correlated to species richness of the lakes.

Table 11. Results of stepwise multiple regression analysis, with hierarchical inclusion of the number of species recorded in each lake against environmental parameters. The cumulative variation explained (r^2) by each variable and F-values are presented. All factors where the F-values were significant at $p<0.05$ are shown in the table.

Dependent variable	Factor	Interpretation	r^2	F-value
Species richness	F2	Salinity	0.23	8.1
		No other variable significantly correlated		

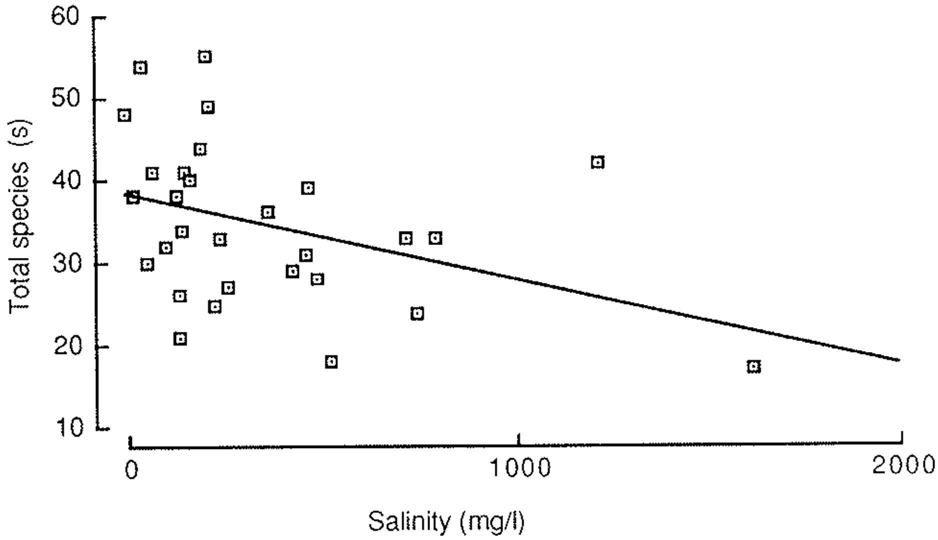


Figure 4. Regression analysis of total species richness vs salinity (TDS). The regression was significant r=-0.48, n=29, $p<0.05$.

The diversity of macroinvertebrates can be useful to compare between different systems, where a more diverse system is considered more 'healthy' than a less diverse one (Magurran 1988) (see Table 12 for a comparison of macroinvertebrate species richness from different biogeographic regions of Western Australia).

The southern coast permanent lakes recorded a total of 209 taxa of macroinvertebrates, this representing a highly diverse fauna. The permanent lakes the Swan Coastal Plain are characterised by nutrient enrichment to an extent where many are eutrophic. Total species diversity recorded in Swan

Coastal Plain lakes was low at 87 taxa, typically generalist, cosmopolitan species, including many nuisance chironomids (Davis and Rolls, 1987).

The macroinvertebrate fauna of permanent lakes of the Two Peoples Bay region was represented by 123 taxa, exclusive of the micro-crustacea and Rotifera (Storey *et al.*, in press).

Table 12. Number of macroinvertebrate species from a range of methodologically similar studies of lentic systems in Western Australia.

Species	System	Reference
South coast lakes		
209	South coast lakes	This report
123	Two Peoples Bay lakes	Storey *et al.* (in press)
River pools of the Pilbara		
80	Robe River pools	Streamtec (1991a)
Urban wetlands on the Swan Coastal Plain		
{ 24	Lake Joondalup	Davis & Rolls (1987)
{ 40	Lake Monger	Davis & Rolls (1987)
87 { 49	Lake Jandabup	Davis & Rolls (1987)
{ 55	North Lake	Davis & Rolls (1987)
{ 62	Lake Thomson	Davis & Rolls (1987)
48	Tamworth Lake	Streamtec (1992)
Rural wetlands in semi-disturbed catchments		
31	Collie wetlands	Streamtec (1991b)
44	Swamphen Lake (Capel)	Cale & Edward (1990)

Zooplankton biomass

Zooplankton biomass was variable between lakes from 0 mg in Doggerup Lake in winter to 678.5 mg in Lake Powell in winter from a standard 50 m trawl (Table 13). The highest biomass values were recorded from lakes 12046 and Powell and indicated high productivity in these lakes. The biomass in these lakes was composed mainly of *Daphnia carinata*.

Table 13. Zooplankton biomass from a standard 50 m trawl from each lake.

Lake	Season	Biomass (mg)
Moses Pool	S	30.6
Lake Davies	W	81.9
Lake Davies	S	47.81
Lake Quitjup	W	143.9
Lake Jasper	W	57.6
Lake Wilson	W	86.6
Lake Smith	W	18.0
Lake Smith	S	72.8
Charley Lake	S	20.2
Yeagarup Lake	W	83.1
Yeagarup Lake	S	11.9
Neanup Swamp	S	31.3
South Yeagarup Lake	S	*
Doggerup Lake	W	0
Doggerup Lake	S	24.2
Lake Samuel	S	67.5
Lake Florence	S	18.8
Windy Harbour Lake	W	7.4
Lake Maringup	W	116.6
Lake Maringup	S	34.5
Owingup Swamp	S	24.3
Boat Harbour Lake 1	W	43.4
Boat Harbour Lake 3	W	39.4
Boat Harbour Lake 4	W	35.1
Lake 12046	W	764.3
Lake Williams	S	68.9
Lake Saide	W	16.5
Lake Powell	W	678.5
Lake Powell	S	586.7

* Inaccessible to the boat and the open water was too deep for wading.

Fish

Fish were not found at Moses Pool or Neanup Swamp. Six native and one introduced species the mosquitofish *Gambusia affinis* were recorded from the other lakes sampled (Table 14). The fish fauna is discussed in detail in Jaensch (1992).

Table 14. Distribution of fish species recorded. W=winter, S=spring.

Lake	Season	Species
Lake Davies	W	*Pseudogobius olorum*
Lake Davies	S	*Pseudogobius olorum*
Lake Quitjup	W	*Galaxias occidentalis* *Edelia vittata*
Lake Jasper	W	*Galaxiella munda* *Edelia vittata*
Lake Wilson	W	*Bostockia porosa*
Lake Smith	S	*Edelia vittata* *Galaxiella nigrostriata*
Charley Lake	S	*Edelia vittata*
Yeagarup Lake	W	*Gambusia affinis* *Bostockia porosa*
Yeagarup Lake	S	*Bostockia porosa*
South Yeagarup Lake	S	*Edelia vittata*
Doggerup Lake	W	*Bostockia porosa* *Galaxiella nigrostriata*
Doggerup Lake	S	*Edelia vittata* *Galaxiella nigrostriata*
Lake Samuel	S	*Edelia vittata* *Galaxias occidentalis* *Galaxiella munda*
Lake Florence	S	*Edelia vittata* *Galaxiella munda*
Windy Harbour Lake	W	*Galaxiella nigrostriata*
Lake Maringup	W	*Edelia vittata*
Lake Maringup	S	*Edelia vittata* *Pseudogobius olorum* *Galaxias occidentalis*
Owingup Swamp	S	*Edelia vittata* *Pseudogobius olorum*
Boat Harbour Lake 1	W	*Edelia vittata* *Pseudogobius olorum*
Boat Harbour Lake 3	W	*Edelia vittata* *Pseudogobius olorum*

Table 14 (cont.). Distribution of fish species recorded. W=winter, S=spring.

Lake	Season	Species
Boat Harbour Lake 4	W	*Edelia vittata* *Pseudogobius olorum*
Lake 12046	W	*Pseudogobius olorum*
Lake Williams	S	*Edelia vittata* *Bostockia porosa*
Lake Saide	W	*Edelia vittata* *Pseudogobius olorum* *Gambusia affinis* (in drain)
Lake Powell	W	*Pseudogobius olorum* *Gambusia affinis* (found dead)
Lake Powell	S	*Edelia vittata* *Pseudogobius olorum*

Frogs

Tadpoles were occasionally found in the qualitative sweep samples and the species are presented in Table 15 below. The sampling technique was not designed to capture tadpoles and this list should not be seen as representative of the species occurring in the lakes.

Table 15. Frog species (larvae) identified from the sweep samples. W=winter, S=spring.

Lake	Season	Species
Moses Pool	S	*Litoria adelaidensis*
Lake Davies	W	*? Helioporus* sp.
Charley Lake	S	*Litoria adelaidensis*
Neanup Swamp	S	*Litoria adelaidensis*
Owingup Swamp	S	*Litoria adelaidensis*
Lake Powell	W	*Helioporus* sp.
Lake Powell	S	*Litoria adelaidensis*

Multivariate analyses

Environmental parameters

Factor analysis using principal components (PCA) outlined seven major factors (Table 16).

Table 16. Factor scores calculated for the environmental variables.

Parameter	F1	F2	F3	F4	F5	F6	F7
Area	.214	-.020	-.238	.115	.103	**.712**	.266
Season	-.178	-.079	**.849**	-.186	.132	.088	.150
Depth	**.794**	-.029	-.037	-.075	-.252	**.329**	.044
Temp (surface)	.033	.108	**.895**	.066	.143	.063	.035
Temp (bottom)	**.880**	.136	**.325**	.124	.133	.089	.036
Temp (ratio)	**.927**	.091	.102	.089	.170	.075	-.006
DO (surface)	**.860**	.090	**-.328**	.070	-.219	-.049	-.073
DO (bottom)	**.839**	.142	-.183	.069	.247	-.133	-.165
DO (ratio)	**.838**	.029	.132	.033	.232	.011	-.052
pH	.249	.133	.190	.042	**.847**	-.020	-.070
Colour	.220	**-.395**	**.626**	.215	**-.344**	-.260	-.146
Turbidity	-.025	-.018	-.168	**.784**	.136	.265	-.138
Na	.085	**.961**	-.029	.192	.049	.049	.006
K	.082	**.315**	**.382**	**.543**	-.254	-.258	.080
Ca	-.264	**.408**	-.268	.261	**.411**	-.092	**.528**
Mg	.065	**.975**	-.014	.010	.022	.048	.000
Cl	.097	**.960**	.005	.164	.044	.083	.015
TDS	.026	**.878**	.023	-.094	.117	-.100	.235
Chloro	.086	.169	**-.368**	**.711**	.277	-.055	.247
Phaeo	-.033	.128	.187	-.149	-.123	.112	**.896**
N	**-.544**	.220	.225	.179	.272	-.003	-.097
P	.072	.067	.251	**.921**	-.118	.040	-.141
BOM	-.005	-.104	**-.333**	-.064	.115	**-.727**	.107

A principal components analysis of the physico-chemical conditions associated with each site shows the pattern of co-occurrence of variables. The parameters highlighted in bold were considered "significant" (i.e. loading on any axis at >+0.30 or <-0.30, Child 1970).

The factors are listed in decreasing amount of variation explained and therefore considered of decreasing "importance".

Factor 1 shows the co-occurrence of depth with stratification and low nutrient levels (Figure 5a).

Factor 2 shows the co-occurrence of all cations measured and TDS, illustrating that in the lakes with relatively elevated salinities, no single cation was responsible (Figure 5a). Additionally, the lakes with elevated salinity had low colour.

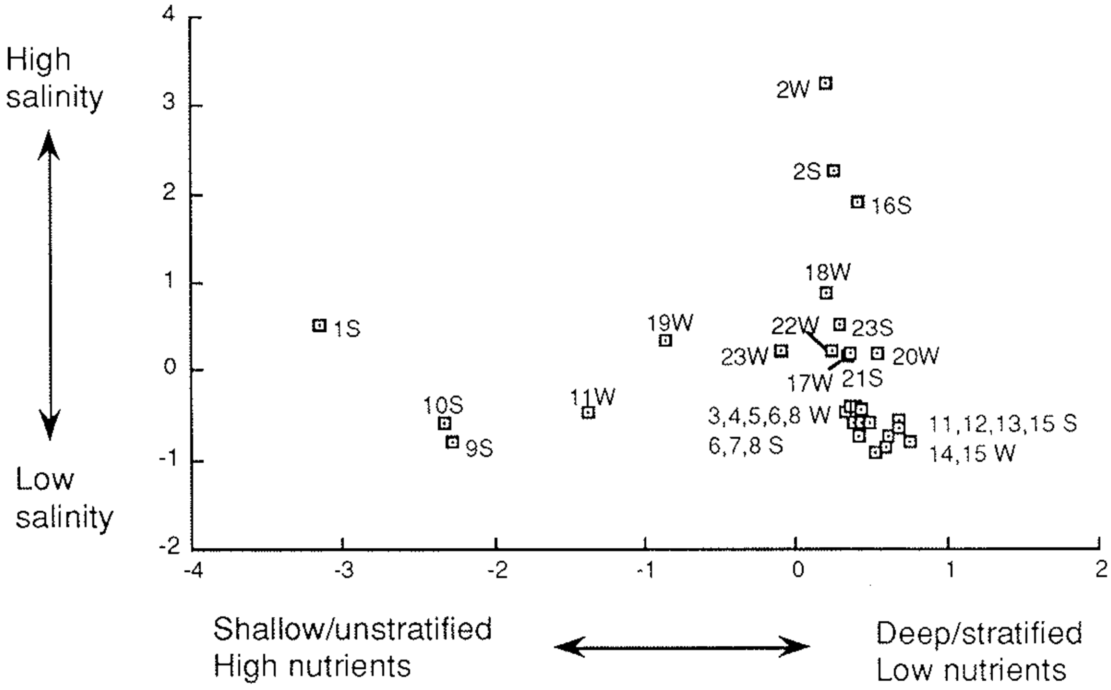
Factor 3 is a gradient generally of parameters that change seasonally; temperature, chlorophyll (a) and colour (Figure 5b).

Factor 4 is a gradient of the association of elevated nutrients (phosphorus and potassium) and turbidity (Figure 5b).

Factor 5 shows that lakes with high pH and calcium also had low colour levels.

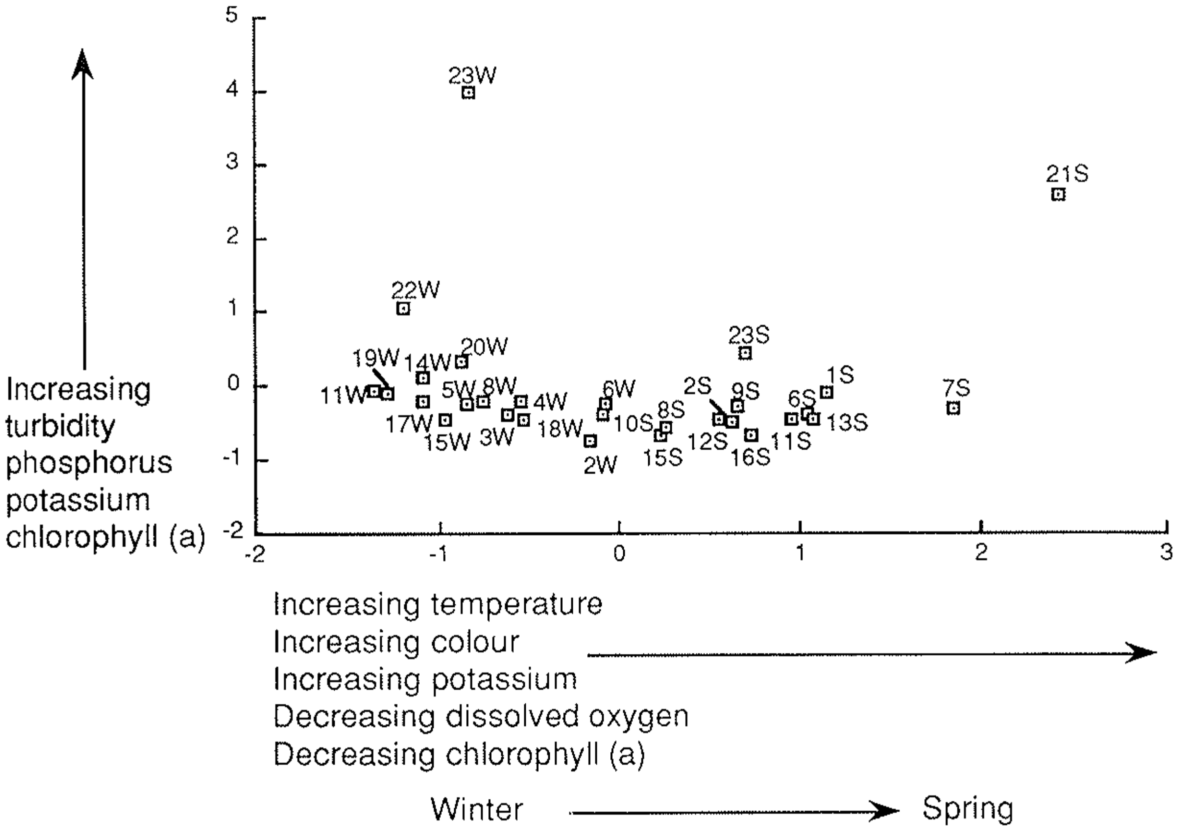
Factor 6 is a gradient of the association of the larger deeper lakes with low levels of benthic organic matter.

Factor 7 shows the association of calcium and phaeophytin (the breakdown product of chlorophyll (a)).



Key to lake numbers:
1 Moses Pool
2 Lake Davies
3 Lake Quitjup
4 Lake Jasper
5 Lake Wilson
6 Lake Smith
7 Charley Lake
8 Yeagarup Lake
9 Neanup Swamp
10 South Yeagarup Lake
11 Doggerup Lake
12 Lake Samuel
13 Lake Florence
14 Windy Harbour Lake
15 Lake Maringup
16 Owingup Swamp
17 Boat Harbour Lake 1
18 Boat Harbour Lake 3
19 Boat Harbour Lake 4
20 Lake 12046
21 Lake Williams
22 Lake Saide
23 Lake Powell

Figure 5a. Factor 1 by factor 2 plot of environmental parameters showing scores for each lake. W=winter, S=spring.



Key to lake numbers:

1	Moses Pool	9	Neanup Swamp	17	Boat Harbour Lake 1
2	Lake Davies	10	South Yeagarup Lake	18	Boat Harbour Lake 3
3	Lake Quitjup	11	Doggerup Lake	19	Boat Harbour Lake 4
4	Lake Jasper	12	Lake Samuel	20	Lake 12046
5	Lake Wilson	13	Lake Florence	21	Lake Williams
6	Lake Smith	14	Windy Harbour Lake	22	Lake Saide
7	Charley Lake	15	Lake Maringup	23	Lake Powell
8	Yeagarup Lake	16	Owingup Swamp		

Figure 5b. Factor 3 by factor 4 plot of environmental parameters showing scores for each lake. W=winter, S=spring.

These factors explained the following variation, from Factor 1 the most variation explained to Factor 7 the least. A total of 83.5 % variation in environmental parameters is explained by the seven Factors:

Factor	Eigen-values	% variation
1	5.5	23.9
2	4.4	19.0
3	2.9	10.2
4	2.4	12.7
5	1.5	6.6
6	1.4	6.3
7	1.1	4.8

The identification of these seven underlying factors greatly simplified the large data array, collapsing the information into co-occurring parameters. In subsequent analyses, identifying gradients in the ordinations of macroinvertebrate community structure, factors are correlated to axis scores rather than individual variables. This results in a more easily understood interpretation of the important environmental parameters and substantially reduces the statistical problems associated with multi-collinearity of independent variables.

Macroinvertebrates

Lakes are typically represented by three major habitats; the water column (planktonic), the benthos and the vegetated littoral zone. In the multivariate analyses, the planktonic and benthic habitats were analysed separately and analyses were also performed using the total species recorded from all habitats.

CLASSIFICATION

A divisive clustering technique TWINSPAN (Hill 1979b) was used to generate lake groupings on the basis of macroinvertebrate community structure. TWINSPAN was applied to three distinct data-sets: the benthic community; the zooplankton and the total macroinvertebrate fauna. Lakes occurring in the same groupings would be characterised by similar ecologies.

Benthic species

The major division separated lakes Quitjup, Smith, Yeagarup, Doggerup Samuel, Florence and Williams from the other lakes. Several re-sampled lakes (e.g. Smith and Yeagarup) were present in different initial TWINSPAN groupings, indicating a large seasonal component to the benthic fauna, validating seasonal sampling. Multiple Discriminant Analysis (MDA) was used to outline the environmental parameters significantly associated with the TWINSPAN groupings (1/2). The initial TWINSPAN division was on the basis of lake pH, calcium and salinity. The lakes with relatively lower levels of each of these parameters were characterised by the indicator species (Figure 6a); *Riethia* spp., *Polypedilum* sp. 2 and *Aphroteniella filicornis.*

Second level TWINSPAN divisions separated a small number of lakes from larger groupings (Figure 6a). The division of lakes Quitjup and Smith from the major grouping was on the basis of the indicator species, the chironomid *Tanytarsus* sp. 3. The environmental parameters correlated to this division were calcium and salinity (Table 17). The final TWINSPAN division (group 5/6: Figure 6a) separated Lake Powell and Boat Harbour Lake 3 from the major grouping. MDA outlined the group of lakes with elevated nutrients were the reason for the division. Indicator species including the cladoceran *Daphnia carinata* and the gastropod ?*Physastra* sp. were dominant in these more nutrient enriched lakes.

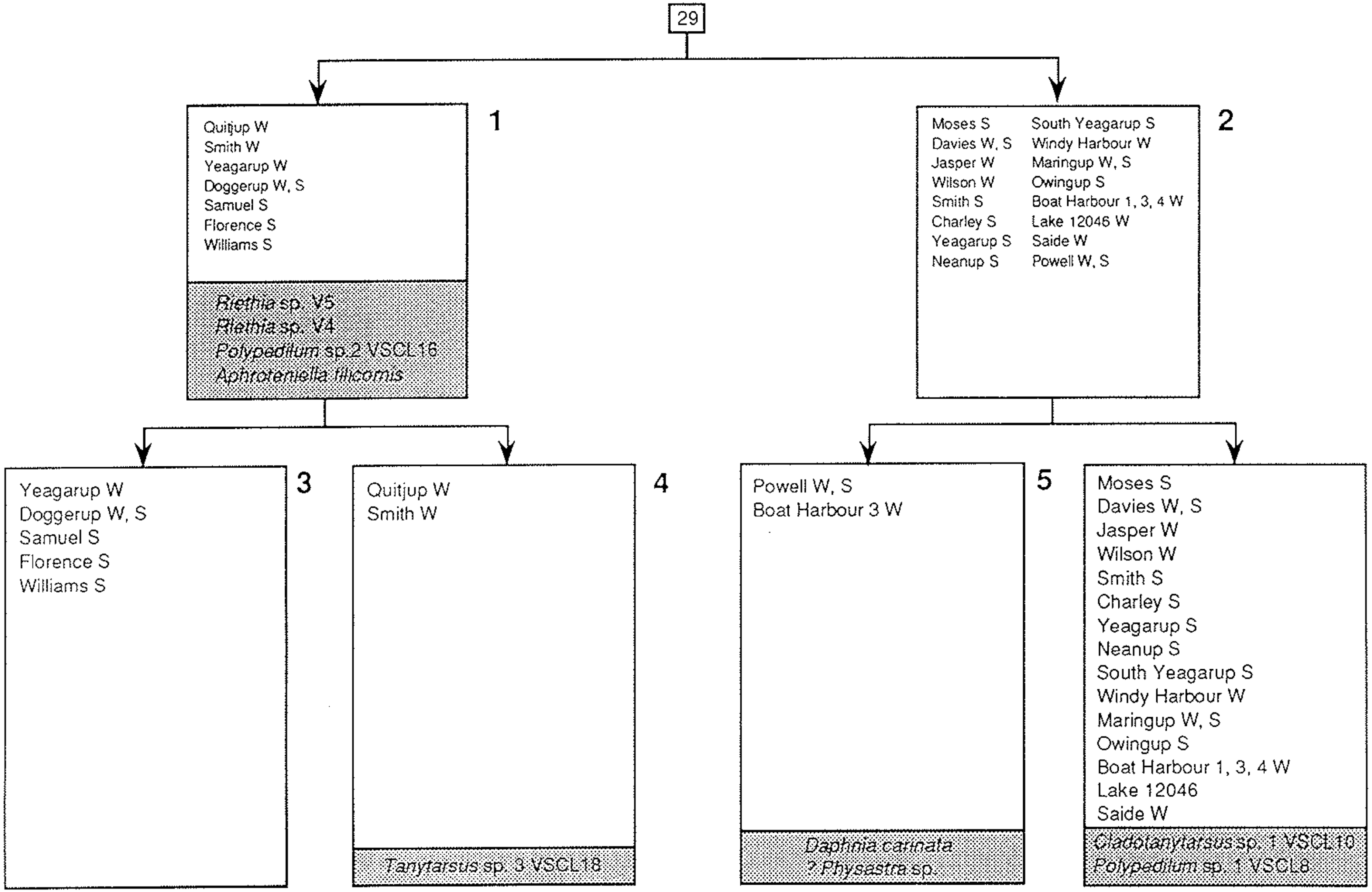


Figure 6a. Dendrogram showing TWINSPAN classification of the lakes using benthic species. Indicator species are indicated in the shaded boxes. W=winter, S=spring.

Zooplankton

The major division between the samples on zooplankton fauna separated lakes Saide and Powell from the other lakes (Figure 6b). The major discriminating environmental parameters for this division were levels of nutrients (Table 17). The indicator species for each grouping were Cyclopoida for the nutrient affected lakes and the calanoids *Calamoecia attenuata* and *C. tasmanica* for the other lake grouping. The second level of the TWINSPAN division separated the deeper/stratified lakes from the shallower/unstratified lakes and also represented a weak seasonal component, with winter separating from spring.

Total fauna

TWINSPAN analysis on the total species data-set was taken to three levels (Figure 6c). The first, and most important, division separated lakes Powell, Moses, Davies, Owingup, Boat Harbour 3 and Saide from the other lakes studied. This division could be attributed to salinity, nutrients and, to a lesser extent the pH of the water (Table 17). The relatively elevated salinity and nutrients characterised this grouping, where indicator species included *Oecetis* sp. typically a lower river species of mayfly. This grouping of the TWINSPAN division represents lakes considered of low conservation significance. In contrast, the other grouping represents lakes of high conservation significance. These lakes have low salinities and nutrient status which is reflected in a structurally different macroinvertebrate fauna. The indicator species associated with the lakes considered of higher conservation status, would form a useful basis for a biological monitoring programme.

TWINSPAN level two divisions, separated lakes Saide and Powell from Moses, Davies, Owingup and Boat Harbour Three. Nutrient status was the major discriminating parameters for this division (Table 17). Indicator species for this separation was the calanoid *Calamoecia tasmanica*, which was absent in the eutrophic lakes. This TWINSPAN division is considered a separation of intermediate conservation status lakes (i.e. Moses, Davies, Owingup, Lake 12046 and Boat Harbour 3) from low conservation status lakes (i.e. the eutrophic lakes Powell and Saide).

Division of the high conservation status lakes into two groups was on the basis of the pH and temperature of the water, with the chironomid *Aphroteniella filicornis* as the major indicator species.

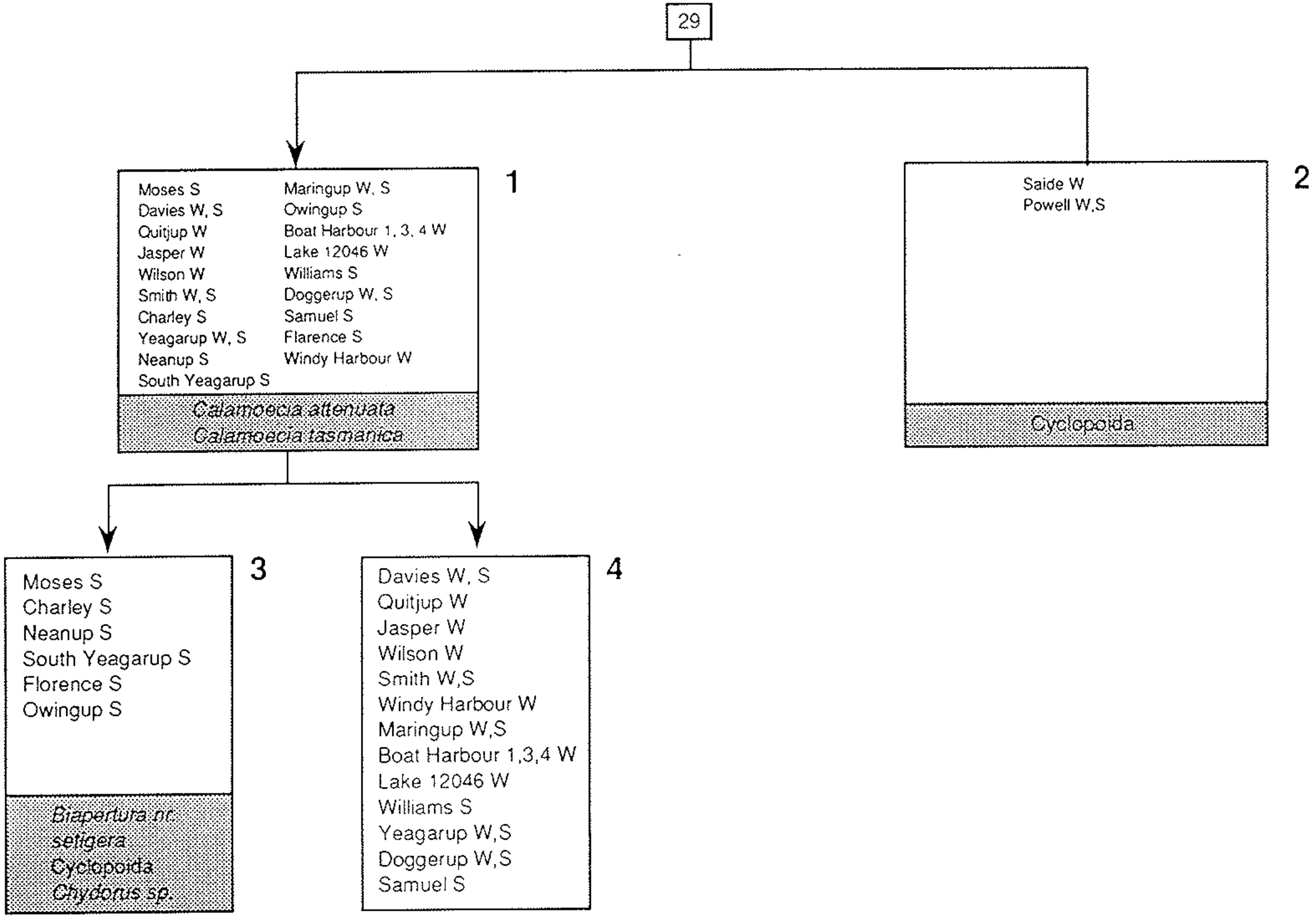


Figure 6b. Dendrogram showing TWINSPAN classification of the lakes using zooplankton species. Indicator species are indicated in the shaded boxes. W=winter, S=spring.

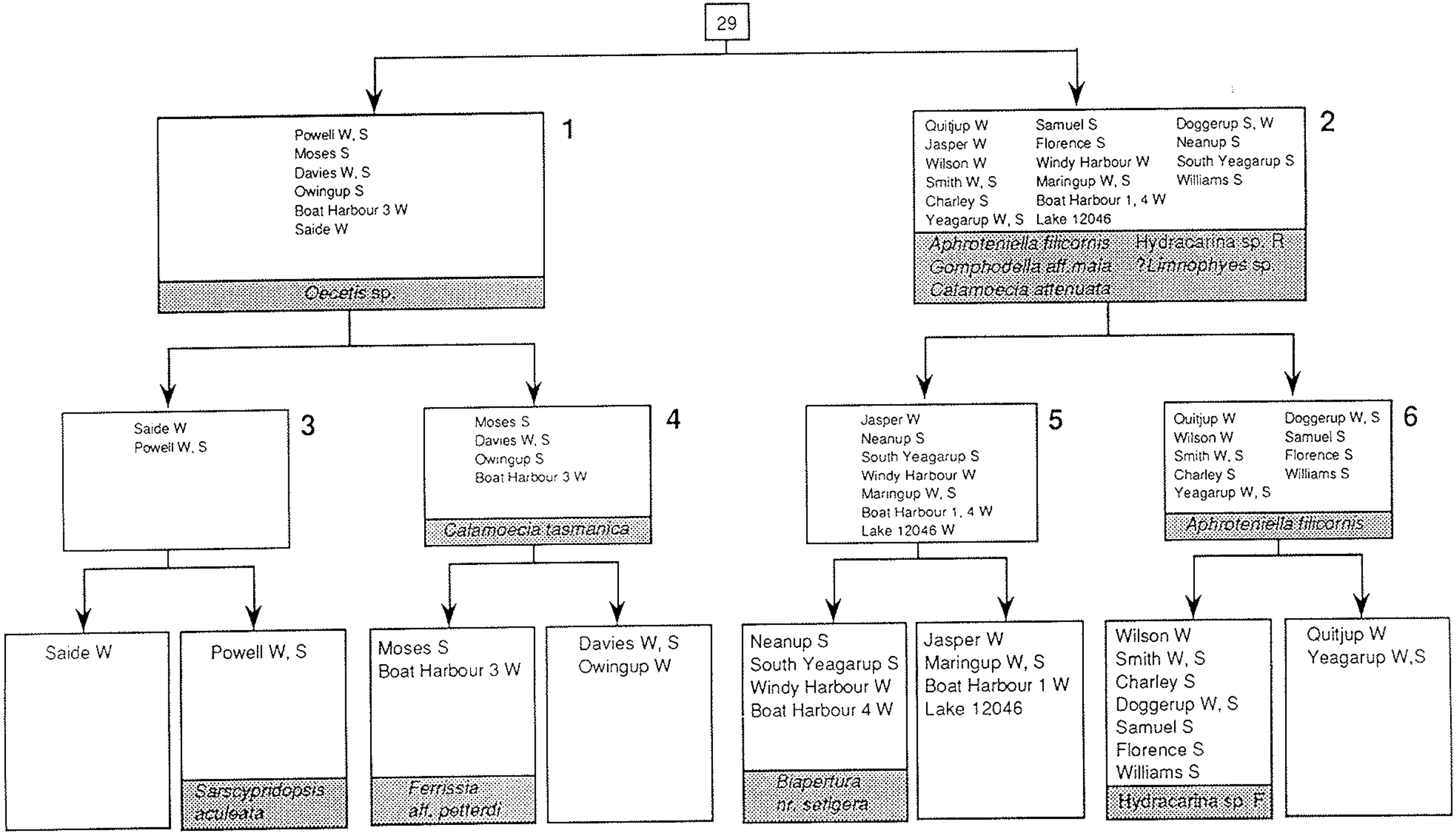
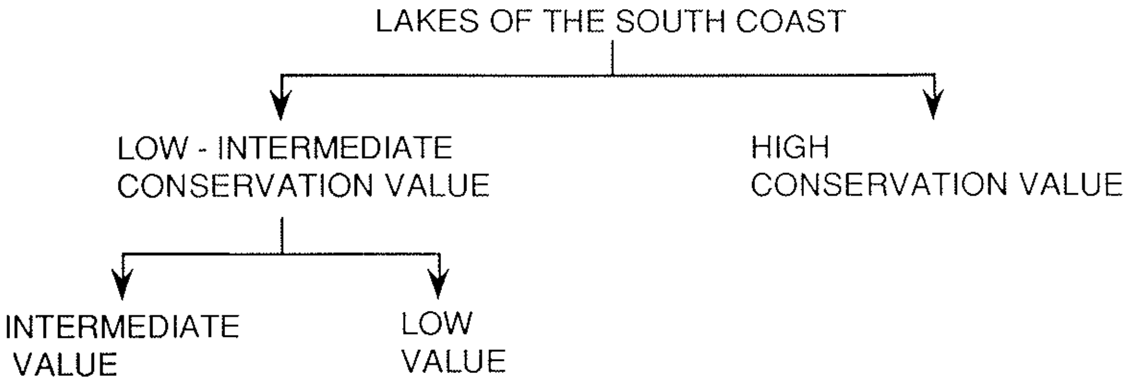


Figure 6c. Dendrogram showing TWINSPAN classification of the lakes using the total species list. Indicator species are indicated in the shaded boxes. W=winter, S=spring.



The figure above shows the interpretation of the TWINSPAN plot outlined in Figure 6c. Essentially the major division separates the high from the intermediate/low conservation lakes, with the second division separating low (i.e. lakes Powell and Saide) from the intermediate value lakes.

In all classification analyses of the total faunal data-set, there was a 100% correct classification using multiple discriminant analysis (Table 17). This means a model can be derived where given a set of environmental parameters the type of macroinvertebrate community can be predicted with a very high degree of accuracy. However detailed seasonal sampling is required to complete the derived model. A biological monitoring programme could determine any changes to the biology of selected lakes by using either the total macroinvertebrate community or the indicator species outlined in the TWINSPAN plot (Figure 6c). For example, the chironomid *Aphroteniella filicornis* and the calanoid *Calamoecia attenuata* are indicators for lakes of 'high' conservation value, and if these species disappear this would indicate that some impact of the lake environment has occurred. Conversely, if the indicator species for the low-intermediate lakes (i.e. the mayfly *Oecetis* sp.) appears this would indicate the direction of a change from a high value to a low-intermediate value system.

Table 17. Multiple Discriminant Analyses (MDA) using factor scores from PCA on TWINSPAN (presence/ absence) groupings. DCA was performed at each TWINSPAN division, terminating at level three of the classification analysis. The table illustrates percent correct classification,the most important factors (entered stepwise) for discriminating between groups and Wilk's Lambda, all significance levels were $p<0.05$. The values in brackets indicate the direction of the correlation between factor scores and TWINSPAN groupings.

TWINSPAN groups	(% correct)	Variables	Interpretation	Lambda
Benthic samples (Figure 6a)				
1/2	(79.3%)	F5	Acidic / Low calcium	0.79 (+)
		F2	Low salinity	0.68 (+)
		F3	Warmer water	0.63 (+)
3/4	(67.0%)	F7	Calcium / Phaeo	0.73 (+)
		F2	High salinity	0.59 (+)
5/6	(95.2%)	F4	High nutrients	0.47 (+)
		F3	Cooler water	0.38 (+)
Zooplankton (Figure 6b)				
1/2	(93.1%)	F4	Low nutrients	0.55(+)
		F5	Acidic / Low calcium	0.50 (+)
3/4	(92.3%)	F1	Shallow / Unstratified	0.72 (+)
		F3	Warmer water	0.53 (+)
Total fauna (Figure 6c)				
1/2	(100%)	F2	High salinity	0.41 (+)
		F4	High nutrients	0.34 (+)
		F5	Alkaline water	0.28(+)
3/4	(100%)	F4	High nutrients	0.41 (+)
5/6	(100%)	F1	Deep / Stratified	0.74 (+)
		F5	Alkaline water	0.61 (+)
		F3	Cooler water	0.48 (+)

ORDINATION

The lakes were ordinated on the basis of macroinvertebrate community structure by DECORANA (Hill 1979a). Three separate data-sets were ordinated; the plankton, benthic samples and the total fauna. Subsequently, axis scores were correlated to environmental gradients by stepwise multiple regression. This method shows which environmental parameters are important in structuring the observed faunal community. These analyses were restricted to the first two axes of DECORANA, as these explain the most variation and further interpretation was difficult.

Benthic species

The ordination of the benthic samples showed Lakes Powell and Boat Harbour Lake 3 separated from the other lakes along axis one[3] (Figure 7a). Axis one was a gradient of different water calcium levels (15% total variation; Table 18), with high calcium values having higher axis scores. A number of variables (factors) explained significant variation in axis two scores (nutrient status, 20%, pH, 16% and salinity 11% Table 18).

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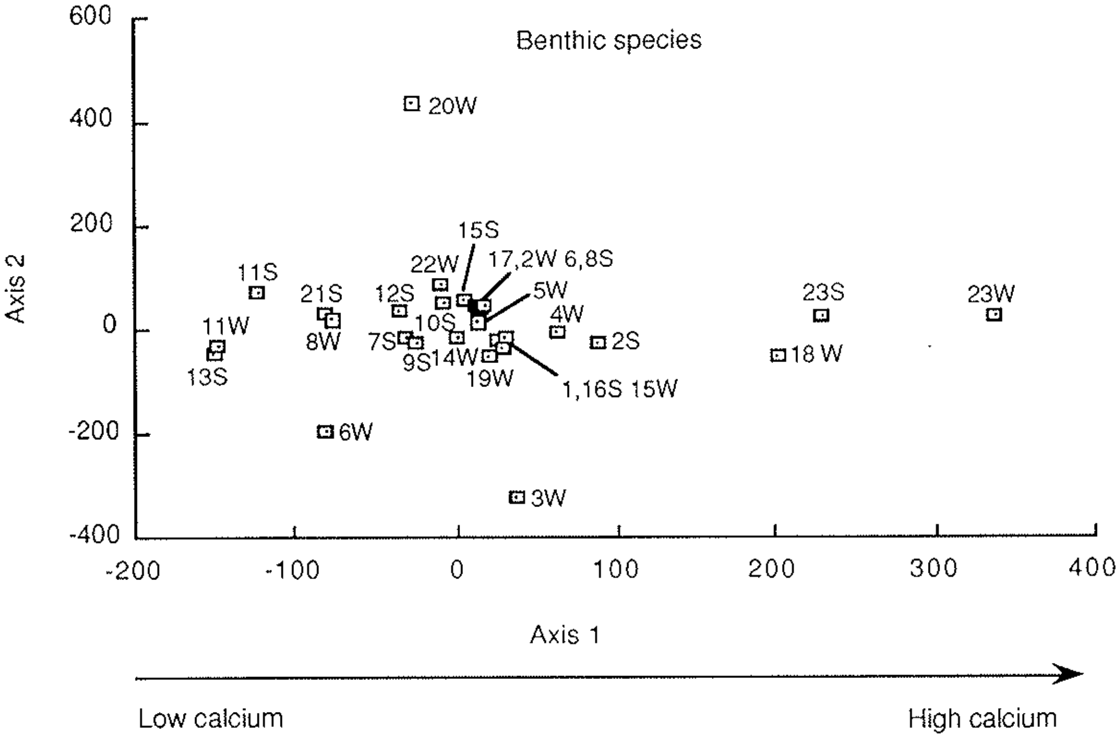
[3] In DECORANA, axis one always explains the most variation in the ordination space. subsequent axes explain less and less variation. Therefore axis one is always considered the most 'important' ordering of samples.



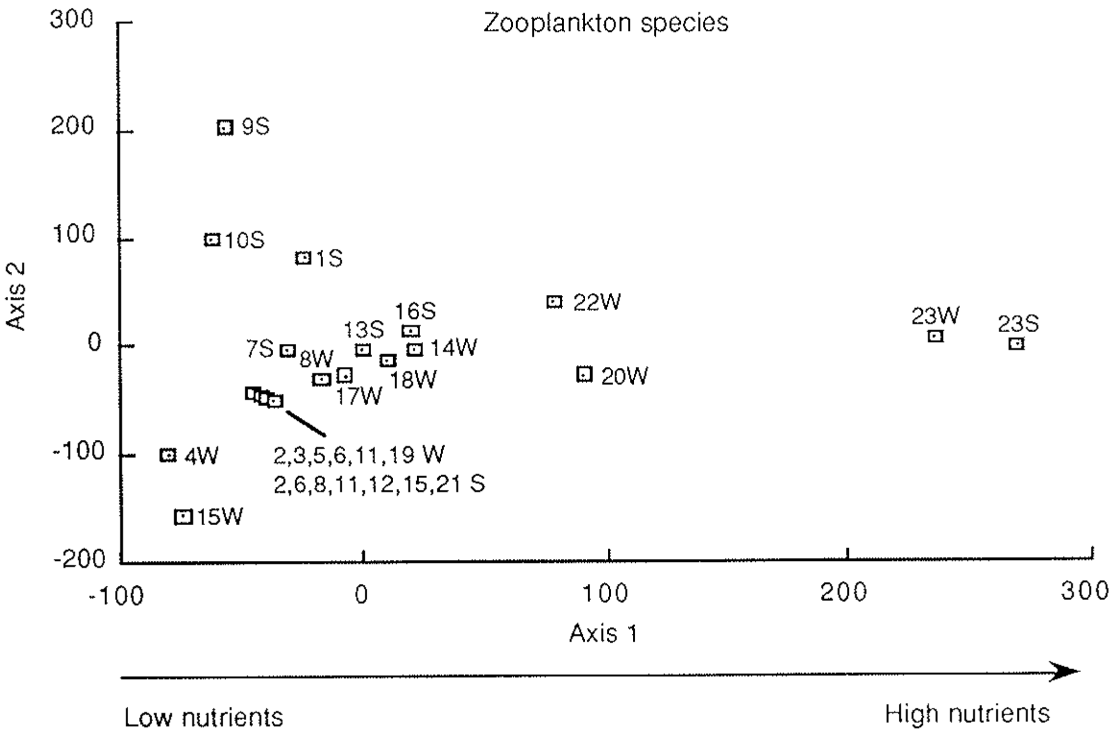
Key to lake numbers:

1	Moses Pool	9	Neanup Swamp	17	Boat Harbour Lake 1
2	Lake Davies	10	South Yeagarup Lake	18	Boat Harbour Lake 3
3	Lake Quitjup	11	Doggerup Lake	19	Boat Harbour Lake 4
4	Lake Jasper	12	Lake Samuel	20	Lake 12046
5	Lake Wilson	13	Lake Florence	21	Lake Williams
6	Lake Smith	14	Windy Harbour Lake	22	Lake Saide
7	Charley Lake	15	Lake Maringup	23	Lake Powell
8	Yeagarup Lake	16	Owingup Swamp		

Figure 7a. Axis 1 by axis 2 plot of DECORANA scores using benthic species for each lake. W=winter, S=spring.

Zooplankton

Ordination of the zooplankton samples showed Lake Powell and to a lesser extent, Lake 12046 and Lake Saide separating from the other lakes on axis one (Figure 7b) Axis one was predominantly a gradient of nutrient status, where the samples with elevated nutrients had higher axis scores (i.e. the previously mentioned lakes Powell and Saide). This relationship between DECORANA axis scores using plankton samples and nutrient status explained 39% of the total variation. Axis two was predominantly a gradient of lake depth, where the shallower lakes had the higher axis scores (i.e. Owingup Swamp). Stepwise multiple regression on this relationship explained 48% of the total variation (Table 18).



Key to lake numbers:

1	Moses Pool
2	Lake Davies
3	Lake Quitjup
4	Lake Jasper
5	Lake Wilson
6	Lake Smith
7	Charley Lake
8	Yeagarup Lake
9	Neanup Swamp
10	South Yeagarup Lake
11	Doggerup Lake
12	Lake Samuel
13	Lake Florence
14	Windy Harbour Lake
15	Lake Maringup
16	Owingup Swamp
17	Boat Harbour Lake 1
18	Boat Harbour Lake 3
19	Boat Harbour Lake 4
20	Lake 12046
21	Lake Williams
22	Lake Saide
23	Lake Powell

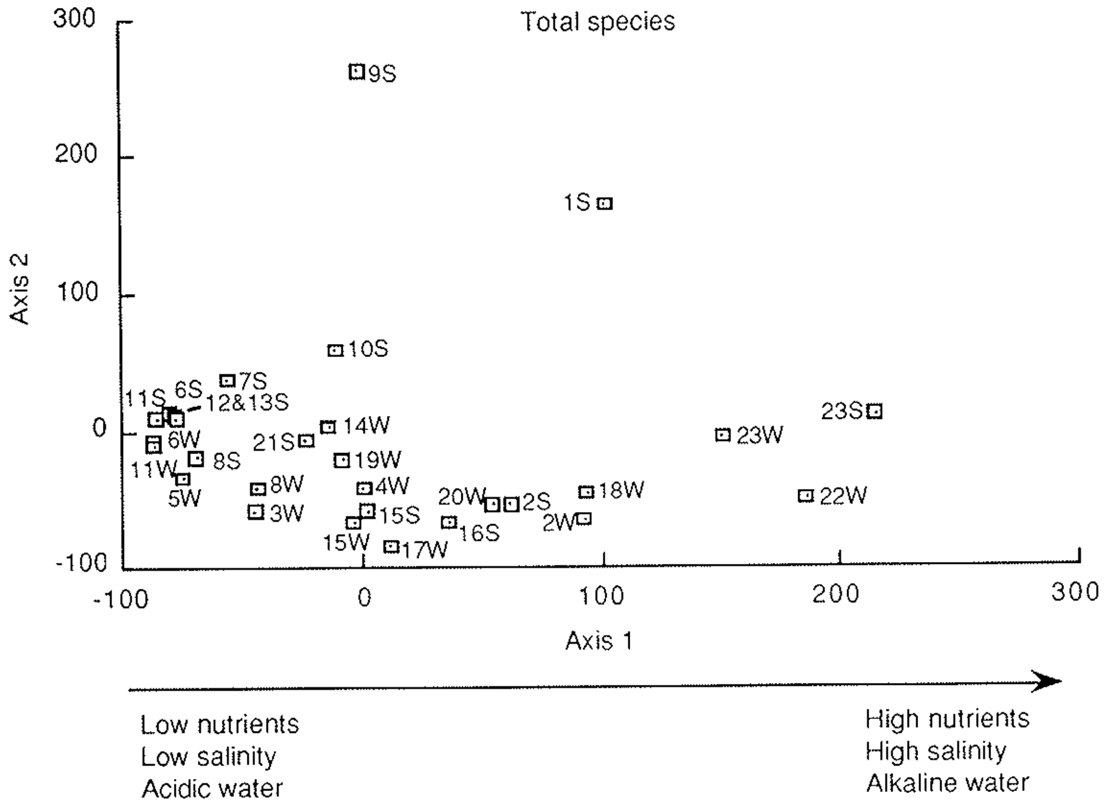
Figure 7b. Axis 1 by axis 2 plot of DECORANA scores using zooplankton species for each lake. W=winter, S=spring.

Total fauna

Ordination by DECORANA on the total species data-set is presented in Figure 7c. Along axis one, the obvious separation is of lakes Powell and Saide from the other lakes. Axis one was a gradient of salinity, nutrients, pH and calcium concentration. These variables explained 33%, 19%, 13% and 13% of the total respectively (Table 18). Axis two separated Moses Lake and Neanup Swamp from the major grouping. This axis was characterised by water depth, temperature and a salinity gradient (Table 18).

DECORANA of the total species dataset shows a gradient of putative conservation status of the lakes, from 'high' quality having low scores on axis one (e.g. lakes Doggerup, Smith, Wilson, Quitjup, Williams and Maringup). The 'intermediate' quality lakes include those in the centre of the axis and include Boat Harbour Lake 3, Lake Davies, Owingup Swamp and Lake 12046 and 'low' quality having high axis one scores (e.g. lakes Powell and Saide).

The above nominal conservation status of the lakes based on macroinvertebrate community structure is reiterated on the important underlying gradients. Salinity and nutrients and pH respectively are the most important parameters describing the above pattern. Future management programmes should include the routine monitoring of these parameters.



Key to lake numbers:

1	Moses Pool	9	Neanup Swamp	17	Boat Harbour Lake 1
2	Lake Davies	10	South Yeagarup Lake	18	Boat Harbour Lake 3
3	Lake Quitjup	11	Doggerup Lake	19	Boat Harbour Lake 4
4	Lake Jasper	12	Lake Samuel	20	Lake 12046
5	Lake Wilson	13	Lake Florence	21	Lake Williams
6	Lake Smith	14	Windy Harbour Lake	22	Lake Saide
7	Charley Lake	15	Lake Maringup	23	Lake Powell
8	Yeagarup Lake	16	Owingup Swamp		

Figure 7c. Axis 1 by axis 2 plot of DECORANA scores using total species for each lake. W=winter, S=spring.

Table 18. Results of stepwise multiple regression analysis, with hierarchical inclusion of DECORANA axes scores against environmental parameters. The cumulative variation explained (r^2) by each variable and F-values are presented. All factors where the F-values were significant at $p<0.05$ are shown in the table.

Dependent variable	Factor	Interpretation	r^2	F-value
Zooplankton (axis 1)	F4	Low nutrients	0.39	17.4
Zooplankton (axis 2)	F1	Deeper water	0.48	24.4
Benthic (axis 1)	F7	Low calcium	0.15	4.8
Benthic (axis 2)	F4	Low nutrients	0.20	6.9
	F5	Acidic water	0.36	7.2
	F2	Low salinity	0.47	7.4
TOTAL (axis 1)	F2	Low salinity	0.33	13.3
	F4	Low nutrients	0.52	14.3
	F5	Acidic	0.65	15.6
	F7	Low calcium	0.78	20.1
TOTAL (axis 2)	F1	Deeper water	0.54	31.8
	F3	Water temperature	0.68	28.1
	F2	Low salinity	0.76	26.1

CONCLUSIONS

The permanent lakes of the south coast of Western Australia contain a highly diverse macroinvertebrate fauna totalling 209 taxa. This represents a significant faunal diversity when assessed on both a regional and State context, to the extent where many of the lakes studied could be considered environments of some significance. In a more regional context, the lakes studied were ordered by multivariate techniques, on the basis of macroinvertebrate community structure, into three nominal conservation categories; low, intermediate and high. These categories were assigned, in part, by comparing faunal composition to the more eutrophic wetlands of the Swan Coastal Plain. These categories were highly correlated to both the levels of salinity and nutrients in the lakes. Knowledge of this relationship may form the useful basis of subsequent management programmes.

The most important environmental parameters, determined by multivariate analyses to be significantly associated with macroinvertebrate community structure were levels of salinity and nutrient status. Essentially the lakes with both elevated salinity and nutrients (e.g. Powell, Saide, Owingup and Boat Harbour 3) contained fauna more typically found in some of the eutrophic wetlands of the Swan Coastal Plain including the species *Phyastra* sp., *Candonocypris aculeata*, *Austrochiltonia subtenuis*, *Palaemonetes australis*, *Chironomus occidentalis* (= *C. australis* of Davis & Rolls 1987) and *Polypedilum nubifer*. Further multivariate analyses showed lakes Powell and Saide to be the more nutrient enriched of the lakes studied. Past and present land practises within the catchments of these lakes has degraded the water quality and subsequently adversely affected the macroinvertebrate fauna. Lake Saide is associated with farming activities, particularly in the past with potato production, and Lake Powell receives large nutrient inputs *via* Five and Seven Mile creeks, of secondary treated sewage from the Timewell Road Treatment Plant, Albany (Western Australian Water Authority 1989b).

Conservation status of the lakes

There are only three biogeographic regions in Western Australia that contain permanent water; the Kimberley, the Pilbara region, and the south-west corner. The management of these systems is therefore important for the maintenance of the diversity of aquatic species of the State.

The permanent lakes in this study represent areas of high conservation value when assessed in both a regional and State context. The south-west corner of the State represents a unique biogeographic region, within which many of the permanent lakes and wetlands, particularly on the Swan Coastal Plain, have been adversely affected by direct human influences and many, often conflicting, land practises within the catchments. However, the less disturbed lakes of the south coast represent systems of high conservation status and appear to act as refugia for species with low tolerances to disturbance, as indicated by the high number of species previously recorded only from the first to third order streams of the jarrah forest.

In the immediate future these lakes will be subjected to increasing human influence through the expanding demand for recreation areas. A suitable management programme for the lakes will be needed and analyses of the combined results of this report and the reports on flora (Robinson, 1992) and fish (Jaensch, 1992) will provide a database to serve as a useful basis for developing such a management programme. The inclusion of data on seasonal components and metabolic status of the lakes, as outlined in the management recommendations below, will further enhance the management programme.

Management Recommendations

1. Re-sample the lakes to complete the seasonal component of the water chemistry and macroinvertebrate fauna. This will enable the completion of the predictive model on the relationship between lake physico-chemistry and macroinvertebrate community structure.

2. Initiate a biological monitoring programme using the indicator species outlined in the text of the report to determine if any significant impacts have occurred in the lakes.

3. Measure metabolic status of the lakes to determine the major patterns of energy flow and material cycling. This ecosystem perspective is necessary to describe how the lakes function as systems.

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APPENDIX 1.

List of taxa identified from the benthic (B), sweep (S) and zooplankton (Z) samples. W = winter, S = spring. Numbers represent abundance categories for each species; 1 = < 50, 2 = 50 - 500, 3 = > 500 individuals. Where a taxa is known not to be typical of a particular habitat and is more abundant in another habitat it is categorised as present (p).

TAXA	Sp. code	Moses S			Davies W			Davies S			Quitjup W			Jasper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA																			
Hydra sp.	70101		2	1															
PLATYHELMINTHES																			
TEMNOCEPHALIDEA																			
Temnocephala sp.	10101																	1	
TURBELLARIA																			
Dugesiidae sp. 1	20101																		
NEMATODA																			
Nematoda spp.	30000	2	1		1	1		1	1			1		3	1		2	1	
MOLLUSCA																			
BIVALVIA																			
Bivalva sp. 1	40001																		
Bivalva sp. 2	40002																		
Westralunio carteri Iredale	40101																		
GASTROPODA																			
?*Glacidorbis* sp.	50102																		
Ferrissia petterdi (Johnston)	50201		1									1							
Gastropoda sp. 1	50501		3																
Gastropoda sp. 2	50701																		
?*Physastra*	50601																		
ANNELIDA																			
OLIGOCHAETA																			
Oligochaeta spp.	60001	3	1		1	2		1	1		1	1		3	1		1	1	
HIRUDINEA																			
Richardsonianidae sp. 1	80101																		
Glossiphoniidae sp 2	80202											1							
ARTHROPODA																			
ARACHNIDA																			
Hydracarina sp. C	90003																		
Hydracarina sp. D	90004																		
Hydracarina sp. E	90005																		
Hydracarina sp. F	90006																	1	
Hydracarina sp. G	90007	1												1					
Hydracarina sp. I	90009																	1	
Hydracarina sp. J	90010																		
Hydracarina sp. L	90012																		
Hydracarina sp. O	90015																		
Hydracarina sp. Q	90017																		
Hydracarina sp. R	90018														1			1	
Hydracarina sp. S	90019																		
Hydracarina sp. T	90020											1						1	
Hydracarina sp. U	90021																		
Hydracarina sp. V	90022																		
CRUSTACEA																			
Cladocera																			
Biapertura nr. *setigera* Brehm 1931	300001		1	1															
Bosmina meridionalis Sars 1904	300002															3			
Chydorus sp. Leach 1816	300003		1												1	2			
Neothrix cf. *armata* Gurney 1927	300004																		
Daphnia carinata King 1855	300005																		
Alonella sp.	300006											1			1				

TAXA	Sp. code	Moses S			Davies W			Davies S			Quiljup W			Jasper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007																		
Cladocera ?genus V16	300008																		
Cladocera ?genus V17	300009																		
Cladocera ?genus V18	300012																		
Cladocera ?genus V15	300013																		
Graptoleberis testudinaria Sars 1862	300010																		
Camptocercus cf.*australis* Sars 1896	300011																		
Ostracoda																			
Newnhamiafenestra King 1855	100001																		
Cypretta baylyi McKenzie 1966	100002																		
Newnhamia sp. 295	100003																		
Sarscypridopsis aculeata (Costa 1847)	100004	1	3																
Limnocythere mowbrayensis Chapman 1914	100005								1										
Candonopsis tenuis (Brady 1886)	100006											1						1	
Gomphodella aff. *maia* De Deckker 1981	100007											1						1	
Cyprididae undescribed genus	100008																		
Alboa worooa De Deckker 1981	100009																		
Ilyodromus sp. 255	100010																		
Paralimnocythere sp. 262	100011																		
Candonocypris novaezelandiae (Baird 1843)	100012																		
Copepoda																			
Cyclopoida																			
Cyclopoida spp.	110100		p	1		1			1			1			1			1	
Harpactacoida																			
Harpactacoida spp.	110200					1			1						1				
Calanoida																			
Calanoida sp.	110300																		
Calamoecia tasmanica (Smith) s.l.	110301		p	3		p	3		p	2		p	3					p	3
Calamoecia attenuata Fairbridge	110303														p	3		p	1
Hemiboeckella searli Sars	110304																		
Hemiboeckella andersonae Bayly	110305																		
Gladioferens imparipes Thompson	110306																		
Isopoda																			
Phreatoicidea																			
Phreatoicidea sp. A	120201																		
Amphipoda																			
Amphipoda sp. A	130301																		
Amphipoda sp. B	130401																		
Gammaridae																			
Perthia branchialis (Nicholls)	130101																		
Perthia acutitelson Straskraba	130103	1	1									1						1	
Ceinidae																			
Austrochiltonia subtenuis (Sayce)	130201	2	3			3		1	2		1	1							
Decapoda																			
Parastacidae																			
Cherax sp. (immature)	140100																		
Cherax quinquecarinatus (Gray)	140101											1			1				
Cherax tenuimanus (Smith)	140103					1												1	
Cherax destructor Clark	140104																		

TAXA	Sp. code	Moses S			Davies W			Davies S			Quitjup W			Jasper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae																			
Palaemonetes australis Dakin	140201					3		1	3		1	3			2				
INSECTA																			
Ephemoptera																			
Leptophlebiidae																			
Leptophlebiidae sp.	160100																	1	
Neboissophlebia occidentalis Dean	160101																		
Bibulmena kadjina Dean	160102																		
Baetidae																			
Cloeon sp.	160202		1																
Caenidae																			
Tasmanocoenis tillyardi (Lestage)	160301											1							
Odonata																			
Odonata sp.	170000																		
Aeshnidae																			
Aeshna brevistyla (Rambur)	170102																		
Libellulidae																			
Orthetrum caledonicum (Brauer)	170201																		
Austrothemis nigrescens (Martin)	170204																		
Corduliidae																			
Lathrocordulia metallica (Tillyard)	170301																		
Hesperocordulia berthoudi (Tillyard)	170302																		
Hemicordulia australie (Rambur)	170304																		
Procordulia affinis (Selys)	170305																		
Synthemidae																			
Synthemis cyanitincta (Tillyard)	170401																		
Gomphidae																			
Austrogomphus lateralis (Selys)	170501										1	1							
Hemigomphus armiger (Tillyard)	170502																		
Austrogomphus collaris Hagen	170503																		
Lestidae																			
Austrolestes annulosus (Selys)	171201		1																
Megapodagriidae																			
Austroagrion cyane (Selys)	171302																		
Coenagriidae																			
Coenagriidae sp.	171300																		
Hemiptera																			
Corixidae																			
Micronecta sp.	180101																		
Agraptocorixa sp. A	180102					1													
Sigara sp.	180103																		
Agraptocorixa sp. B	180104																		
Veliidae																			
Veliidae sp. 2	180202																		
Notonectidae																			
Notonectidae sp.	180300																		
Anisops sp.	180302		2	1															
Notonecta sp.	180303																		
Nepidae																			
Ranatra sp.	180401																		

TAXA	Sp. code	Moses S			Davies W			Davies S			Quitjup W			Jasper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera																			
Chironomidae																			
Paramerina levidensis (Skuse)	220201																	1	
Procladius paludicola Skuse	220240																		
Procladius villosimanus Kieffer	224221																		
?*Zavrelimyia* sp.	220222																		
Macropelopia dalyupensis Freeman	220235					1		1											
Macropelopia sp. VSCL50	224222																		
Ablabesmyia sp.	220237																		
Coelopynia pruinosa Freeman	224212										1	1							
Orthocladinae sp. 1 VSCL3	224201		1																
Orthocladinae sp. 3 VSCL7	224203					1													
Orthocladinae sp. 5 VSCL20	224208											1							
Orthocladinae sp. 6 VSCL36	224217																		
Orthocladinae sp. 7 VSCL38	224218																		
Orthocladinae sp. 9 VSCL43	224220																		
Orthocladinae sp. V43	220263																		
Cricotopus annuliventris (Skuse)	220208																		
Corynoneura sp.	220250		1																
Limonophyes pullulus (Skuse)	220261		1								1								
?*Limnophyes* sp. V31	220232											1		1	1			1	
?*Limnophyes* sp. VSCL45	224223																		
Thienemanniella sp.	220210																		
Stictocladius sp. VSCL24	224213																		
Dicrotendipes sp.	220241	1	1																
Dicrotendipes ?conjunctus Walker	224226							1											
Kiefferulus martini Freeman	224224																		
Kiefferulus intertinctus Skuse	220242																		
Cryptochironomus griseidorsum Kieffer	220227							1				1		1					
Nilothauma sp.	220223											1							
?*Stenochironomus* sp.	220220																	1	
Stenochironomus sp. 1 VSCL14	224210											1							
Stenochironomus sp. 2 VSCL31	224211											1							
Riethia sp. V5	220202																		
Riethia sp. V4	220203																		
Polypedilum sp. 1 VSCL8	224204					1		1	1			1		1	1			1	
Polypedilum sp. 2 VSCL16	224209										1	2							
Polypedilum sp. 3 VSCL 33	224215																		
Polypedilum nubifer (Skuse)	220277																		
Chironomus occidentalis Skuse	224225																		
Chironomus aff. *alternans* Walker	220226																		
Cladopelma curtivalva Kieffer	220273																		
Harnischia sp.	220275																	1	
Chironominae ?genus VSCL27	224214																		
Chironominae ?genus VSCL34	224216																		
Chironominae ?genus VSCL35	224219																		
Tanytarsini	220216																		
Tanytarsus sp.1 VSCL5	224202	1	2					1	1			1						1	
Tanytarsus sp. 2 VSCL9	224205					1		1	1					1	1				
Tanytarsus sp. 3 VSCL18	224207										1	2						1	
Cladotanytarsus sp. 1 VSCL10	224206	1			1	1		1	1			1			1				
Stempellina ?australiensis Freeman	220206											1							
Aphroteniella filicornis Brundin	220225										1	2						1	

TAXA	Sp. code	Moses S			Davies W			Davies S			Quitjup W			asper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae																			
Ceratopogonidae sp. B	220302																	1	
Ceratopogonidae sp. F	220306																		
Ceratopogonidae sp. G	220307													1					
Ceratopogonidae sp. K	220311																		
Ceratopogonidae sp. L	220312											1							
Ceratopogonidae sp. N	220314																		
Ceratopogonidae sp. O	220315																		
Ceratopogonidae sp. P	220316																		
Tipulidae																			
Limoniinae sp. A	220402																		
Limoniinae sp. B	220403		1																
Limnoniinae sp. F	220409																		
Empididae																			
Empididae sp. A	220502														1				
Empididae sp. B	220503																		
Tabanidae																			
Tabanidae sp. A	220801							1											
Dolochopodidae																			
Dolochopodidae sp. A	221001																		
Culicidae																			
Culicidae sp.	221100			1															
Ephydridae																			
Ephydridae sp. A	221701																		
Trichoptera																			
Ecnomidae																			
Ecnomidae sp.	240100																1		
Ecnomina ?trulla Neboiss	240101																		
?*Ecnomus* sp.	240107											1						1	
Ecnomus pansus Neboiss	240105																	1	
Ecnomus turgidus Neboiss	240106																		
Leptoceridae																			
Leptoceridae spp.	240200					1													
Lectrides parilis Neboiss	240202																		
Triplectides sp. B	240205																		
Notoperata tenax Neboiss	240206																		
Nolalina sp. A	240207																		
Oecetis sp.	240209					1													
Triplectides australis Navas	240212																		
Leptoceridae sp. C	240215								1										
Leptoceridae sp. F	240218																	1	
Leptoceridae sp. H	240219																		
Leptoceridae sp. I	240220																		
Hydroptilidae																			
Hydroptilidae sp.	240400																		
Acritoptila globosa Wells	240404																		
Hellyethira sp. B	240409														1				
Atriplectididae																			
Atriplectides ?dubius Mosley	240601																		

TAXA	Sp. code	Moses S			Davies W			Davies S			Quitjup W			Jasper W			Wilson W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae																			
Polycentropodidae sp.	240800																		
Plectronemia eximia Neboiss	240802																		
Coleoptera																			
Dytiscidae																			
Sternopriscus ?browni Sharp	250201																		
Sternopriscus sp. A	250203																		
Liodessus sp.	250208																		
Megaporus sp.	250211																		
Homeodytes scutellaris (Germar)	250215								1										
Homeodytes sp.	250216																		
Sternopriscus browni Sharp	255201		1			2						1			1				
Sternopriscus marginata Watts	255203											1			1				
Rhantus sp.	255204																		
Liodessus inornatus (Sharp)	255208																		
Necterosoma darwini (Babington)	255205																		
Antiporus femuralis (Boheman)	255210																		
Megaporus howitti (Clark)	255211																		
Megaporus solidus (Sharp)	255213		1			2													
Homeodytes scutellaris (Germar)	255215																		
Lancetes lanceolatus Clark	255216																		
Liodessus dispar (Germar)	255225		1																
Megaporus sp.	255227																		
Helodidae																			
Hellodidae	250301																		
Gyrinidae																			
Macrogyrus sp.	255501																		
Hydrophilidae																			
Hydrophilidae sp. 6	250606																		
Hydrophilidae sp. 1	255601		2																
Hydrophilidae sp. 2	255602																		
Hydrophilidae sp. 3	255603																		
Hydrophilidae sp. 9	255609																		
Hydrophilidae sp. 11	255611																		
Carabidae																			
?Carabidae sp. A	250901																		

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA																			
Hydra sp.	70101																	1	
PLATYHELMINTHES																			
TEMNOCEPHALIDEA																			
Temnocephala sp.	10101																		
TURBELLARIA																			
Dugesiidae sp. 1	20101																		
NEMATODA																			
Nematoda spp.	30000	1	1		1	1		1	1		1	1		1			2	1	
MOLLUSCA																			
BIVALVIA																			
Bivalva sp. 1	40001																		
Bivalva sp. 2	40002																		
Westralunio carteri Iredale	40101													1					
GASTROPODA																			
?*Glacidorbis* sp.	50102																		
Ferrissia petterdi (Johnston)	50201																		
Gastropoda sp. 1	50501																		
Gastropoda sp. 2	50701																		
?*Physastra*	50601																		
ANNELIDA																			
OLIGOCHAETA																			
Oligochaeta spp.	60001	1	1		1	1		1	2		1	2		1			1		
HIRUDINEA																			
Richardsonianidae sp. 1	80101																		
Glossiphoniidae sp 2	80202																		
ARTHROPODA																			
ARACHNIDA																			
Hydracarina sp. C	90003								1										
Hydracarina sp. D	90004											1							
Hydracarina sp. E	90005					1													
Hydracarina sp. F	90006		1			1			1										
Hydracarina sp. G	90007					1													
Hydracarina sp. I	90009								1										
Hydracarina sp. J	90010								1								1		
Hydracarina sp. L	90012																		
Hydracarina sp. O	90015																		
Hydracarina sp. Q	90017																		
Hydracarina sp. R	90018		1			1												1	
Hydracarina sp. S	90019		1			1													
Hydracarina sp. T	90020		1			1			1			1							
Hydracarina sp. U	90021																	1	1
Hydracarina sp. V	90022																		
CRUSTACEA																			
Cladocera																			
Biapertura nr. *setigera* Brehm 1931	300001								1										1
Bosmina meridionalis Sars 1904	300002																		
Chydorus sp. Leach 1816	300003		1			1				1								1	1
Neothrix cf. *armata* Gurney 1927	300004		1			1												1	2
Daphnia carinata King 1855	300005																		
Alonella sp.	300006		1			1													

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007								1										
Cladocera ?genus V16	300008								1										
Cladocera ?genus V17	300009								1										
Cladocera ?genus V18	300012																		
Cladocera ?genus V15	300013																		
Graptoleberis testudinaria Sars 1862	300010																	2	
Camptocercus cf.*australis* Sars 1896	300011																		
Ostracoda																			
Newnhamia fenestra King 1855	100001								1									1	2
Cypretta baylyi McKenzie 1966	100002								1									2	1
Newnhamia sp. 295	100003																		
Sarscypridopsis aculeata (Costa 1847)	100004																		
Limnocythere mowbrayensis Chapman 1914	100005																		
Candonopsis tenuis (Brady 1886)	100006								1		1	1							
Gomphodella aff. *maia* De Deckker 1981	100007		1			1			2			1							
Cyprididae undescribed genus	100008											1						2	
Alboa worooa De Deckker 1981	100009																	1	
Ilyodromus sp. 255	100010																		
Paralimnocythere sp. 262	100011																		
Candonocypris novaezelandiae (Baird 1843)	100012																		
Copepoda																			
Cyclopoida																			
Cyclopoida spp.	110100		1			1			p	1			1					p	1
Harpactacoida																			
Harpactacoida spp.	110200		1			1												1	
Calanoida																			
Calanoida sp.	110300																		
Calamoecia tasmanica (Smith) s.l.	110301		p	3			3						3			3		p	2
Calamoecia attenuata Fairbridge	110303		p	1					p	3			1			3		p	2
Hemiboeckella searli Sars	110304					2													
Hemiboeckella andersonae Bayly	110305															p			
Gladioferens imparipes Thompson	110306																		
Isopoda																			
Phreatoicidea																			
Phreatoicidea sp. A	120201																		
Amphipoda																			
Amphipoda sp. A	130301																		
Amphipoda sp. B	130401																		
Gammaridae																			
Perthia branchialis (Nicholls)	130101																		
Perthia acutitelson Straskraba	130103		1						1									1	
Ceinidae																			
Austrochiltonia subtenuis (Sayce)	130201		1			1			2			2						1	
Decapoda																			
Parastacidae																			
Cherax sp. (immature)	140100																		
Cherax quinquecarinatus (Gray)	140101		1			1			1										
Cherax tenuimanus (Smith)	140103											1							
Cherax destructor Clark	140104																		

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae																			
Palaemonetes australis Dakin	140201											1							
INSECTA																			
Ephemoptera																			
Leptophlebiidae																			
Leptophlebiidae sp.	160100																		
Neboissophlebia occidentalis Dean	160101		1						1										
Bibulmena kadjina Dean	160102		1									1							
Baetidae																			
Cloeon sp.	160202																	1	
Caenidae																			
Tasmanocoenis tillyardi (Lestage)	160301		1			1								1				1	
Odonata																			
Odonata sp.	170000		1																
Aeshnidae																			
Aeshna brevistyla (Rambur)	170102								1									1	
Libellulidae																			
Orthetrum caledonicum (Brauer)	170201																		
Austrothemis nigrescens (Martin)	170204																		
Corduliidae																			
Lathrocordulia metallica (Tillyard)	170301																		
Hesperocordulia berthoudi (Tillyard)	170302					1													
Hemicordulia australie (Rambur)	170304								1										
Procordulia affinis (Selys)	170305																	1	
Synthemidae																			
Synthemis cyanitincta (Tillyard)	170401																		
Gomphidae																			
Austrogomphus lateralis (Selys)	170501																		
Hemigomphus armiger (Tillyard)	170502																		
Austrogomphus collaris Hagen	170503																		
Lestidae																			
Austrolestes annulosus (Selys)	171201																	1	
Megapodagriidae																			
Austroagrion cyane (Selys)	171302																	1	
Coenagriidae																			
Coenagriidae sp.	171300																		
Hemiptera																			
Corixidae																			
Micronecta sp.	180101																		
Agraptocorixa sp. A	180102																		
Sigara sp.	180103																		
Agraptocorixa sp. B	180104																		
Veliidae																			
Veliidae sp. 2	180202																	1	
Notonectidae																			
Notonectidae sp.	180300																	1	
Anisops sp.	180302																		1
Notonecta sp.	180303																		1
Nepidae																			
Ranatra sp.	180401																	1	

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera																			
Chironomidae																			
Paramerina levidensis (Skuse)	220201		1		1	2		1	1			1						1	
Procladius paludicola Skuse	220240	1	1					1	1										
Procladius villosimanus Kieffer	224221																		
?*Zavrelimyia* sp.	220222		1						1										
Macropelopia dalyupensis Freeman	220235																		
Macropelopia sp. VSCL50	224222																		
Ablabesmyia sp.	220237																		
Coelopynia pruinosa Freeman	224212																		
Orthocladinae sp. 1 VSCL3	224201																		
Orthocladinae sp. 3 VSCL7	224203																		
Orthocladinae sp. 5 VSCL20	224208								1						1				
Orthocladinae sp. 6 VSCL36	224217											1							
Orthocladinae sp. 7 VSCL38	224218													1	1				
Orthocladinae sp. 9 VSCL43	224220																		
Orthocladinae sp. V43	220263																		
Cricotopus annuliventris (Skuse)	220208																		
Corynoneura sp.	220250																	1	
Limonophyes pullulus (Skuse)	220261					1			1						1		1		
?*Limnophyes* sp. V31	220232	1	1			1			1			1			1			1	
?*Limnophyes* sp. VSCL45	224223																		
Thienemanniella sp.	220210								1										
Stictocladius sp. VSCL24	224213		1																
Dicrotendipes sp.	220241	1				1						1			1				
Dicrotendipes ?conjunctus Walker	224226																		
Kiefferulus martini Freeman	224224																		
Kiefferulus intertinctus Skuse	220242																		
Cryptochironomus griseidorsum Kieffer	220227				1	1									1		1		
Nilothauma sp.	220223	1				1													
?*Stenochironomus* sp.	220220																		
Stenochironomus sp. 1 VSCL14	224210														1				
Stenochironomus sp. 2 VSCL31	224211								1						1				
Riethia sp. V5	220202								1		1	1			2				
Riethia sp. V4	220203								1			1							
Polypedilum sp. 1 VSCL8	224204							1	1			1		1	1		1	1	
Polypedilum sp. 2 VSCL16	224209										1	1							
Polypedilum sp. 3 VSCL 33	224215								1					1	1				
Polypedilum nubifer (Skuse)	220277																		
Chironomus occidentalis Skuse	224225																		
Chironomus aff. *alternans* Walker	220226										1				1				
Cladopelma curtivalva Kieffer	220273								1										
Harnischia sp.	220275					1						1		1	1				
Chironominae ?genus VSCL27	224214				1	1													
Chironominae ?genus VSCL34	224216							1	1		1	1			1		1		
Chironominae ?genus VSCL35	224219																	1	
Tanytarsini	220216											1			1				
Tanytarsus sp.1 VSCL5	224202	1	1			1		1	1					1	1		1	1	
Tanytarsus sp. 2 VSCL9	224205																		
Tanytarsus sp. 3 VSCL18	224207	1	1						1			1							
Cladotanytarsus sp. 1 VSCL10	224206							1			1	1		1					
Stempellina ?australiensis Freeman	220206					1			1								1	1	
Aphroteniella filicornis Brundin	220225	1	1			1			1			1			1				

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae																			
Ceratopogonidae sp. B	220302		1																
Ceratopogonidae sp. F	220306		1																
Ceratopogonidae sp. G	220307											1							
Ceratopogonidae sp. K	220311								1										
Ceratopogonidae sp. L	220312		1																
Ceratopogonidae sp. N	220314		1																
Ceratopogonidae sp. O	220315																		
Ceratopogonidae sp. P	220316		1																
Tipulidae																			
Limoniinae sp. A	220402																		
Limoniinae sp. B	220403																	1	
Limnoniinae sp. F	220409																		
Empididae																			
Empididae sp. A	220502																		
Empididae sp. B	220503																		
Tabanidae																			
Tabanidae sp. A	220801																		
Dolochopodidae																			
Dolochopodidae sp. A	221001																		
Culicidae																			
Culicidae sp.	221100																		
Ephydridae																			
Ephydridae sp. A	221701																		
Trichoptera																			
Ecnomidae																			
Ecnomidae sp.	240100																		
Ecnomina ?trulla Neboiss	240101	1	1			1		1	1										
?*Ecnomus* sp.	240107	1	1			1													
Ecnomus pansus Neboiss	240105																		
Ecnomus turgidus Neboiss	240106																		
Leptoceridae																			
Leptoceridae spp.	240200		1									1							
Lectrides parilis Neboiss	240202																		
Triplectides sp. B	240205																		
Notoperata tenax Neboiss	240206																		
Nolalina sp. A	240207																		
Oecetis sp.	240209																		
Triplectides australis Navas	240212																		
Leptoceridae sp. C	240215								1										
Leptoceridae sp. F	240218		1			1			1										
Leptoceridae sp. H	240219					1													
Leptoceridae sp. I	240220																		
Hydroptilidae																			
Hydroptilidae sp.	240400											1							
Acritoptila globosa Wells	240404		1			1			1										
Hellyethira sp. B	240409																		
Atriplectididae																			
Atriplectides ?dubius Mosley	240601																		

TAXA	Sp. code	Smith W			Smith S			Charley S			Yeagarup W			Yeagarup S			Neanup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae																			
Polycentropodidae sp.	240800								1										
Plectronemia eximia Neboiss	240802																		
Coleoptera																			
Dytiscidae																			
Sternopriscus ?browni Sharp	250201																		
Sternopriscus sp. A	250203																		
Liodessus sp.	250208																		
Megaporus sp.	250211																		
Homeodytes scutellaris (Germar)	250215																	1	
Homeodytes sp.	250216					1													
Sternopriscus browni Sharp	255201		1			1			1									1	
Sternopriscus marginata Watts	255203		1																
Rhantus sp.	255204																		
Liodessus inornatus (Sharp)	255208																		
Necterosoma darwini (Babington)	255205																		
Antiporus femuralis (Boheman)	255210								1										
Megaporus howitti (Clark)	255211																		
Megaporus solidus (Sharp)	255213																		
Homeodytes scutellaris (Germar)	255215																		
Lancetes lanceolatus Clark	255216																		
Liodessus dispar (Germar)	255225								1										
Megaporus sp.	255227											1							
Helodidae																			
Hellodidae	250301								1									1	
Gyrinidae																			
Macrogyrus sp.	255501																		
Hydrophilidae																			
Hydrophilidae sp. 6	250606																		
Hydrophilidae sp. 1	255601								1										
Hydrophilidae sp. 2	255602								1										
Hydrophilidae sp. 3	255603																		
Hydrophilidae sp. 9	255609																		
Hydrophilidae sp. 11	255611																		
Carabidae																			
?Carabidae sp. A	250901																		

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA																
Hydra sp.	70101		1													
PLATYHELMINTHES																
TEMNOCEPHALIDEA																
Temnocephala sp.	10101															
TURBELLARIA																
Dugesiidae sp. 1	20101															
NEMATODA																
Nematoda spp.	30000	1	2		1	2		1	1		1	1		1	1	
MOLLUSCA																
BIVALVIA																
Bivalva sp. 1	40001															
Bivalva sp. 2	40002															
Westralunio carteri Iredale	40101															
GASTROPODA																
?*Glacidorbis* sp.	50102		1													
Ferrissia petterdi (Johnston)	50201		1													
Gastropoda sp. 1	50501															
Gastropoda sp. 2	50701															
?*Physastra*	50601		1													
ANNELIDA																
OLIGOCHAETA																
Oligochaeta spp.	60001	1	1		1	1		1	1		1			2	1	
HIRUDINEA																
Richardsonianidae sp. 1	80101															
Glossiphoniidae sp 2	80202															
ARTHROPODA																
ARACHNIDA																
Hydracarina sp. C	90003															
Hydracarina sp. D	90004															
Hydracarina sp. E	90005							1				1				
Hydracarina sp. F	90006					1			1			1			1	
Hydracarina sp. G	90007								1			1			1	
Hydracarina sp. I	90009					1		1	1						1	
Hydracarina sp. J	90010													1		
Hydracarina sp. L	90012					1										
Hydracarina sp. O	90015				1											
Hydracarina sp. Q	90017				1									1		
Hydracarina sp. R	90018		1			1			1			1			1	
Hydracarina sp. S	90019															
Hydracarina sp. T	90020															
Hydracarina sp. U	90021															
Hydracarina sp. V	90022															
CRUSTACEA																
Cladocera																
Biapertura nr. *setigera* Brehm 1931	300001			1												1
Bosmina meridionalis Sars 1904	300002					1										
Chydorus sp. Leach 1816	300003		1	1		1			1			1				
Neothrix cf. *armata* Gurney 1927	300004		1						1							
Daphnia carinata King 1855	300005															
Alonella sp.	300006		1						1						1	

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007											1			1	
Cladocera ?genus V16	300008															
Cladocera ?genus V17	300009															
Cladocera ?genus V18	300012															
Cladocera ?genus V15	300013															
Graptoleberis testudinaria Sars 1862	300010														1	
Camptocercus cf. *australis* Sars 1896	300011		1						1							
Ostracoda																
Newnhamiafenestra King 1855	100001															
Cypretta baylyi McKenzie 1966	100002		1	1												
Newnhamia sp. 295	100003		1	1												
Sarscypridopsis aculeata (Costa 1847)	100004		1													
Limnocythere mowbrayensis Chapman 1914	100005															
Candonopsis tenuis (Brady 1886)	100006	1	1		1	1										
Gomphodella aff. *maia* De Deckker 1981	100007				1	2			1						2	
Cyprididae undescribed genus	100008															
Alboa worooa De Deckker 1981	100009															
Ilyodromus sp. 255	100010					1			1			1				
Paralimnocythere sp. 262	100011															
Candonocypris novaezelandiae (Baird 1843)	100012															
Copepoda																
Cyclopoida																
Cyclopoida spp.	110100	p	2		p				1		p	1			1	p
Harpactacoida																
Harpactacoida spp.	110200		2			1			1						1	p
Calanoida																
Calanoida sp.	110300															
Calamoecia tasmanica (Smith) s.l.	110301	p	p	1			1		p	3	p	p	3	p	p	3
Calamoecia attenuata Fairbridge	110303	p	p	1			1							p	p	3
Hemiboeckella searli Sars	110304															
Hemiboeckella andersonae Bayly	110305	p	1	p					p	p						
Gladioferens imparipes Thompson	110306															
Isopoda																
Phreatoicidea																
Phreatoicidea sp. A	120201															
Amphipoda																
Amphipoda sp. A	130301								1						1	
Amphipoda sp. B	130401															
Gammaridae																
Perthia branchialis (Nicholls)	130101															
Perthia acutitelson Straskraba	130103		1						1		1	1			1	
Ceinidae																
Austrochiltonia subtenuis (Sayce)	130201				1											
Decapoda																
Parastacidae																
Cherax sp. (immature)	140100								1							
Cherax quinquecarinatus (Gray)	140101											1			1	
Cherax tenuimanus (Smith)	140103		1													
Cherax destructor Clark	140104															

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae																
Palaemonetes australis Dakin	140201		2													
INSECTA																
Ephemoptera																
Leptophlebiidae																
Leptophlebiidae sp.	160100															
Neboissophlebia occidentalis Dean	160101															
Bibulmena kadjina Dean	160102														1	
Baetidae																
Cloeon sp.	160202															
Caenidae																
Tasmanocoenis tillyardi (Lestage)	160301	1			1	1		1	1		1					
Odonata																
Odonata sp.	170000				1											
Aeshnidae																
Aeshna brevistyla (Rambur)	170102		1													
Libellulidae																
Orthetrum caledonicum (Brauer)	170201															
Austrothemis nigrescens (Martin)	170204		1													
Corduliidae																
Lathrocordulia metallica (Tillyard)	170301		1													
Hesperocordulia berthoudi (Tillyard)	170302															
Hemicordulia australie (Rambur)	170304															
Procordulia affinis (Selys)	170305					1										
Synthemidae																
Synthemis cyanitincta (Tillyard)	170401								1							
Gomphidae																
Austrogomphus lateralis (Selys)	170501															
Hemigomphus armiger (Tillyard)	170502													1		
Austrogomphus collaris Hagen	170503	1														
Lestidae																
Austrolestes annulosus (Selys)	171201															
Megapodagriidae																
Austroagrion cyane (Selys)	171302															
Coenagriidae																
Coenagriidae sp.	171300															
Hemiptera																
Corixidae																
Micronecta sp.	180101								1							
Agraptocorixa sp. A	180102															
Sigara sp.	180103															
Agraptocorixa sp. B	180104															
Veliidae																
Veliidae sp. 2	180202															
Notonectidae																
Notonectidae sp.	180300															
Anisops sp.	180302															
Notonecta sp.	180303															
Nepidae																
Ranatra sp.	180401															

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera																
Chironomidae																
Paramerina levidensis (Skuse)	220201	1	1			1			1		1	1			1	
Procladius paludicola Skuse	220240															
Procladius villosimanus Kieffer	224221					1					1	1				
?*Zavrelimyia* sp.	220222								1			1				
Macropelopia dalyupensis Freeman	220235					1										
Macropelopia sp. VSCL50	224222											1				
Ablabesmyia sp.	220237	1				1					1					
Coelopynia pruinosa Freeman	224212					1										
Orthocladinae sp. 1 VSCL3	224201															
Orthocladinae sp. 3 VSCL7	224203															
Orthocladinae sp. 5 VSCL20	224208															
Orthocladinae sp. 6 VSCL36	224217															
Orthocladinae sp. 7 VSCL38	224218	1	1													
Orthocladinae sp. 9 VSCL43	224220					1			1			1				
Orthocladinae sp. V43	220263		1													
Cricotopus annuliventris (Skuse)	220208															
Corynoneura sp.	220250		1													
Limonophyes pullulus (Skuse)	220261		1						2			1			1	
?*Limnophyes* sp. V31	220232	1	1			1			1			1		1	1	
?*Limnophyes* sp. VSCL45	224223															
Thienemanniella sp.	220210					1		1	2			2			2	
Stictocladius sp. VSCL24	224213													1		
Dicrotendipes sp.	220241		2			1			1		1	1			1	
Dicrotendipes ?conjunctus Walker	224226															
Kiefferulus martini Freeman	224224															
Kiefferulus intertinctus Skuse	220242															
Cryptochironomus griseidorsum Kieffer	220227	1				1		1								
Nilothauma sp.	220223														1	
?*Stenochironomus* sp.	220220															
Stenochironomus sp. 1 VSCL14	224210															
Stenochironomus sp. 2 VSCL31	224211															
Riethia sp. V5	220202				1			1	1		1	1		1	1	
Riethia sp. V4	220203				1	2		1			1	1		1		
Polypedilum sp. 1 VSCL8	224204	1	1			1		1	1							
Polypedilum sp. 2 VSCL16	224209				1			1								
Polypedilum sp. 3 VSCL 33	224215	1	1			1			1			1			1	
Polypedilum nubifer (Skuse)	220277															
Chironomus occidentalis Skuse	224225															
Chironomus aff. *alternans* Walker	220226		2								1					
Cladopelma curtivalva Kieffer	220273	1									1					
Harnischia sp.	220275				1	2		1	1					1	1	
Chironominae ?genus VSCL27	224214															
Chironominae ?genus VSCL34	224216	1				1					1					
Chironominae ?genus VSCL35	224219	1	1													
Tanytarsini	220216															
Tanytarsus sp.1 VSCL5	224202	1	1		1	1		1	1		1			1	1	
Tanytarsus sp. 2 VSCL9	224205															
Tanytarsus sp. 3 VSCL18	224207								1							
Cladotanytarsus sp. 1 VSCL10	224206															
Stempellina ?australiensis Freeman	220206					1										
Aphroteniella filicornis Brundin	220225				1	1			1			1		1	1	

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae																
Ceratopogonidae sp. B	220302				1	1			1					1		
Ceratopogonidae sp. F	220306															
Ceratopogonidae sp. G	220307															
Ceratopogonidae sp. K	220311															
Ceratopogonidae sp. L	220312															
Ceratopogonidae sp. N	220314															
Ceratopogonidae sp. O	220315															
Ceratopogonidae sp. P	220316															
Tipulidae																
Limoniinae sp. A	220402														1	
Limoniinae sp. B	220403															
Limnoniinae sp. F	220409		1													
Empididae																
Empididae sp. A	220502					1										
Empididae sp. B	220503	1														
Tabanidae																
Tabanidae sp. A	220801															
Dolochopodidae																
Dolochopodidae sp. A	221001															
Culicidae																
Culicidae sp.	221100															
Ephydridae																
Ephydridae sp. A	221701															
Trichoptera																
Ecnomidae																
Ecnomidae sp.	240100															
Ecnomina ?trulla Neboiss	240101					1								1		
?*Ecnomus* sp.	240107				1	1			1							
Ecnomus pansus Neboiss	240105															
Ecnomus turgidus Neboiss	240106															
Leptoceridae																
Leptoceridae spp.	240200					1								1	1	
Lectrides parilis Neboiss	240202															
Triplectides sp. B	240205															
Notoperata tenax Neboiss	240206		1						1							
Nolalina sp. A	240207															
Oecetis sp.	240209															
Triplectides australis Navas	240212															
Leptoceridae sp. C	240215		1													
Leptoceridae sp. F	240218					1			1			1				
Leptoceridae sp. H	240219															
Leptoceridae sp. I	240220		1						1						1	
Hydroptilidae																
Hydroptilidae sp.	240400	1			1	1									1	
Acritoptila globosa Wells	240404					1			1							
Hellyethira sp. B	240409		1													
Atriplectididae																
Atriplectides ?dubius Mosley	240601					1										

TAXA	Sp. code	Sth Yeagarup S			Doggerup W			Doggerup S			Samuel S			Florence S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae																
Polycentropodidae sp.	240800															
Plectronemia eximia Neboiss	240802					1										
Coleoptera																
Dytiscidae																
Sternopriscus ?browni Sharp	250201								1						1	
Sternopriscus sp. A	250203															
Liodessus sp.	250208								1							
Megaporus sp.	250211		1													
Homeodytes scutellaris (Germar)	250215															
Homeodytes sp.	250216															
Sternopriscus browni Sharp	255201		1						1							
Sternopriscus marginata Watts	255203								1							
Rhantus sp.	255204															
Liodessus inornatus (Sharp)	255208															
Necterosoma darwini (Babington)	255205															
Antiporus femuralis (Boheman)	255210														1	
Megaporus howitti (Clark)	255211															
Megaporus solidus (Sharp)	255213															
Homeodytes scutellaris (Germar)	255215															
Lancetes lanceolatus Clark	255216		1													
Liodessus dispar (Germar)	255225															
Megaporus sp.	255227															
Helodidae																
Hellodidae	250301		1													
Gyrinidae																
Macrogyrus sp.	255501															
Hydrophilidae																
Hydrophilidae sp. 6	250606															
Hydrophilidae sp. 1	255601															
Hydrophilidae sp. 2	255602															
Hydrophilidae sp. 3	255603															
Hydrophilidae sp. 9	255609															
Hydrophilidae sp. 11	255611															
Carabidae																
?Carabidae sp. A	250901															

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA													
Hydra sp.	70101												
PLATYHELMINTHES													
TEMNOCEPHALIDEA													
Temnocephala sp.	10101												
TURBELLARIA													
Dugesiidae sp. 1	20101												
NEMATODA													
Nematoda spp.	30000	2	1		2	1		1	1		1	1	
MOLLUSCA													
BIVALVIA													
Bivalva sp. 1	40001												1
Bivalva sp. 2	40002												
Westralunio carteri Iredale	40101					1							
GASTROPODA													
?*Glacidorbis* sp.	50102												
Ferrissia petterdi (Johnston)	50201					1		1	2				
Gastropoda sp. 1	50501												
Gastropoda sp. 2	50701					1			1				
?*Physastra*	50601		1			1						1	
ANNELIDA													
OLIGOCHAETA													
Oligochaeta spp.	60001	1			1	2		1	1		2	1	
HIRUDINEA													
Richardsonianidae sp. 1	80101					1			1			1	
Glossiphoniidae sp 2	80202												
ARTHROPODA													
ARACHNIDA													
Hydracarina sp. C	90003												
Hydracarina sp. D	90004												
Hydracarina sp. E	90005												
Hydracarina sp. F	90006								1				
Hydracarina sp. G	90007		1						1				
Hydracarina sp. I	90009					1							
Hydracarina sp. J	90010												
Hydracarina sp. L	90012												
Hydracarina sp. O	90015												
Hydracarina sp. Q	90017												
Hydracarina sp. R	90018					1			1				
Hydracarina sp. S	90019												
Hydracarina sp. T	90020					1							
Hydracarina sp. U	90021												
Hydracarina sp. V	90022		1										
CRUSTACEA													
Cladocera													
Biapertura nr.setigera Brehm 1931	300001		1										1
Bosmina meridionalis Sars 1904	300002						3						
Chydorus sp. Leach 1816	300003												1
Neothrix cf. *armata* Gurney 1927	300004												
Daphnia carinata King 1855	300005												1
Alonella sp.	300006		1									1	

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007												
Cladocera ?genus V16	300008												
Cladocera ?genus V17	300009												
Cladocera ?genus V18	300012												
Cladocera ?genus V15	300013												
Graptoleberis testudinaria Sars 1862	300010		1										
Camptocercus cf. *australis* Sars 1896	300011												
Ostracoda													
Newnhamiafenestra King 1855	100001												
Cypretta baylyi McKenzie 1966	100002												
Newnhamia sp. 295	100003												
Sarscypridopsis aculeata (Costa 1847)	100004												
Limnocythere mowbrayensis Chapman 1914	100005		1										
Candonopsis tenuis (Brady 1886)	100006					2		1			1	1	
Gomphodella aff. *maia* De Deckker 1981	100007					1							
Cyprididae undescribed genus	100008								1			1	
Alboa worooa De Deckker 1981	100009				1	2		1	1		1	1	
Ilyodromus sp. 255	100010		1										
Paralimnocythere sp. 262	100011		1										
Candonocypris novaezelandiae (Baird 1843)	100012												
Copepoda													
Cyclopoida													
Cyclopoida spp.	110100	p	1	1		1		p	1			1	1
Harpactacoida													
Harpactacoida spp.	110200		1						1			1	
Calanoida													
Calanoida sp.	110300												
Calamoecia tasmanica (Smith) s.l.	110301	1	p	1		p	3	p	p	3		p	3
Calamoecia attenuata Fairbridge	110303							p	p	3			
Hemiboeckella searli Sars	110304												
Hemiboeckella andersonae Bayly	110305												
Gladioferens imparipes Thompson	110306												
Isopoda													
Phreatoicidea													
Phreatoicidea sp. A	120201											1	
Amphipoda													
Amphipoda sp. A	130301												
Amphipoda sp. B	130401												
Gammaridae													
Perthia branchialis (Nicholls)	130101												
Perthia acutitelson Straskraba	130103	1	1			2			1			1	
Ceinidae													
Austrochiltonia subtenuis (Sayce)	130201				1	2		1	1		1	2	
Decapoda													
Parastacidae													
Cherax sp. (immature)	140100												
Cherax quinquecarinatus (Gray)	140101		1			1			1				
Cherax tenuimanus (Smith)	140103												
Cherax destructor Clark	140104											1	

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae													
Palaemonetes australis Dakin	140201				1	1			3			2	
INSECTA													
Ephemoptera													
Leptophlebiidae													
Leptophlebiidae sp.	160100												
Neboissophlebia occidentalis Dean	160101												
Bibulmena kadjina Dean	160102												
Baetidae													
Cloeon sp.	160202												
Caenidae													
Tasmanocoenis tillyardi (Lestage)	160301					1		1					
Odonata													
Odonata sp.	170000												
Aeshnidae													
Aeshna brevistyla (Rambur)	170102												
Libellulidae													
Orthetrum caledonicum (Brauer)	170201											1	
Austrothemis nigrescens (Martin)	170204												
Corduliidae													
Lathrocordulia metallica (Tillyard)	170301												
Hesperocordulia berthoudi (Tillyard)	170302												
Hemicordulia australie (Rambur)	170304												
Procordulia affinis (Selys)	170305								1			1	
Synthemidae													
Synthemis cyanitincta (Tillyard)	170401												
Gomphidae													
Austrogomphus lateralis (Selys)	170501												
Hemigomphus armiger (Tillyard)	170502												
Austrogomphus collaris Hagen	170503								1				
Lestidae													
Austrolestes annulosus (Selys)	171201												
Megapodagriidae													
Austroagrion cyane (Selys)	171302												
Coenagriidae													
Coenagriidae sp.	171300												
Hemiptera													
Corixidae													
Micronecta sp.	180101												
Agraptocorixa sp. A	180102												
Sigara sp.	180103												
Agraptocorixa sp. B	180104												
Veliidae													
Veliidae sp. 2	180202												
Notonectidae													
Notonectidae sp.	180300												
Anisops sp.	180302												
Notonecta sp.	180303												
Nepidae													
Ranatra sp.	180401												

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera													
Chironomidae													
Paramerina levidensis (Skuse)	220201		1		1	1			1				
Procladius paludicola Skuse	220240							1			1		
Procladius villosimanus Kieffer	224221												
?*Zavrelimyia* sp.	220222												
Macropelopia dalyupensis Freeman	220235		1										
Macropelopia sp. VSCL50	224222												
Ablabesmyia sp.	220237												
Coelopynia pruinosa Freeman	224212												
Orthocladinae sp. 1 VSCL3	224201												
Orthocladinae sp. 3 VSCL7	224203												
Orthocladinae sp. 5 VSCL20	224208								1			1	
Orthocladinae sp. 6 VSCL36	224217												
Orthocladinae sp. 7 VSCL38	224218				1			1	1				
Orthocladinae sp. 9 VSCL43	224220												
Orthocladinae sp. V43	220263							1					
Cricotopus annuliventris (Skuse)	220208											1	
Corynoneura sp.	220250												
Limonophyes pullulus (Skuse)	220261		1			1					1	1	
?*Limnophyes* sp. V31	220232	1			1	1		1	1			1	
?*Limnophyes* sp. VSCL45	224223												
Thienemanniella sp.	220210												
Stictocladius sp. VSCL24	224213												
Dicrotendipes sp.	220241	1	1			1		1				1	
Dicrotendipes ?conjunctus Walker	224226												
Kiefferulus martini Freeman	224224												
Kiefferulus intertinctus Skuse	220242												
Cryptochironomus griseidorsum Kieffer	220227							1					
Nilothauma sp.	220223												
?*Stenochironomus* sp.	220220												
Stenochironomus sp. 1 VSCL14	224210												
Stenochironomus sp. 2 VSCL31	224211												
Riethia sp. V5	220202												
Riethia sp. V4	220203												
Polypedilum sp. 1 VSCL8	224204	1			1	1		1	1		1		
Polypedilum sp. 2 VSCL16	224209												
Polypedilum sp. 3 VSCL 33	224215												
Polypedilum nubifer (Skuse)	220277												
Chironomus occidentalis Skuse	224225												
Chironomus aff. *alternans* Walker	220226								1				
Cladopelma curtivalva Kieffer	220273										1	1	
Harnischia sp.	220275												
Chironominae ?genus VSCL27	224214												
Chironominae ?genus VSCL34	224216												
Chironominae ?genus VSCL35	224219												
Tanytarsini	220216								1				
Tanytarsus sp.1 VSCL5	224202	1	1		1	1		1	1		2	2	
Tanytarsus sp. 2 VSCL9	224205				1	1			1		1	1	
Tanytarsus sp. 3 VSCL18	224207												
Cladotanytarsus sp. 1 VSCL10	224206	1			1	1		1	2		1	2	
Stempellina ?australiensis Freeman	220206												
Aphroteniella filicornis Brundin	220225												

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae													
Ceratopogonidae sp. B	220302										1		
Ceratopogonidae sp. F	220306												
Ceratopogonidae sp. G	220307												
Ceratopogonidae sp. K	220311					1							
Ceratopogonidae sp. L	220312												
Ceratopogonidae sp. N	220314	1											
Ceratopogonidae sp. O	220315				1			1					
Ceratopogonidae sp. P	220316										1		
Tipulidae													
Limoniinae sp. A	220402											1	
Limoniinae sp. B	220403												
Limnoniinae sp. F	220409												
Empididae													
Empididae sp. A	220502												
Empididae sp. B	220503												
Tabanidae													
Tabanidae sp. A	220801							1					
Dolochopodidae													
Dolochopodidae sp. A	221001												
Culicidae													
Culicidae sp.	221100												
Ephydridae													
Ephydridae sp. A	221701												
Trichoptera													
Ecnomidae													
Ecnomidae sp.	240100												
Ecnomina ?trulla Neboiss	240101												
?*Ecnomus* sp.	240107												
Ecnomus pansus Neboiss	240105					1							
Ecnomus turgidus Neboiss	240106												
Leptoceridae													
Leptoceridae spp.	240200	1										1	
Lectrides parilis Neboiss	240202					1							
Triplectides sp. B	240205												
Notoperata tenax Neboiss	240206												
Nolalina sp. A	240207												
Oecetis sp.	240209										1		
Triplectides australis Navas	240212												
Leptoceridae sp. C	240215					1							
Leptoceridae sp. F	240218					1							
Leptoceridae sp. H	240219		1										
Leptoceridae sp. I	240220												
Hydroptilidae													
Hydroptilidae sp.	240400												
Acritoptila globosa Wells	240404												
Hellyethira sp. B	240409										1	1	
Atriplectididae													
Atriplectides ?dubius Mosley	240601												

TAXA	Sp. code	Windy Harbour W			Maringup W			Maringup S			Owingup S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae													
Polycentropodidae sp.	240800										1		
Plectronemia eximia Neboiss	240802												
Coleoptera													
Dytiscidae													
Sternopriscus ?browni Sharp	250201							1					
Sternopriscus sp. A	250203												
Liodessus sp.	250208												
Megaporus sp.	250211												
Homeodytes scutellaris (Germar)	250215												
Homeodytes sp.	250216												
Sternopriscus browni Sharp	255201											1	
Sternopriscus marginata Watts	255203												
Rhantus sp.	255204												
Liodessus inornatus (Sharp)	255208											1	
Necterosoma darwini (Babington)	255205												
Antiporus femuralis (Boheman)	255210												
Megaporus howitti (Clark)	255211												
Megaporus solidus (Sharp)	255213												
Homeodytes scutellaris (Germar)	255215											1	
Lancetes lanceolatus Clark	255216								1				
Liodessus dispar (Germar)	255225												
Megaporus sp.	255227												
Helodidae													
Hellodidae	250301		1			1							
Gyrinidae													
Macrogyrus sp.	255501					1			1				
Hydrophilidae													
Hydrophilidae sp. 6	250606												
Hydrophilidae sp. 1	255601												
Hydrophilidae sp. 2	255602											1	
Hydrophilidae sp. 3	255603											1	
Hydrophilidae sp. 9	255609												
Hydrophilidae sp. 11	255611												
Carabidae													
?Carabidae sp. A	250901												

TAXA	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA													
Hydra sp.	70101												
PLATYHELMINTHES													
TEMNOCEPHALIDEA													
Temnocephala sp.	10101								1				
TURBELLARIA													
Dugesiidae sp. 1	20101												
NEMATODA													
Nematoda spp.	30000		1		1	1			1		1	1	
MOLLUSCA													
BIVALVIA													
Bivalva sp. 1	40001												
Bivalva sp. 2	40002												
Westralunio carteri Iredale	40101				1								
GASTROPODA													
?*Glacidorbis* sp.	50102												
Ferrissia petterdi (Johnston)	50201		1			1							
Gastropoda sp. 1	50501												
Gastropoda sp. 2	50701												
?*Physastra*	50601				1	1							
ANNELIDA													
OLIGOCHAETA													
Oligochaeta spp.	60001	1	1		1	2		2	1		1	2	
HIRUDINEA													
Richardsonianidae sp. 1	80101		1										
Glossiphoniidae sp 2	80202												
ARTHROPODA													
ARACHNIDA													
Hydracarina sp. C	90003												
Hydracarina sp. D	90004												
Hydracarina sp. E	90005												
Hydracarina sp. F	90006		1									1	
Hydracarina sp. G	90007		1			1						1	
Hydracarina sp. I	90009											1	
Hydracarina sp. J	90010												
Hydracarina sp. L	90012												
Hydracarina sp. O	90015												
Hydracarina sp. Q	90017												
Hydracarina sp. R	90018											1	
Hydracarina sp. S	90019								1			1	
Hydracarina sp. T	90020												
Hydracarina sp. U	90021												
Hydracarina sp. V	90022												
CRUSTACEA													
Cladocera													
Biapertura nr. *setigera* Brehm 1931	300001								1				
Bosmina meridionalis Sars 1904	300002												
Chydorus sp. Leach 1816	300003								1				
Neothrix cf. *armata* Gurney 1927	300004												
Daphnia carinata King 1855	300005												3
Alonella sp.	300006												

TAXA	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007								1				
Cladocera ?genus V16	300008												
Cladocera ?genus V17	300009												
Cladocera ?genus V18	300012		1										
Cladocera ?genus V15	300013												
Graptoleberis testudinaria Sars 1862	300010												
Camptocercus cf.*australis* Sars 1896	300011								1				
Ostracoda													
Newnhamia fenestra King 1855	100001												
Cypretta baylyi McKenzie 1966	100002												
Newnhamia sp. 295	100003												
Sarscypridopsis aculeata (Costa 1847)	100004					1			1			1	
Limnocythere mowbrayensis Chapman 1914	100005												
Candonopsis tenuis (Brady 1886)	100006		1						1				
Gomphodella aff. *maia* De Deckker 1981	100007		3						1				
Cyprididae undescribed genus	100008		1						1				
Alboa worooa De Deckker 1981	100009		2										
Ilyodromus sp. 255	100010												
Paralimnocythere sp. 262	100011												
Candonocypris novaezelandiae (Baird 1843)	100012											1	
Copepoda													
Cyclopoida													
Cyclopoida spp.	110100	p	1	p		1	2	p	1			1	
Harpactacoida													
Harpactacoida spp.	110200					2			1				
Calanoida													
Calanoida sp.	110300												
Calamoecia tasmanica (Smith) s.l.	110301	p	p	3		p	3	p	p	2		p	3
Calamoecia attenuata Fairbridge	110303							p	p	1		p	1
Hemiboeckella searli Sars	110304												
Hemiboeckella andersonae Bayly	110305							p	1				p
Gladioferens imparipes Thompson	110306												
Isopoda													
Phreatoicidea													
Phreatoicidea sp. A	120201												
Amphipoda													
Amphipoda sp. A	130301												
Amphipoda sp. B	130401					1							
Gammaridae													
Perthia branchialis (Nicholls)	130101								2				
Perthia acutitelson Straskraba	130103							1					
Ceinidae													
Austrochiltonia subtenuis (Sayce)	130201		1			2							
Decapoda													
Parastacidae													
Cherax sp. (immature)	140100					1							
Cherax quinquecarinatus (Gray)	140101								1				
Cherax tenuimanus (Smith)	140103												
Cherax destructor Clark	140104												

TAXA	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae													
Palaemonetes australis Dakin	140201		2		1	2			1				
INSECTA													
Ephemoptera													
Leptophlebiidae													
Leptophlebiidae sp.	160100												
Neboissophlebia occidentalis Dean	160101												
Bibulmena kadjina Dean	160102												
Baetidae													
Cloeon sp.	160202												
Caenidae													
Tasmanocoenis tillyardi (Lestage)	160301										1	1	
Odonata													
Odonata sp.	170000												
Aeshnidae													
Aeshna brevistyla (Rambur)	170102												
Libellulidae													
Orthetrum caledonicum (Brauer)	170201												
Austrothemis nigrescens (Martin)	170204					1							
Corduliidae													
Lathrocordulia metallica (Tillyard)	170301												
Hesperocordulia berthoudi (Tillyard)	170302												
Hemicordulia australie (Rambur)	170304												
Procordulia affinis (Selys)	170305												
Synthemidae													
Synthemis cyanitincta (Tillyard)	170401												
Gomphidae													
Austrogomphus lateralis (Selys)	170501												
Hemigomphus armiger (Tillyard)	170502												
Austrogomphus collaris Hagen	170503												
Lestidae													
Austrolestes annulosus (Selys)	171201												
Megapodagriidae													
Austroagrion cyane (Selys)	171302												
Coenagriidae													
Coenagriidae sp.	171300												
Hemiptera													
Corixidae													
Micronecta sp.	180101												
Agraptocorixa sp. A	180102												
Sigara sp.	180103												
Agraptocorixa sp. B	180104												
Veliidae													
Veliidae sp. 2	180202												
Notonectidae													
Notonectidae sp.	180300												
Anisops sp.	180302											1	
Notonecta sp.	180303												
Nepidae													
Ranatra sp.	180401												

TAXA	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera													
Chironomidae													
Paramerina levidensis (Skuse)	220201		1			1			1				
Procladius paludicola Skuse	220240							1					
Procladius villosimanus Kieffer	224221												
?*Zavrelimyia* sp.	220222												
Macropelopia dalyupensis Freeman	220235		1										
Macropelopia sp. VSCL50	224222												
Ablabesmyia sp.	220237												
Coelopynia pruinosa Freeman	224212												
Orthocladinae sp. 1 VSCL3	224201												
Orthocladinae sp. 3 VSCL7	224203												
Orthocladinae sp. 5 VSCL20	224208												
Orthocladinae sp. 6 VSCL36	224217					1			1				
Orthocladinae sp. 7 VSCL38	224218												
Orthocladinae sp. 9 VSCL43	224220												
Orthocladinae sp. V43	220263										1	1	
Cricotopus annuliventris (Skuse)	220208												
Corynoneura sp.	220250												
Limonophyes pullulus (Skuse)	220261		1			1							
?*Limnophyes* sp. V31	220232		1										
?*Limnophyes* sp. VSCL45	224223		1										
Thienemanniella sp.	220210												
Stictocladius sp. VSCL24	224213												
Dicrotendipes sp.	220241		1			1		1	1				
Dicrotendipes ?*conjunctus* Walker	224226												
Kiefferulus martini Freeman	224224							1	1				
Kiefferulus intertinctus Skuse	220242								1				
Cryptochironomus griseidorsum Kieffer	220227							1					
Nilothauma sp.	220223												
?*Stenochironomus* sp.	220220												
Stenochironomus sp. 1 VSCL14	224210												
Stenochironomus sp. 2 VSCL31	224211												
Riethia sp. V5	220202												
Riethia sp. V4	220203												
Polypedilum sp. 1 VSCL8	224204	1											
Polypedilum sp. 2 VSCL16	224209												
Polypedilum sp. 3 VSCL 33	224215							1					
Polypedilum nubifer (Skuse)	220277												
Chironomus occidentalis Skuse	224225	1											
Chironomus aff. *alternans* Walker	220226					1							
Cladopelma curtivalva Kieffer	220273	1	2			1		1	1				
Harnischia sp.	220275												
Chironominae ?genus VSCL27	224214												
Chironominae ?genus VSCL34	224216												
Chironominae ?genus VSCL35	224219								1				
Tanytarsini	220216												
Tanytarsus sp.1 VSCL5	224202		1			1		1	1				
Tanytarsus sp. 2 VSCL9	224205												
Tanytarsus sp. 3 VSCL18	224207												
Cladotanytarsus sp. 1 VSCL10	224206		1			1			1		1	1	
Stempellina ?*australiensis* Freeman	220206												
Aphroteniella filicornis Brundin	220225												

	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
TAXA		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae													
Ceratopogonidae sp. B	220302		1					1	1			1	
Ceratopogonidae sp. F	220306												
Ceratopogonidae sp. G	220307												
Ceratopogonidae sp. K	220311								1				
Ceratopogonidae sp. L	220312							1					
Ceratopogonidae sp. N	220314							1					
Ceratopogonidae sp. O	220315											1	
Ceratopogonidae sp. P	220316					1							
Tipulidae													
Limoniinae sp. A	220402					1						1	
Limoniinae sp. B	220403												
Limnoniinae sp. F	220409												
Empididae													
Empididae sp. A	220502												
Empididae sp. B	220503												
Tabanidae													
Tabanidae sp. A	220801		1										
Dolochopodidae													
Dolochopodidae sp. A	221001										1		
Culicidae													
Culicidae sp.	221100												
Ephydridae													
Ephydridae sp. A	221701		1										
Trichoptera													
Ecnomidae													
Ecnomidae sp.	240100												
Ecnomina ?trulla Neboiss	240101												
?*Ecnomus* sp.	240107												
Ecnomus pansus Neboiss	240105												
Ecnomus turgidus Neboiss	240106								1				
Leptoceridae													
Leptoceridae spp.	240200		1										
Lectrides parilis Neboiss	240202												
Triplectides sp. B	240205												
Notoperata tenax Neboiss	240206												
Nolalina sp. A	240207												
Oecetis sp.	240209					1							
Triplectides australis Navas	240212												
Leptoceridae sp. C	240215												
Leptoceridae sp. F	240218											1	
Leptoceridae sp. H	240219											1	
Leptoceridae sp. I	240220												
Hydroptilidae													
Hydroptilidae sp.	240400												
Acritoptila globosa Wells	240404												
Hellyethira sp. B	240409		1					1					
Atriplectididae													
Atriplectides ?dubius Mosley	240601												

TAXA	Sp. code	Boat Harbour 1 W			Boat Harbour 3 W			Boat Harbour 4 W			12046 W		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae													
Polycentropodidae sp.	240800												
Plectronemia eximia Neboiss	240802												
Coleoptera													
Dytiscidae													
Sternopriscus ?browni Sharp	250201												
Sternopriscus sp. A	250203												
Liodessus sp.	250208												
Megaporus sp.	250211												
Homeodytes scutellaris (Germar)	250215												
Homeodytes sp.	250216												
Sternopriscus browni Sharp	255201												
Sternopriscus marginata Watts	255203											1	
Rhantus sp.	255204					1							
Liodessus inornatus (Sharp)	255208					1						1	
Necterosoma darwini (Babington)	255205					1							
Antiporus femuralis (Boheman)	255210												
Megaporus howitti (Clark)	255211												
Megaporus solidus (Sharp)	255213					1							
Homeodytes scutellaris (Germar)	255215												
Lancetes lanceolatus Clark	255216					1							
Liodessus dispar (Germar)	255225					1							
Megaporus sp.	255227												
Helodidae													
Hellodidae	250301		1			1					1	1	
Gyrinidae													
Macrogyrus sp.	255501												
Hydrophilidae													
Hydrophilidae sp. 6	250606												
Hydrophilidae sp. 1	255601					1							
Hydrophilidae sp. 2	255602												
Hydrophilidae sp. 3	255603												
Hydrophilidae sp. 9	255609											1	
Hydrophilidae sp. 11	255611												
Carabidae													
?Carabidae sp. A	250901											1	

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell s		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
CNIDARIA													
Hydra sp.	70101		1										
PLATYHELMINTHES													
TEMNOCEPHALIDEA													
Temnocephala sp.	10101												
TURBELLARIA													
Dugesiidae sp. 1	20101								1				
NEMATODA													
Nematoda spp.	30000	1	3		1				2		1	1	
MOLLUSCA													
BIVALVIA													
Bivalva sp. 1	40001												
Bivalva sp. 2	40002								1				
Westralunio carteri Iredale	40101												
GASTROPODA													
?*Glacidorbis* sp.	50102												
Ferrissia petterdi (Johnston)	50201												
Gastropoda sp. 1	50501												
Gastropoda sp. 2	50701												
?*Physastra*	50601					1		1	1			2	
ANNELIDA													
OLIGOCHAETA													
Oligochaeta spp.	60001	1	1		1	1		1	2		1	1	
HIRUDINEA													
Richardsonianidae sp. 1	80101											1	
Glossiphoniidae sp 2	80202												
ARTHROPODA													
ARACHNIDA													
Hydracarina sp. C	90003												
Hydracarina sp. D	90004												
Hydracarina sp. E	90005												
Hydracarina sp. F	90006		1										
Hydracarina sp. G	90007		1										
Hydracarina sp. I	90009												
Hydracarina sp. J	90010											1	
Hydracarina sp. L	90012												
Hydracarina sp. O	90015												
Hydracarina sp. Q	90017												
Hydracarina sp. R	90018	1											
Hydracarina sp. S	90019												
Hydracarina sp. T	90020												
Hydracarina sp. U	90021												
Hydracarina sp. V	90022												
CRUSTACEA													
Cladocera													
Biapertura nr. *setigera* Brehm 1931	300001												
Bosmina meridionalis Sars 1904	300002												
Chydorus sp. Leach 1816	300003												
Neothrix cf. *armata* Gurney 1927	300004												
Daphnia carinata King 1855	300005							p	3	3	p	3	3
Alonella sp.	300006												

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Cladocera undescribed genus V13	300007												
Cladocera ?genus V16	300008												
Cladocera ?genus V17	300009												
Cladocera ?genus V18	300012												
Cladocera ?genus V15	300013											2	
Graptoleberis testudinaria Sars 1862	300010												
Camptocercus cf.*australis* Sars 1896	300011												
Ostracoda													
Newnhamiafenestra King 1855	100001												
*Cypretta baylyi*McKenzie 1966	100002												
*Newnhamia*sp. 295	100003												
Sarscypridopsis aculeata (Costa 1847)	100004								2	2		2	1
Limnocythere mowbrayensis Chapman 1914	100005												
Candonopsis tenuis (Brady 1886)	100006												
Gomphodella aff. *maia* De Deckker 1981	100007		1										
Cyprididae undescribed genus	100008		1										
Alboa worooa De Deckker 1981	100009												
Ilyodromus sp. 255	100010		1										
Paralimnocythere sp. 262	100011	1											
Candonocypris novaezelandiae (Baird 1843)	100012							1	2			1	
Copepoda													
Cyclopoida													
Cyclopoida spp.	110100	p					1		2	2	p	1	1
Harpactacoida													
Harpactacoida spp.	110200		1						3	2		1	
Calanoida													
Calanoida sp.	110300						2						
Calamoecia tasmanica (Smith) s.l.	110301			3									
Calamoecia attenuata Fairbridge	110303			3									
Hemiboeckella searli Sars	110304												
Hemiboeckella andersonae Bayly	110305												
Gladioferens imparipes Thompson	110306											p	1
Isopoda													
Phreatoicidea													
Phreatoicidea sp. A	120201		1										
Amphipoda													
Amphipoda sp. A	130301												
Amphipoda sp. B	130401												
Gammaridae													
Perthia branchialis (Nicholls)	130101												
Perthia acutitelson Straskraba	130103		2										
Ceinidae													
Austrochiltonia subtenuis (Sayce)	130201	1	3		1	2		1	3			1	
Decapoda													
Parastacidae													
Cherax sp. (immature)	140100												
Cherax quinquecarinatus (Gray)	140101												
Cherax tenuimanus (Smith)	140103												
Cherax destructor Clark	140104		1										

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Palaemonidae													
Palaemonetes australis Dakin	140201					2			3			3	
INSECTA													
Ephemoptera													
Leptophlebiidae													
Leptophlebiidae sp.	160100												
Neboissophlebia occidentalis Dean	160101												
Bibulmena kadjina Dean	160102												
Baetidae													
Cloeon sp.	160202												
Caenidae													
Tasmanocoenis tillyardi (Lestage)	160301	1	2		1				1				
Odonata													
Odonata sp.	170000												
Aeshnidae													
Aeshna brevistyla (Rambur)	170102								1				
Libellulidae													
Orthetrum caledonicum (Brauer)	170201					1							
Austrothemis nigrescens (Martin)	170204												
Corduliidae													
Lathrocordulia metallica (Tillyard)	170301												
Hesperocordulia berthoudi (Tillyard)	170302												
Hemicordulia australie (Rambur)	170304												
Procordulia affinis (Selys)	170305												
Synthemidae													
Synthemis cyanitincta (Tillyard)	170401												
Gomphidae													
Austrogomphus lateralis (Selys)	170501												
Hemigomphus armiger (Tillyard)	170502												
Austrogomphus collaris Hagen	170503												
Lestidae													
Austrolestes annulosus (Selys)	171201												
Megapodagriidae													
Austroagrion cyane (Selys)	171302					1							
Coenagriidae													
Coenagriidae sp.	171300								1				
Hemiptera													
Corixidae													
Micronecta sp.	180101		1			1			1			2	
Agraptocorixa sp. A	180102					1			1				
Sigara sp.	180103					1						1	
Agraptocorixa sp. B	180104								1				
Veliidae													
Veliidae sp. 2	180202												
Notonectidae													
Notonectidae sp.	180300												
Anisops sp.	180302								1			2	
Notonecta sp.	180303												
Nepidae													
Ranatra sp.	180401												

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Diptera													
Chironomidae													
Paramerina levidensis (Skuse)	220201	1	1						1			1	
Procladius paludicola Skuse	220240												
Procladius villosimanus Kieffer	224221							1	1			1	
?*Zavrelimyia* sp.	220222												
Macropelopia dalyupensis Freeman	220235												
Macropelopia sp. VSCL50	224222												
Ablabesmyia sp.	220237												
Coelopynia pruinosa Freeman	224212							1	1			1	
Orthocladinae sp. 1 VSCL3	224201												
Orthocladinae sp. 3 VSCL7	224203												
Orthocladinae sp. 5 VSCL20	224208												
Orthocladinae sp. 6 VSCL36	224217				1								
Orthocladinae sp. 7 VSCL38	224218												
Orthocladinae sp. 9 VSCL43	224220												
Orthocladinae sp. V43	220263												
Cricotopus annuliventris (Skuse)	220208												
Corynoneura sp.	220250												
Limonophyes pullulus (Skuse)	220261	1	1									1	
?*Limnophyes* sp. V31	220232												
?*Limnophyes* sp. VSCL45	224223												
Thienemanniella sp.	220210											1	
Stictocladius sp. VSCL24	224213												
Dicrotendipes sp.	220241		1										
Dicrotendipes ?conjunctus Walker	224226										1	1	
Kiefferulus martini Freeman	224224												
Kiefferulus intertinctus Skuse	220242					1			1				
Cryptochironomus griseidorsum Kieffer	220227	1	1		1			1	1				
Nilothauma sp.	220223												
?*Stenochironomus* sp.	220220												
Stenochironomus sp. 1 VSCL14	224210		1										
Stenochironomus sp. 2 VSCL31	224211												
Riethia sp. V5	220202												
Riethia sp. V4	220203	1											
Polypedilum sp. 1 VSCL8	224204		1										
Polypedilum sp. 2 VSCL16	224209												
Polypedilum sp. 3 VSCL 33	224215							1					
Polypedilum nubifer (Skuse)	220277				1								
Chironomus occidentalis Skuse	224225				1	1							
Chironomus aff. *alternans* Walker	220226												
Cladopelma curtivalva Kieffer	220273												
Harnischia sp.	220275	1	1										
Chironominae ?genus VSCL27	224214												
Chironominae ?genus VSCL34	224216												
Chironominae ?genus VSCL35	224219												
Tanytarsini	220216												
Tanytarsus sp.1 VSCL5	224202								1		1	1	
Tanytarsus sp. 2 VSCL9	224205												
Tanytarsus sp. 3 VSCL18	224207												
Cladotanytarsus sp. 1 VSCL10	224206				1								
Stempellina ?australiensis Freeman	220206		1										
Aphroteniella filicornis Brundin	220225		1										

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Ceratopogonidae													
Ceratopogonidae sp. B	220302	1	1		1								
Ceratopogonidae sp. F	220306												
Ceratopogonidae sp. G	220307							1	2		1	2	
Ceratopogonidae sp. K	220311												
Ceratopogonidae sp. L	220312												
Ceratopogonidae sp. N	220314												
Ceratopogonidae sp. O	220315												
Ceratopogonidae sp. P	220316												
Tipulidae													
Limoniinae sp. A	220402												
Limoniinae sp. B	220403												
Limnoniinae sp. F	220409												
Empididae													
Empididae sp. A	220502												
Empididae sp. B	220503												
Tabanidae													
Tabanidae sp. A	220801												
Dolochopodidae													
Dolochopodidae sp. A	221001												
Culicidae													
Culicidae sp.	221100												
Ephydridae													
Ephydridae sp. A	221701												
Trichoptera													
Ecnomidae													
Ecnomidae sp.	240100												
Ecnomina ?trulla Neboiss	240101												
?*Ecnomus* sp.	240107												
Ecnomus pansus Neboiss	240105												
Ecnomus turgidus Neboiss	240106											1	
Leptoceridae													
Leptoceridae spp.	240200	1											
Lectrides parilis Neboiss	240202		1										
Triplectides sp. B	240205					1							
Notoperata tenax Neboiss	240206												
Notalina sp. A	240207	1											
Oecetis sp.	240209		1					1	1			1	
Triplectides australis Navas	240212								1			1	
Leptoceridae sp. C	240215												
Leptoceridae sp. F	240218		1										
Leptoceridae sp. H	240219												
Leptoceridae sp. I	240220												
Hydroptilidae													
Hydroptilidae sp.	240400												
Acritoptila globosa Wells	240404												
Hellyethira sp. B	240409												
Atriplectididae													
Atriplectides ?dubius Mosley	240601												

TAXA	Sp. code	Williams S			Saide W			Powell W			Powell S		
		B	S	Z	B	S	Z	B	S	Z	B	S	Z
Polycentropodidae													
Polycentropodidae sp.	240800												
Plectronemia eximia Neboiss	240802												
Coleoptera													
Dytiscidae													
Sternopriscus ?browni Sharp	250201												
Sternopriscus sp. A	250203												
Liodessus sp.	250208												
Megaporus sp.	250211												
Homeodytes scutellaris (Germar)	250215												
Homeodytes sp.	250216												
Sternopriscus browni Sharp	255201					1			1				
Sternopriscus marginata Watts	255203												
Rhantus sp.	255204												
Liodessus inornatus (Sharp)	255208												
Necterosoma darwini (Babington)	255205												
Antiporus femuralis (Boheman)	255210		1									1	
Megaporus howitti (Clark)	255211											1	
Megaporus solidus (Sharp)	255213					1							
Homeodytes scutellaris (Germar)	255215												
Lancetes lanceolatus Clark	255216											1	
Liodessus dispar (Germar)	255225					1							
Megaporus sp.	255227												
Helodidae													
Hellodidae	250301								1				
Gyrinidae													
Macrogyrus sp.	255501												
Hydrophilidae													
Hydrophilidae sp. 6	250606												
Hydrophilidae sp. 1	255601												
Hydrophilidae sp. 2	255602												
Hydrophilidae sp. 3	255603												
Hydrophilidae sp. 9	255609											1	
Hydrophilidae sp. 11	255611					1						1	
Carabidae													
?Carabidae sp. A	250901												