WATERBIRDS BREEDING IN SPRING 1992 IN WETLANDS ON THE SOUTH COAST OF WESTERN AUSTRALIA

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CONTENTS

Photograph on title page: eggs of Purple Swamphen at Lake Powell, October 1992 (RJ).

SUMMARY

Surveys of 11 wetlands on the south coast of Western Australia were conducted in October 1992, to complement surveys of waterbird breeding at the same (and 16 other) wetlands in summer 1991-2 and improve knowledge of the breeding distribution of Australasian and Little Bitterns. Listening for calls was an important part of the strategy for finding the bitterns.

Nine waterbird species were found breeding in spring 1992; three of these, including colonially breeding cormorants, had not been recorded breeding in summer 1991-2. No breeding of Australasian Bittern was recorded but Little Bittern was recorded present at two wetlands on the basis of calls associated with breeding. Only two of the 34 waterbird species that commonly occur and probably breed on the south coast were not recorded breeding in the south coast wetlands in the 1991 or 1992 surveys.

Eleven new breeding species for particular wetlands were recorded in the spring 1992 surveys. Data from surveys of the 27 south coast wetlands since 1981 reveal that the three most important wetlands in terms of number of breeding species recorded are Lake Powell, Lake Saide and Owingup Swamp.

Maintenance of water quality and exclusion of human disturbance are recommended for Owingup Swamp, in recognition of its good condition and high importance for waterbird breeding and bitterns.

Whereas Little Bittern occurs and breeds widely in the south coast wetlands, Australasian Bittern mainly occurs in the east, between Owingup Swamp and Lake Pleasant View, and probably breeds at only several wetlands. Intensive study of all aspects of the breeding of Australasian Bittern in WA is urgently needed for formulation of management strategies for this species.

The low forest community, comprising *Agonis, Melaleuca* and *Eucalyptus* species, supported the highest number of breeding efforts recorded in spring 1992. Wise management of the south coast wetlands for waterbird breeding should include protection of wetland forest and shrub thickets from excessive wildfire.

1. INTRODUCTION

1.1 Background.

In 1991-2, the WA Department of Conservation and Land Management (CALM) received funds from the Australian National Parks and Wildlife Service (now the Australian Nature Conservation Agency) to conduct wetland inventory work on the south coast of Western Australia. This work included surveys of waterbird usage of 27 wetlands, which were undertaken in summer 1991-2 (Jaensch 1992a) and supplemented with opportunistic observations in autumn 1992 (datasheets in Jaensch 1992b).

The surveys revealed that the south coast wetlands included extensive dense vegetation, now lost from many other wetlands in south-western Australia (e.g. due to salinisation), that was potentially suitable for breeding by many waterbird species. Fourteen waterbird species were found breeding but many of the other species present were not found breeding and discovery of empty nests suggested that some had bred in spring 1991 or earlier. Therefore, it was considered desirable to conduct further surveys, in spring 1992, to complete an assessment of the significance of the wetlands for waterbird breeding.

Furthermore, it was considered desirable to survey suitable wetlands in spring in the hope of widening the known distribution and obtaining breeding records of the only declared rare species, Australasian Bittern *Botaurus poiciloptilus*, that had been recorded. In summer 1991-2 the bittern was found at only one wetland (5 birds at Owingup Swamp) and was not found breeding, whereas there were past records of occurrence at several of the other surveyed wetlands and extensive areas of apparently suitable habitat were recognised at yet other surveyed wetlands. Presence of the species may be established readily from recognising its distinctive "booming" calls, apparently uttered mainly in the spring-summer breeding season (Marchant and Higgins 1990).

Another secretive bittern, the relatively uncommon Little Bittern *Ixobrychus minutus*, was found breeding in summer 1991-2 at one wetland (Lake Saide) and recently-used nests and/or extensive breeding habitat were found at several other wetlands surveyed. Therefore it was considered desirable to re-survey certain wetlands in spring in the hope of also discovering further breeding localities of Little Bittern.

Subsequently, the Wetlands Program of CALM obtained funding from the WA National Parks and Nature Conservation Authority to undertake surveys of waterbird breeding in the south coast wetlands in spring 1992.

1.2 Wetlands to be surveyed.

The 27 wetlands surveyed in summer 1991-2 and autumn 1992 are located on Crown land on the south coast of WA between Cape Naturaliste and Albany, which is the study area also for the current project (Fig. 1). A sub-set of the 27 was selected for the spring 1992 surveys, comprising the 10 wetlands most highly

ranked in terms of number of species found breeding in 1991-2 (Jaensch 1992a) and/or with extensive habitat considered probably suitable for breeding by bitterns. The selected wetlands were spread throughout the study area. An additional wetland, adjacent to one of the 10 and including a substantial area of bittern habitat, was included during fieldwork. The 11 wetlands surveyed and dates of spring 1992 surveys are listed in Table 1.

1.3 Objectives.

The project's objectives were:

1. to determine waterbird species breeding in spring at the 10 wetlands most likely to support breeding waterbirds;

2. to determine probable breeding distribution of Australasian Bittern and Little Bittern in the 10 wetlands; and

3. to provide advice concerning management of breeding waterbird habitat in the 10 wetlands.

2. METHODS

To pursue the project objectives with the available funds, one survey was planned for each selected wetland. Survey dates were set for early-mid October, to be significantly (6+ weeks) earlier than the summer 1991-2 surveys and yet late enough in spring for water levels to have stopped rising (few waterbirds will lay until winter water levels have stopped rising).

At each wetland, areas in which nests previously had been found generally were re-surveyed and at least one other substantial area of dense vegetation potentially suitable for waterbird breeding was investigated for the first time.

Techniques for finding waterbirds and their nests and typical nest sites in dense vegetation have been described elsewhere (Jaensch 1992a, Jaensch *et al.* 1988). Essentially, nest searching in spring 1992 involved wading and/or boating through and looking closely at the most dense areas of tall sedge, shrubs and trees inundated by at least c. 0.3 m of water.

Old nests were recorded, where the user could be identified confidently to species level, in order to maximise the quantity of data collected. Usually it was possible to identify those old nests that had been used earlier in spring 1992 by presence of green nest materials, eggshell and/or droppings. This recent breeding, and active breeding (freshly built nests, nests with clutches of eggs/young, nests with sitting adults, broods of dependent young out of the nest), are distinguished from breeding in previous years (empty nests last used in 1991-2 season or earlier) in some tables of results (below). However, this information has been combined in calculating the number of waterbird species found breeding at each wetland in any survey.

Survey time was also devoted to listening for calling Australasian and Little Bitterns in the early night and/or at dusk and dawn, at each of the 11 wetlands other than Lake Davies (which could be surveyed thoroughly by wading). Typical "advertising calls" (Marchant and Higgins 1990) made by adult bitterns in the early stages of breeding had been learnt by RPJ from field experience in south-western Australia. Also, imitations of the "croaking" Little Bittern call were usually made by the observers near suitable nest sites in the hope that any birds present might respond. This latter strategy was successful at two wetlands where the species otherwise would not have been recorded in this project.

Calm weather, which is best for detecting calls, was experienced on most nights. A couple of nights were unseasonally cold.

Areal extent of inundation of fringing vegetation suggested that all of the wetlands were full. High water marks on the vegetation indicated that, in general, wetlands were slightly below the maximum depth of water reached in winter-spring 1992.

3. RESULTS

A list of waterbird species recorded in the spring 1992 surveys and others mentioned in the report, is given in Appendix 1; scientific names and codes used in tables are also given. Datasheets for each wetland surveyed, presenting numbers and breeding data for each species, are in Appendix 2 together with wetland maps and some photographs.

3.1 Species recorded breeding.

Number of breeding efforts by waterbird species at the 11 south coast wetlands in spring 1992 and evidence of breeding in previous years are summarised in Table 2.

Nine species were found breeding (or recently bred) at the 11 wetlands in spring 1992, compared with 13 in summer 1991-2 (Jaensch 1992a).

Great Cormorant (colony at Gardner River Lake), Little Black Cormorant (colony near Owingup Swamp) and Pacific Black Duck (at 3 wetlands) were found breeding in spring 1992 but not in summer 1991-2. All three species tend to breed more in winter and/or spring than summer in south-western Australia (Halse and Jaensch 1989).

Little Bittern, Blue-billed Duck, Black-fronted Plover, Clamorous Reed-Warbler and Little Grassbird each had eggs or small young in summer 1991-2 but were not found breeding in spring 1992. All tend to breed mainly in spring and/or summer in south-western Australia (Halse and Jaensch 1989) and most tend to breed more in summer than spring on the south coast (pers. obs. RPJ).

Australasian Bittern was not found breeding in spring 1992 and no evidence of recent breeding was detected.

Of the 34 species that each have now been recorded present **in at least three** of the 27 south coast wetlands (Table 7 in Jaensch 1992a and Appendix 2 of current report) and that breed in south-western Australia (Storr 1991), 14 have not yet been found breeding in the 27 wetlands. Habitat is unsuitable for three: Australian Pelican and Silver Gull (prefer bare islands) and Maned Duck (mainly breeds in dryland tree hollows). Seven others (certain cormorants, herons and allies), though not lacking suitable habitat (inundated trees), apparently do not breed in the 27 wetlands: their colonies are conspicuous and should have been noticed by now if they existed. Two of the other four species, Great Crested Grebe and Hardhead, are not widespread (each at only 3-4 wetlands) and not abundant and probably do not breed in the 27 wetlands. The remaining two species, Grey Teal and Australasian Bittern, probably breed in the wetlands since apparently suitable habitat exists, but their breeding has been overlooked so far.

The number of species found breeding in spring 1992 was lower at eight wetlands, equal at two wetlands and higher at one wetland compared to results from summer 1991-2, though in the summer surveys some breeding was recorded where eggs had been laid in spring 1991. Only one species was found breeding at Lake Jasper

in spring compared with 6 in summer, partly because some good breeding sites were too deeply flooded in spring to permit access. Three species were found breeding at Lake Saide in spring compared with 6 in summer, partly because the extensive beds of *Typha* at that lake had not yet completed their spring growth.

Forty-two breeding efforts were recorded in spring 1992 (Table 2). Eight new breeding species for particular wetlands were established from these records, e.g. Darter at Owingup Swamp, Spotless Crake at Boat Harbour Lake 2.

The highest number of active or recent breeding efforts at a particular wetland was 16 at Owingup Swamp, 10 of the efforts being active Little Black Cormorant nests. Gardner River Lake also had 10 active (Great) cormorant nests. Efforts varied from 1-5 at five other wetlands and no breeding was recorded at four wetlands.

Thirty-one nests from previous years were noted in spring 1992 (Table 2). Most of these 31 were discovered in summer 1991-2. However, three new breeding species for particular wetlands were established from finding old nests: Clamorous Reed-Warbler at Yeagarup Lake, Little Grassbird at Un-named Lake (first breeding species there), Purple Swamphen at Lake Saide.

3.2 Ranking of wetlands.

The waterbird species found breeding at each of the 11 wetlands in any survey from 1981 to present (see Table 7 in Jaensch 1992a and Appendix 2 in current report) are shown in Table 3. A ranking of wetlands by number of species found breeding (Table 4) has been constructed using this information.

Table 4 suggests that the three most important wetlands in terms of number of breeding species are Lake Powell, Lake Saide and Owingup Swamp.

Note that none of the other 16 (of the 27) wetlands supported more than two breeding species in summer 1991-2 and they would probably support few additional breeding species. Therefore, Lake Powell, Lake Saide and Owingup Swamp can be considered the most important among all 27 wetlands in regard to number of waterbird species found breeding.

3.3 Habitats used for breeding.

The number of new, active or recently used nests found in each "habitat" (wetland vegetation community: Robinson 1992) is shown in Table 5.

The Cedar Dense Low Forest community, which includes some other tree species (*Melaleuca rhaphiophylla, Eucalyptus* spp.) as well as "cedar" *Agonis juniperina*, supported by far the largest number of nests because two small breeding colonies occurred in it.

If, however, only non-colonial breeding species are considered, then the Tall Sedges community supported three times more nests and two times more breeding species than the other communities. The Tall Sedges community is the most extensive and widespread community in the 11 wetlands. Nevertheless there are large areas

of Low Sedges, Cedar Forest and Beaufortia Heath, which each supported some breeding in spring 1992, and also *Agonis floribunda* Heath, which supported no breeding in spring 1992 but supported breeding by several species in summer 1991-2.

4. CONCLUSIONS

4.1 Methods.

We are confident that the timing of the surveys (October) and search methods used were appropriate for the project objectives. This conclusion is supported by our acquisition of substantial new information on waterbird breeding.

Greater depth of water in spring than in summer limited our access (by wading) to some areas of good nesting habitat. However, other areas of good nesting habitat that were dry in summer were inundated in spring and some of these had active nests.

Results have shown that surveys of waterbird breeding at south coast wetlands should be conducted both in spring (ideally mid-spring) and summer (ideally early summer) in order to record the majority of the species that breed there. Surveys in either season alone would be inadequate.

4.2 Relative importance of the wetlands for breeding by waterbirds.

The high importance of Lakes Powell and Saide for waterbird breeding, as shown in Table 4, can be partly attributed to suitable habitat for nests and young being present, despite the highly disturbed nature (modified hydrology, nutrient-enriched waters, exotic vegetation) of these wetlands. Some highly disturbed wetlands in the Perth metropolitan area (e.g. Forrestdale Lake) also are important for waterbird breeding (ANCA 1993).

Like the other three wetlands ranked highly for breeding, Owingup Swamp supports a relatively high number of species (present, not necessarily breeding) and further surveys will probably reveal even greater value for waterbird breeding, perhaps another five breeding species. However, most of the other 24 wetlands surveyed in 1991 and/or 1992 are unlikely to support more than 10 breeding species because the relatively low numbers of species present at most of these wetlands suggests some deficiency in habitat for nests and/or young.

We therefore conclude that the ranking in Table 4 gives a true indication of the relative importance of the wetlands for waterbird breeding.

4.3 Probable breeding distributions of Australasian Bittern and Little Bittern.

Australasian Bittern

A survey at Lake Pleasant View (a known breeding site, just ENE of the study area) immediately following surveys of the 11 wetlands in October 1992, revealed at least six Australasian Bitterns (flushed from shallow feeding areas) and a similar number were heard calling strongly during the night. Some birds also called occasionally in the several hours after dawn. Therefore it is considered likely that the species would have

been calling and detected at the 11 other wetlands surveyed in October 1992 if it had been present.

On the basis of past records (Jaensch 1992a) and evidence from the current project we conclude that, on the south coast of Western Australia, Australasian Bittern occurs mainly from Owingup Swamp eastwards to Mettler Lake. Records further west (e.g. Hardy Inlet marshes, J. Lane pers. comm.) may be of wandering birds.

Apart from records of breeding at Yakamia Creek Swamp near Albany and Lake Pleasant View in the 1980s (T. Bush pers. comm.), there have been few if any recent breeding records of Australasian Bittern from the south coast. There is still insufficient knowledge of the breeding habitat requirements of this species in WA. Therefore the only conclusion we can draw on the breeding distribution of Australasian Bittern on the south coast is that it may be limited to a sub-set of the relatively few (15+) localities at which the species has been seen.

In our opinion, the most promising locations for further searches of nests in the south coast area are those clusters of wetlands at which most records have been made, through several seasons: the Owingup/Boat Harbour wetlands (in the project study area) and the Two Peoples' Bay and Lake Pleasant View wetland groups (east of the study area). These wetlands all support extensive tall sedgeland, which is probably the required breeding habitat.

A strategy for finding nests may be to find or construct an elevated vantage point from which to watch for flying bitterns in the early morning, probably in late spring or early summer. Consistent landings of birds at a particular site may warrant an inspection of the site and areas adjacent, using a boat and/or wading.

Little Bittern

Although there are fewer known localities for Little Bittern on the south coast, the distribution of this species is wider than that of the Australasian Bittern. Also, unlike the Australasian Bittern, most records of Little Bittern in this region are from the breeding season (spring-summer) and there are at least three confirmed breeding localities (Lakes Jasper, Saide and Pleasant View). Therefore we are confident that the Little Bittern breeds widely in the study area, at both small and large wetlands (as is the case elsewhere in WA). Breeding habitat includes mature living thickets of *Agonis floribunda* over tall sedges (very extensive from Gingilup Swamps through Quitjup Lake to Lake Jasper), tall dense beds of *Typha orientalis* not choked with couch grass *Cynodon dactylon* (large patch at Boat Harbour Lake 2, some patches at Lakes Saide and Powell), and tall dense beds of *Baumea articulata* (small patches at most wetlands, larger patches at some wetlands, e.g. Lake Pleasant View). (Most of the *B. articulata* at Owingup Swamp is probably not dense enough for Little Bittern nests.)

4.4 Management of breeding waterbird habitat.

Bitterns.

Wise management of breeding populations of Australasian Bittern on the south coast is hampered by poor knowledge of all aspects of the breeding of this species. Until that knowledge improves, the integrity of the three abovementioned known or possible breeding areas should be maintained. That is, the water regimes and vegetation communities should be maintained as they have existed in the last 10 or so years.

We believe there is no immediate threat to the viability of breeding populations of Little Bittern on the south coast, though local populations may be threatened by excessive wildfire in *Agonis* thickets and spread of couch grass in *Typha* swamps.

Other species.

Disturbance to breeding cormorants and darters from passing boats should be avoided, since young of these birds tend to leap out of their nests when approached too closely, even by boats. This is not likely to be a problem at the Gardner River Lake, which is rarely visited by humans, but is a potential problem at Owingup Swamp (lower Kent River colonies of Little Black Cormorant, and Darter nests) because the river would be attractive for canoeing. Exclusion of boating from Owingup Swamp and lower Kent River should be considered.

In general, the main factor influencing breeding activity by Musk Duck, Spotless Crake and Purple Swamphen (widespread breeding species on the south coast), is sufficient inundation of sufficiently tall and dense vegetation. In wetter years, some potential nest sites may be almost covered by water (i.e. unusable) whereas other sites near the wetland margins may become available; the converse applies in drier years. Wetlands that have a broad area of dense emergent vegetation occurring on a gently sloping or undulating substrate (e.g. Lake Jasper, Owingup Swamp) therefore offer the best conditions for long term viability of local breeding populations of these species. Managers should ensure that the total wetland area is protected from degrading influences such as excessive wildfire, excessive inundation (e.g. when catchments are cleared or mined), and weed invasion.

5. RECOMMENDATIONS

1. The high importance of Owingup Swamp both for waterbird breeding and for Australasian Bitterns should be recognised through design and implementation of appropriate land management strategies, including maintenance of water quality in the Kent River catchment, monitoring of changes in vegetation communities at the Swamp and exclusion of recreational activity from the Swamp.

2. Further research into the ecological requirements, particularly breeding, of Australasian Bittern should be undertaken urgently. Intensive observations could be made at a conveniently accessed site where significant numbers occur in spring-summer, notably Benger Swamp (on the Swan Coastal Plain) or Lake Pleasant View.

3. Further systematic searches for Australasian Bitterns in the extensive marshes between Walpole and Augusta (particularly Lake Jasper, Quitjup Lake, Gingilup Swamps) are not considered highly probable to reveal broods or nests and therefore are not a high priority. However, researchers and managers working in the area should be encouraged to listen for calling birds in spring-summer.

4. As far as possible, wildfire should be excluded from living thickets and forest of *Agonis juniperina* and *A. floribunda* at the south coast wetlands, since these have (in this and earlier studies) proven to be important habitats for waterbird breeding and do not readily regenerate after burning. Placement of firebreaks some distance above the high water marks of the wetlands may be appropriate.

6. ACKNOWLEDGEMENTS

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District and Regional officers of CALM at Busselton, Nannup, Pemberton and Albany and Keith Moon, Ranger at William Bay National Park, provided advice and assistance during fieldwork.

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Figure 1. The study area and wetlands surveyed.

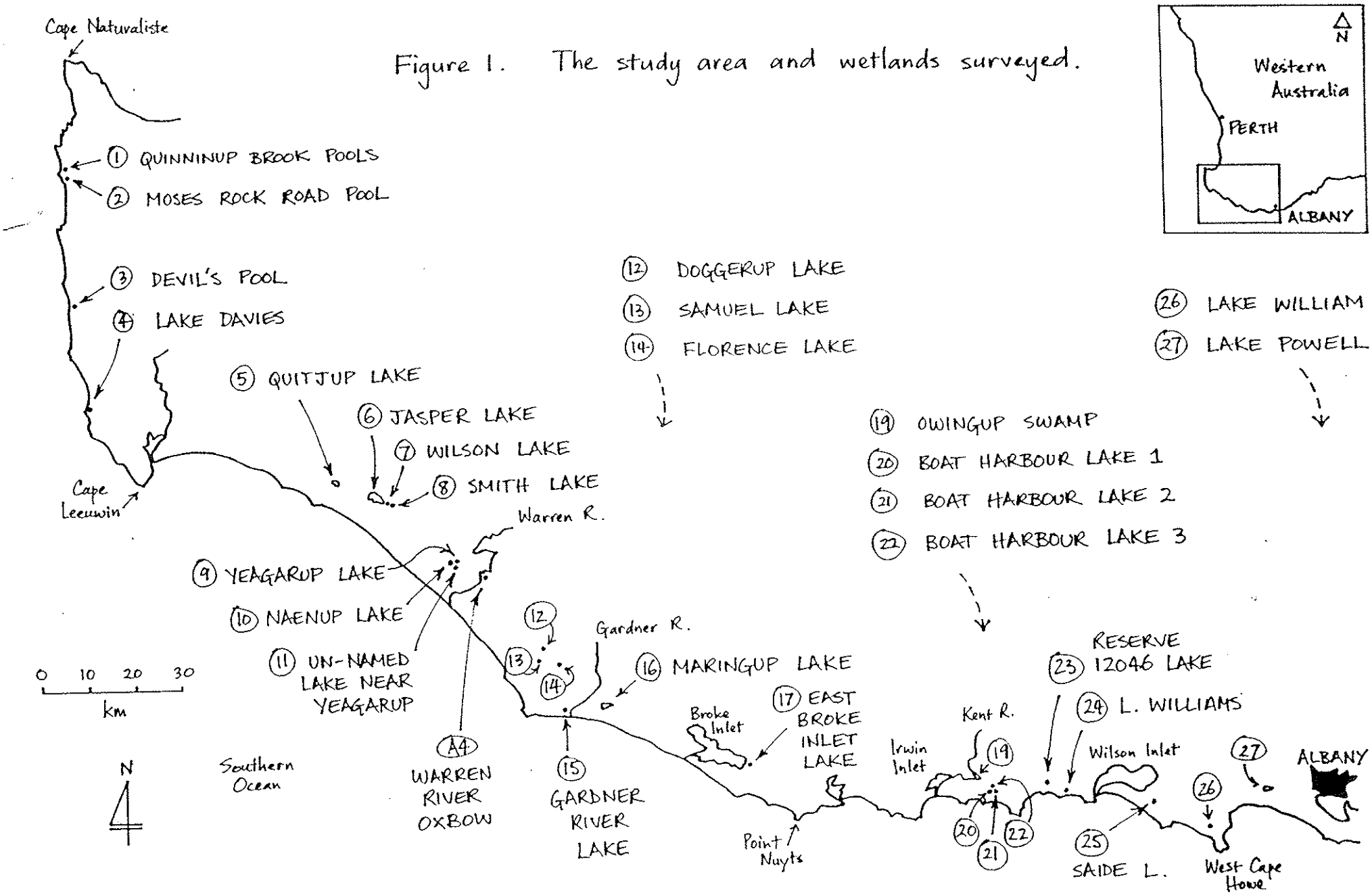


Table 1. Dates of survey and latitude/longitude of the wetlands surveyed in spring 1992.

wetland name	*code*	*latitude S * / longitude E*	*survey date*
Lake Davies	DAV	34.13 / 115.02	9 Oct 92
Lake Jasper	JAS	34.24 / 115.41	8-9 Oct 92
Yeagarup Lake	YEA	34.32 / 115.53	7 Oct 92
Un-named Lake	UNN	34.33 / 115.52	7 Oct 92
Gardner R Lake	GAR	34.50 / 116.06	6-7 Oct 92
Maringup Lake	MAR	34.50 / 116.12	5-6 Oct 92
Owingup Swamp	OWI	35.00 / 117.04	13 Oct 92
Boat Harbour Lake 1	BH1	35.01 / 117.05	12-13 Oct 92
Boat Harbour Lake 2	BH2	35.01 / 117.06	12-13 Oct 92
Lake Saide	SAI	35.03 / 117.28	14-15 Oct 92
Lake Powell	POW	35.01 / 117.44	15 Oct 92

* in degrees and minutes

Table 2. Waterbird species found breeding at 11 wetlands on the south coast of Western Australia in spring 1992, and (a) number of breeding efforts (new, active or recently used nests, or broods) and (b) number of old nests (from previous years) at each wetland. See Appendix 1 and Table 1 for codes used.

waterbird species	*wetland* DAV	JAS	YEA	UNN	GAR	MAR	OWI	BH1	BH2	SAI	POW	*total breeding efforts*
(a) Spring 1992 breeding efforts:												
AuGb	2											2
Dart							2					2
LiBC							10					10
GreC					10							10
Swan									1	3	1	5
PaBD	1									1	1	3
MusD		2					2			1		5
SpCk									1			1
PuSn							2				2	4
total breeding efforts	3	2	0	0	10	0	16	0	2	5	4	42
(b) Old nests:												
Dart						2						2
GreC					10							10
LitB		2										2
SpCk			2									2
PuSn										3		3
CreW		8	1		1							10
LiGd			1	1								2
total old nests	0	10	4	1	11	2	0	0	0	3	0	31

Table 3. The waterbird species found breeding at the 11 wetlands in any survey since 1981, using data from Jaensch (1992a) and the current report.

waterbird species	*wetland* DAV	JAS	YEA	UNN	GAR	MAR	OWI	BH1	BH2	SAI	POW
HhGb	*										
AuGb	*										
GreC					*						
LiBC							*				
Dart						*	*				
WfHn											*
LitB		*								*	
Swan							*		*	*	*
Shel										*	*
PaBD	*									*	*
Shov											*
BbiD							*			*	*
MusD		*					*			*	*
MaHa											*
SpCk	*	*	*				*		*		
PuSn		*					*		*	*	*
Coot										*	*
BfoP							*				
BwSt											*
CReW		*	*		*				*	*	*
LiGd		*	*	*			*			*	*
total species	4	6	3	1	2	2[a]	9	0	4	10	13

(a). Includes an unidentified cormorant breeding at Maringup.

Table 4. The 11 wetlands ranked in decreasing order of number of species found breeding (including old nests) in any survey.

wetland	*number of waterbird species found breeding*			*rank*
	before 10/92	*extras, 10/92*	*new total*	
Powell	12	1	13	1
Saide	7	3	10	2
Owingup	7	2	9	3
Jasper	6	0	6	4
Davies	3	1	4	= 5
Boat Harbour 2	2	2	4	= 5
Yeagarup	2	1	3	7
Gardner	2	0	2	= 8
Maringup	2	0	2	= 8
Un-named	0	1	1	10
Boat Harbour 1	0	0	0	11

Sources: Jaensch (1992a), Jaensch (1992b), Table 2 above.

Note. Of the 16 other wetlands surveyed in summer 1991-2, only two supported more than one breeding species: Devil's Pool (2 species) and Quitjup Lake (2).

Table 5. Number of spring 1992 (new, active, recently used) nests found in each wetland vegetation community in which nests were found.

waterbird species	*wetland vegetation community* (a)			
	TS	*LS*	*CF*	*BH*
AuGb		2		
Dart			2	
GreC			10	
LiBC			10	
Swan	3			
PaBD		1	1	
MusD	1			2
SpCk	1			
PuSn	4			
total nests:	9	3	23	2
total species:	4	2	4	1

(a) TS = Tall Sedges (*Typha orientalis, Baumea articulata*; often over *B. vaginalis*).
LS = Low Sedges (*Juncus kraussii, B. vaginalis*).
CF = Cedar Dense Low Forest (*Agonis juniperina*, with some *Melaleuca rhaphiophylla, Eucalyptus* spp.).
BH = *Beaufortia* Heath (*Beaufortia* and *Melaleuca* spp.).

Note. Other communities occur but no active/recent nests were found in them in spring 1992.

APPENDIX 1

List of waterbird species mentioned in the report.

English name	*scientific name*	*code*
Great Crested Grebe	*Podiceps cristatus*	GCGb
Hoary-headed Grebe	*Poliocephalus poliocephalus*	HhGb
Australasian Grebe	*Tachybaptus novaehollandiae*	AuGb
Australian Pelican	*Pelecanus conspicillatus*	APel
Darter	*Anhinga melanogaster*	Dart
Great Cormorant	*Phalacrocorax carbo*	GreC
Little Black Cormorant	*Phalacrocorax sulcirostris*	LiBC
White-faced Heron	*Ardea novaehollandiae*	WfHn
Rufous Night Heron	*Nycticorax caledonicus*	RNHn
Black Bittern	*Dupetor flavicollis*	BlaB
Little Bittern	*Ixobrychus minutus*	LitB
Australasian Bittern	*Botaurus poiciloptilus*	AusB
Sacred (White) Ibis	*Threskiornis molucca*	SacI
Black Swan	*Cygnus atratus*	Swan
Australian Shelduck	*Tadorna tadornoides*	Shel
Pacific Black Duck	*Anas superciliosa*	PaBD
Grey Teal	*Anas gracilis*	GyTl
Australasian Shoveler	*Anas rhynchotis*	Shov
Hardhead	*Aythya australis*	Hard
Maned Duck	*Chenonetta jubata*	ManD
Blue-billed Duck	*Oxyura australis*	BbiD
Musk Duck	*Biziura lobata*	MusD
Marsh Harrier	*Circus aeruginosus*	MaHa
Lewin's Rail	*Rallus pectoralis*	LewR
Buff-banded Rail	*Rallus philippensis*	BbaR
Baillon's Crake	*Porzana pusilla*	BaCk
Spotless Crake	*Porzana tabuensis*	SpCk
Purple Swamphen	*Porphyrio porphyrio*	PuSn
Eurasian Coot	*Fulica atra*	Coot
Black-fronted Plover	*Charadrius melanops*	BfoP
Black-winged Stilt	*Himantopus himantopus*	BwSt
Silver Gull	*Larus novaehollandiae*	SiGl
Clamorous Reed-Warbler	*Acrocephalus stentoreus*	CReW
Little Grassbird	*Megalurus gramineus*	LiGd

APPENDIX 2

Datasheets, maps and photographs from the spring 1992 surveys.

Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE DAVIES

WETLAND DETAILS

Lat: 34°13'S. Long: 115°02'E. Shire: Augusta - Margaret R.

Land Status: within Leeuwin-Naturaliste National Park.

CALM Region: Central Forest. District: Busselton.
Forestry Sheet (1:50 000): Boranup.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):

LS = Low Sedges. (given as TS = Tall Sedges on Robinson's maps but effectively LS for waterbird usage).
OW = Open Water.

SURVEY DETAILS

Date: 9/10/92 Depth: .37 on gauge (= 4.37$_m$?) Salinity 1.5 ppt
Fringing vegetation was flooded extensively.

Effort: waded through LS around most of lake perimeter.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
AuGb	4	2			OW, LS*.
PaBD	4			1	OW, LS*.
SiGl	2				OW.
Totals:	10	2		1	(including data on other sheets? NO)

species (now/~~earlier~~) = 3, breeding spp (now/earlier) = 1/1 extra.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: SpCk, LiGd.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
AuGb	new	nil	LS	0.5m	Juncus kraussii.
PaBD	old	eggshells	LS	<0.3m	J. kraussii & Baumea vaginalis.

Other notes on species: Grebe nests were fresh, probably ready for laying in. Duck nest was concealed under collapsed sedges half-way between open water edge and dry land.

Fishes caught in baited box traps:
Pseudogobius olorum (common).

Other fauna:
marron (1).

See also report on frogs.

ACCESS NOTES

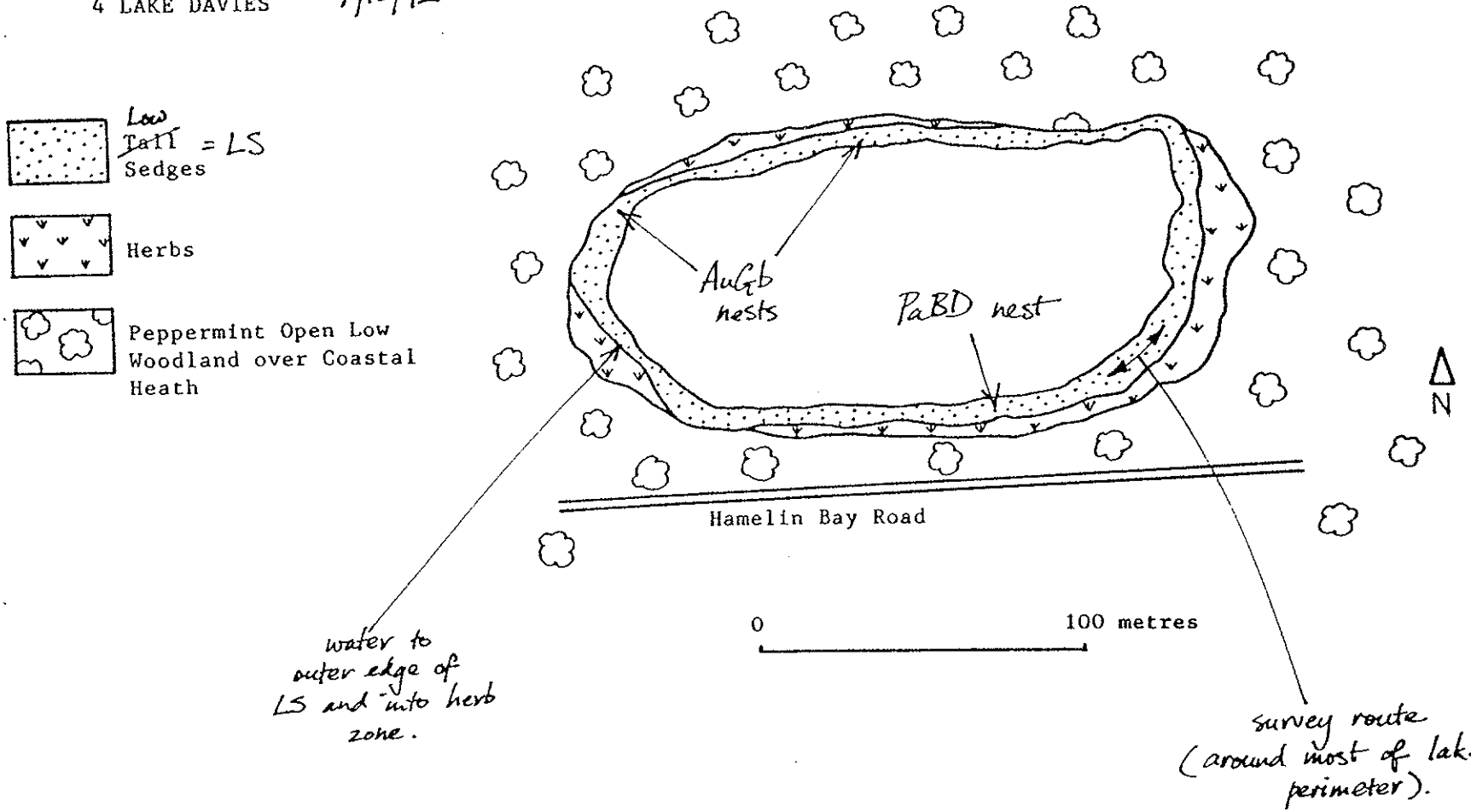
—

MANAGEMENT CONSIDERATIONS

—

Notes cont'd

4 LAKE DAVIES 9/10/92



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE JASPER

WETLAND DETAILS

Lat: 34°24' S. Long: 115°41' E. Shire: Nannup.

Land Status: within D'Entrecasteaux National Park.

CALM Region: Central Forest District: Nannup.
Forestry Sheet (1:50 000): Jasper.

Wetland Vegetation Communities (WVCs)(C.J.Robinson):
TS = Tall Sedges; LS = Low Sedges; AF = Agonis floribunda (Thicket) Heath, over tall sedges; CF = Cedar Dense Low Forest; OW = Open Water.

SURVEY DETAILS

Date: 8-9/10/92 Depth: full (up ca. 10 cm from 12/91). Salinity 0.19 ppt
Fringing vegetation was flooded extensively.

Effort: intensive searching for nests in AF/TS/CF in NW, including areas not searched in previous visits (1991), also in LS/CF in largest swamp on S side of lake; brief searches in TS at several other sites. Dusk, night and early morning listening for calling bitterns.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
LiBC	2				OW.
LitB	2			2	AF*/CF, TS.
Swan	8				OW.
PaBD	2				TS.
MusD	12		2		OW, AF, TS.
MaHa	1				OW overhead.
SpCk	2				TS.
PuSn	2				TS.
SiGl	2				OW.
LiGd	5				TS.
Totals:	41		2	10	(including data on other sheets? YES)

species (now/~~earlier~~) = 11, breeding spp (now/earlier) = 1/2 extra.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: —
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
LitB	old	nil	AF	1.0+m	Agonis floribunda with low sedges (Baumea vaginalis).
LitB	old	nil	AF	1.0+m	

NOTE: these were the 2 nests found in summer 1991-2; they were in much deteriorated condition now, in spring 1992. Also, a possible 3rd nest was found in shrub thicket to W — also old

CReW x 8	old	nil	AF	1.0+m	Agonis floribunda.

NOTE: most if not all were the same nests found in summer 1991-2.

MusD: NOTE: chicks were only a few weeks old.

Other notes on species: Little Bitterns were induced to call in response to imitations of the Advertising Call made by the observers; time was 6:45pm for first bird, 7:15pm for second bird (see map). Conditions that evening (8/10) were ideal for hearing Australasian Bittern, but none heard.

Fishes caught in baited box traps or scooped from shallows: Pseudogobius olorum (3), Edelia vittata (74), Galaxias occidentalis (24), Bostockia porosa (5). All were present in TS & flooded Banksia woodland over LS, at edge of largest swamp on S side of lake.

ACCESS NOTES

Track to middle SW side of lake was under up to 0.5m of water for several hundred metres. Boat ramp at picnic area was completely under water, but approaches were usable.

MANAGEMENT CONSIDERATIONS

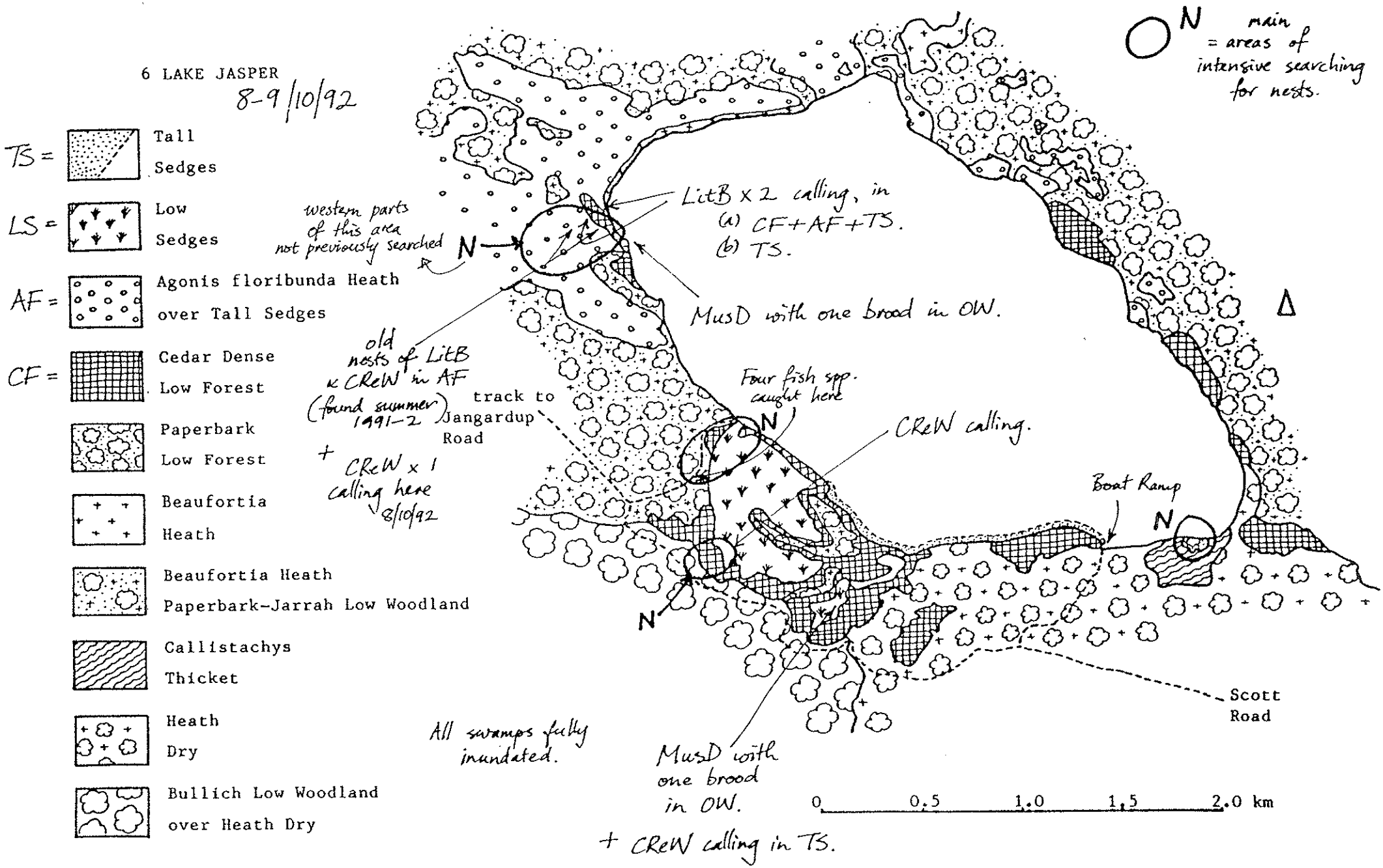
EFFORT: Approx. 10 man-hours spent searching for nests in TS, LS & AF habitats. Water depths up to 1.5m made wading difficult and prevented access to best area for nests in summer 1991-2. Suspect we were too early for breeding by some species — water levels may not have peaked yet or had only just peaked recently.

Notes cont'd

ADDITIONAL WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
CREW	3			8	TS, AF*

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species


6 LAKE JASPER
8-9/10/92
TS = Tall Sedges
LS = Low Sedges
AF = Agonis floribunda Heath over Tall Sedges
CF = Cedar Dense Low Forest
Paperbark Low Forest
Beaufortia Heath
Beaufortia Heath Paperbark-Jarrah Low Woodland
Callistachys Thicket
Heath Dry
Bullich Low Woodland over Heath Dry
N = main areas of intensive searching for nests.
western parts of this area not previously searched
LitB x 2 calling, in (a) CF+AF+TS. (b) TS.
MusD with one brood in OW.
old nests of LitB & CReW in AF (found summer 1991–2)
+ CReW x 1 calling here 8/10/92
track to Jangardup Road
Four fish spp. caught here
CReW calling.
Boat Ramp
Scott Road
All swamps fully inundated.
MusD with one brood in OW.
+ CReW calling in TS.
0 0.5 1.0 1.5 2.0 km

Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE YEAGARUP

WETLAND DETAILS

Lat: 34° 32' S. Long: 115° 53' E. Shire: Manjimup.

Land Status: within State Forest (Charley Block).

CALM Region: Southern Forest. District: Pemberton.
Forestry Sheet (1:50 000): Warren.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, CF = Cedar Dense Low Forest, LS = Low Sedges,
AL = Agonis linearifolia Thicket, OW = Open Water.

SURVEY DETAILS

Date: 7/10/92 Depth: (full). Salinity 0·10 ppt
Fringing vegetation was flooded extensively.

Effort: intensive searching for nests in AL, TS & LS in eastern and especially SE part of lake; some of this area not investigated previously (dry in summer 1991-2).

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
PaBD	2				OW.
[SpCk	Ø			2	AL*.]
[CReW	Ø			1	AL*.]
[LiGd	Ø			1	AL*.]

Totals: 2 ____ ____ 4 (including data on other sheets? NO)
species (now/earlier) = 1/3 extra, breeding spp (now/earlier) = Ø/3 extra.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: SpCk*, LiGd*, BbaR, ? LitB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
SpCk x 2	old	nil	AL	~0.3m	Agonis linearifolia with fine sedges e.g. Lepidosperma spp.
CReW	old	nil	AL	~0.3m	" " "
LiGd	old	nil	AL	~0.4m	" " "

NOTE: The 2 crake nests were found in summer 1991-2.
The LiGd nest also was " " " " " .
The CReW nest, which comprised 2 nests placed on top of each other, had not been found previously.

Other notes on species: Thickets to 3m high over fine sedges and water 0.3-0.5m deep, near dryland SE side of the wetland, looked good for LitB nests but none found. Tried imitations of calls but no response. (→ at dusk)

Larger patches of LS may be suitable for AusB feeding.

ACCESS NOTES

Zonation of wetland vegetation communities in SE of lake is as follows: from open water of lake, TS (several m wide), LS (several to 20m wide), AL (thicket or patchily, 10-20m wide), LS (with some TS; 5-20m wide), and a thicket against dryland side (?AL or similar; 3-10m wide).

MANAGEMENT CONSIDERATIONS

Water in 10/92 was up to 0.5m deep in LS near lake, shallowing to a few cm over clumpy substrate of AL zone, deepening to >0.5m in outer LS zone.

No nests found in outer parts of this area despite thick cover and plenty of water. A surprising result.

Notes cont'd

Fishes caught in baited box traps: Galaxias occidentalis[1], Edelia vittata[3]; also 13 marron.

9 LAKE YEAGARUP
10 NAENUP SWAMP
11 UNNAMED LAKE

7/10/92

TS Tall Sedges

LS Low Sedges

Beaufortia Heath

CF Cedar Dense Low Forest

Paperbark Low Woodland

Banksia Low Woodland

Heath Coastal

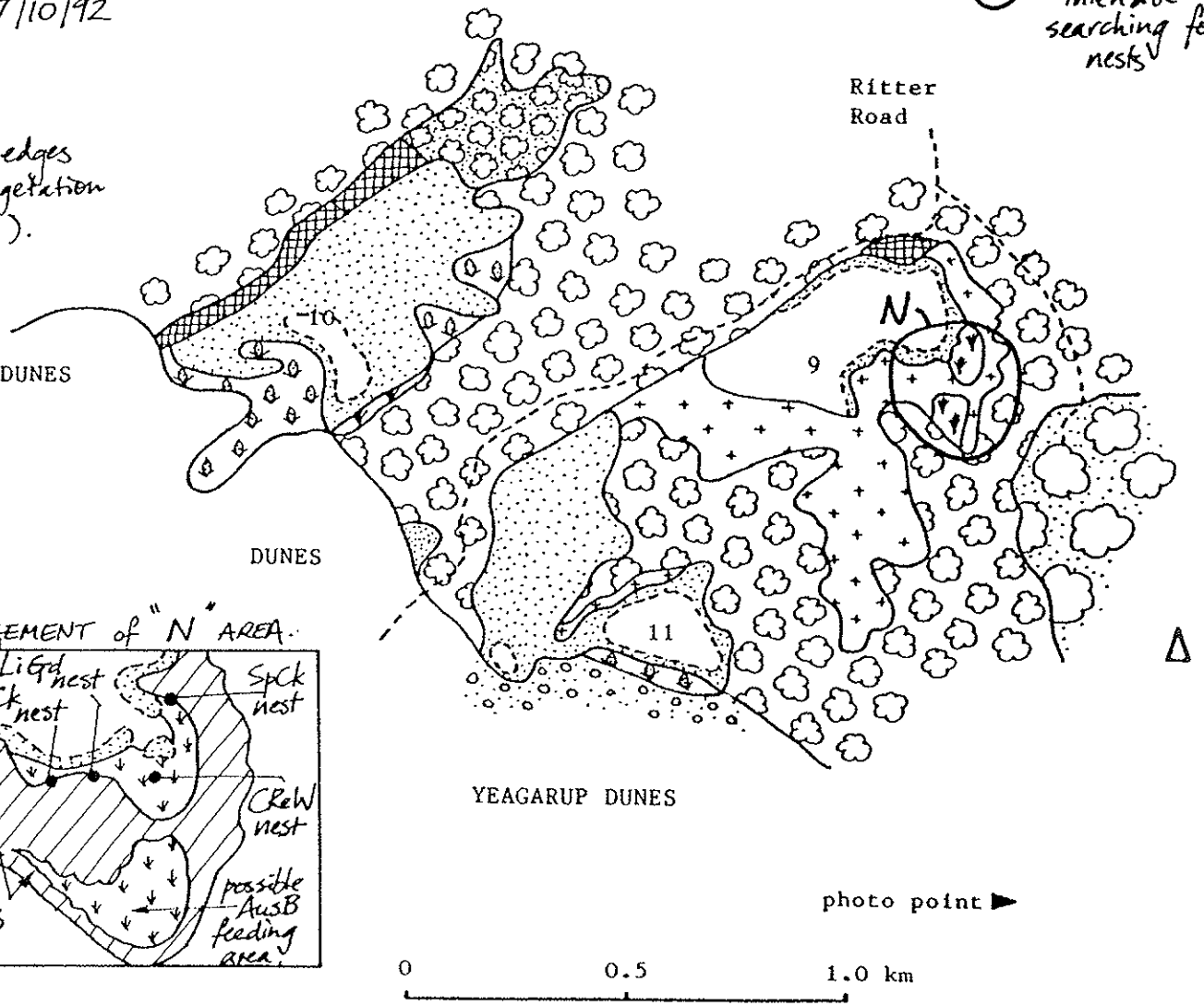
Jarrah Low Woodland over Heath

Karri Forest

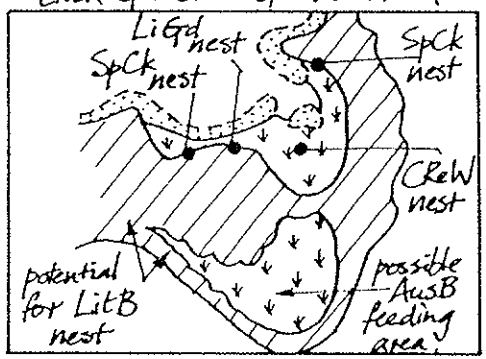
AL = Agonis linearifolia thicket (within area marked as Beaufortia heath).

water to outer edges of swamp vegetation (lake full).

N = area of intensive searching for nests



ENLARGEMENT of "N" AREA.



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE UN-NAMED

WETLAND DETAILS

Lat: 34°33' S. Long: 115°52' E. Shire: Manjimup.

Land Status: within State Forest (Charley Block).

CALM Region: Southern Forest. District: Pemberton.
Forestry Sheet (1:50 000): Warren.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, LS = Low Sedges, OW = Open Water.
Areas of Banksia littoralis saplings occur within the LS.

SURVEY DETAILS

Date: 7/10/92 Depth: (full). Salinity 0.12 ppt
Fringing vegetation was flooded extensively.

Effort: searched for nests in N half of W part of the wetland, i.e. in broad area of mixed TS & LS and scattered Banksias.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
PaBD	2				OW.
PuSw	1				TS.
LiGd	1			1	TS.*
Totals:	4			1	(including data on other sheets? NO)

species (now/~~earlier~~) = 3 , breeding spp (now/earlier) = 0/1 extra.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: SpCk*, BbaR*, MusD, AusB.
(* possibly breeding now) Habitat looks suitable for Lewin's Rail.

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
LiGd	old	nil	TS	0.5m	Baumea articulata with B. vaginalis.

Other notes on species: The sedgeland is probably extensive enough to support resident Aust. Bitterns. We listened at dusk for calling birds, in good weather conditions, but none heard. This very interesting swamp deserves further waterbird surveys, though "rewards" are likely to be few due to dense vegetation.

ACCESS NOTES

Wading in this swamp is extremely hazardous! Channels and holes of deeper water occur though it is possible to recognise many of them. The peaty mat on which the TS/CS occurs is firm in places but soft elsewhere. Patches of Baumea articulata tend to be in deeper water — avoid!

MANAGEMENT CONSIDERATIONS

Interesting mounds of mosses occur, e.g. at edges of main sedge areas, where tussocks of Gahnia trifida begin.

Notes cont'd

9 LAKE YEAGARUP
10 NAENUP SWAMP
11 UNNAMED LAKE

7/10/92

TS Tall Sedges

LS Low Sedges

Beaufortia Heath

Cedar Dense Low Forest

Paperbark Low Woodland

Banksia Low Woodland

Heath Coastal

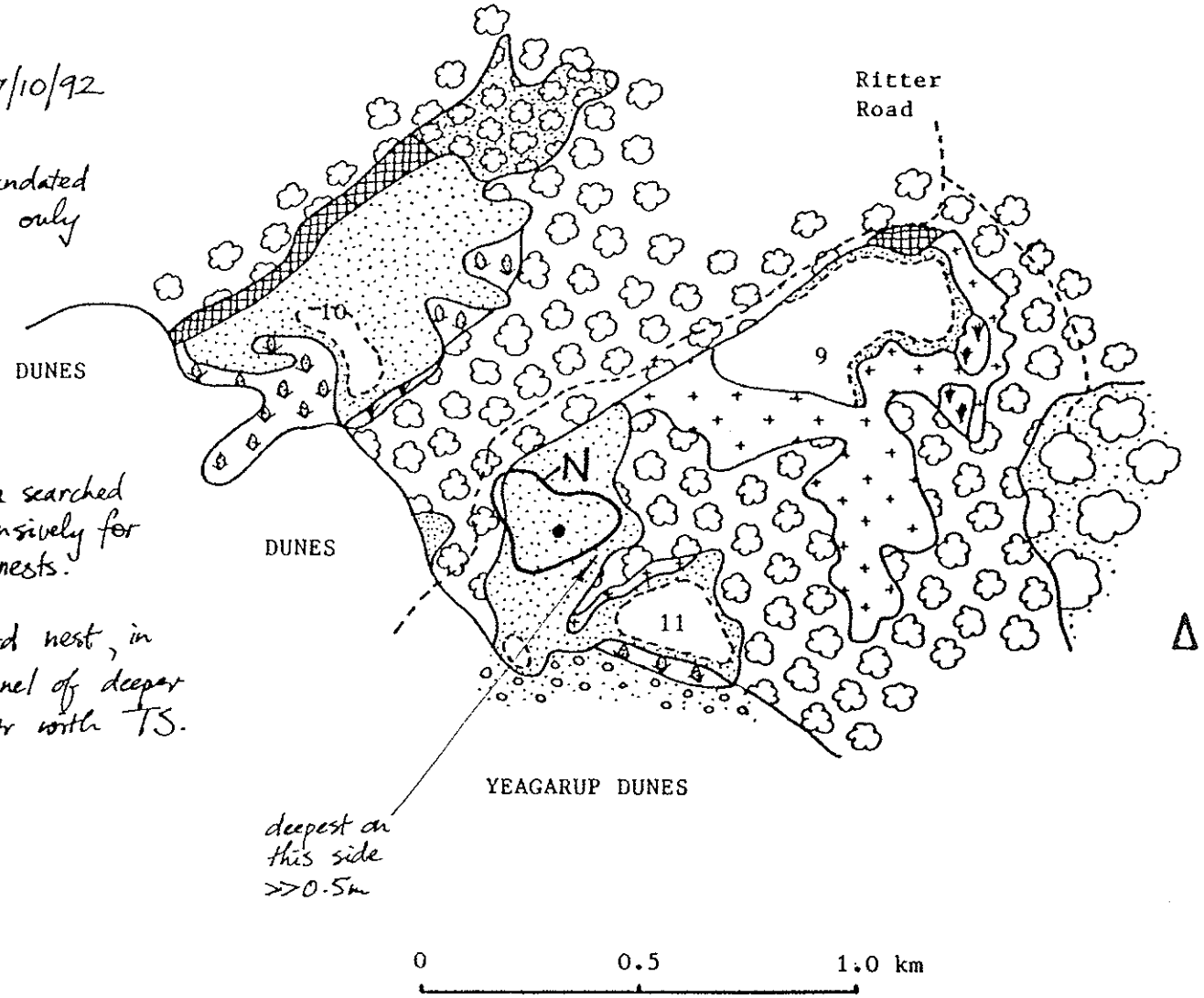
Jarrah Low Woodland over Heath

Karri Forest

whole swamp inundated though some parts only shallow (<0.1m), espec. in W & N of swamp.

N = area searched intensively for nests.

• = LiGd nest, in channel of deeper water with TS.



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE GARDNER R. LAKE

WETLAND DETAILS

Lat: 34°50' S. Long: 116°06' E. Shire: Manjimup.

Land Status: within D'Entrecasteaux National Park.

CALM Region: Southern Forest. District: Pemberton.
Forestry Sheet (1:50 000): Broke Inlet.

Wetland Vegetation Communities (WVCs)(C.J.Robinson):
TS = Tall Sedges, CF = Cedar Dense Low Forest, AF = Agonis floribunda (Thicket) Heath over tall sedges, OW = Open Water. LS = Low Sedges.

SURVEY DETAILS

Date: 6-7/10/92. Depth: (full). ~1.25m Salinity 0.15 ppt
Fringing vegetation was flooded extensively.

Effort: used a boat to gain access to several points along "channel" part of lake, where searched intensively for nests in TS, and CF or AF over LS or TS. Also explored large NE basin by boat. Listened for bitterns at night.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
GreC	20	10		10	CF*
MusD	1				OW.
[CReW	Ø			1	AF*.]
Totals:	21	10		11	(including data on other sheets? NO)

species (now/earlier) = 2/1 extra, breeding spp (now/earlier) = 1/1 extra.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: CReW, LiGd, SpCk, ? LitB, ?? BlaB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

	waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
a.	GreC x 10	active	large young	CF	~1.0m	understorey/edge paperbarks
b.	GreC x 5	old	nil	CF	~1.0m	Melaleuca
c.	GreC x 5	old	nil	CF	~0.5m	rhaphiophylla overhanging open water.
d.	CReW	old	nil	AF	~0.3m	→ Agonis floribunda over tall sedges e.g. Baumea spp.

NOTE: existence of a. b. and d. was known from summer 1991-2 surveys. The "new" GreC nests (c.) were in a previously unexplored area — see map.

Other notes on species:
Habitat appears suitable for occurrence and breeding by LitB and SpCk (latter was present 12/91) and possibly BlaB (channels through CF to NE part of wetland). Cormorant nests were not closely investigated due to threat of disturbance.

ACCESS NOTES

At this time of year, a flat-bottom punt can be motored into the NE basin without great difficulty, via the obvious channel.

MANAGEMENT CONSIDERATIONS

Fishes caught in baited traps in the lake: Edelia vittata (4).
Fishes caught in baited traps in wet heath (water to 30 cm deep): Galaxiella nigrostriata (7).
Other fauna caught: marron (1), gilgie (13), koonac (8).
↖ lake ↗ ↑ wet heath

Notes cont'd

15 GARDNER RIVER LAKES 6-7/10/92

TS Tall Sedges

AF Agonis floribunda Heath over Tall Sedges

CF Cedar Dense Low Forest

Beaufortia Heath

Heath Dry

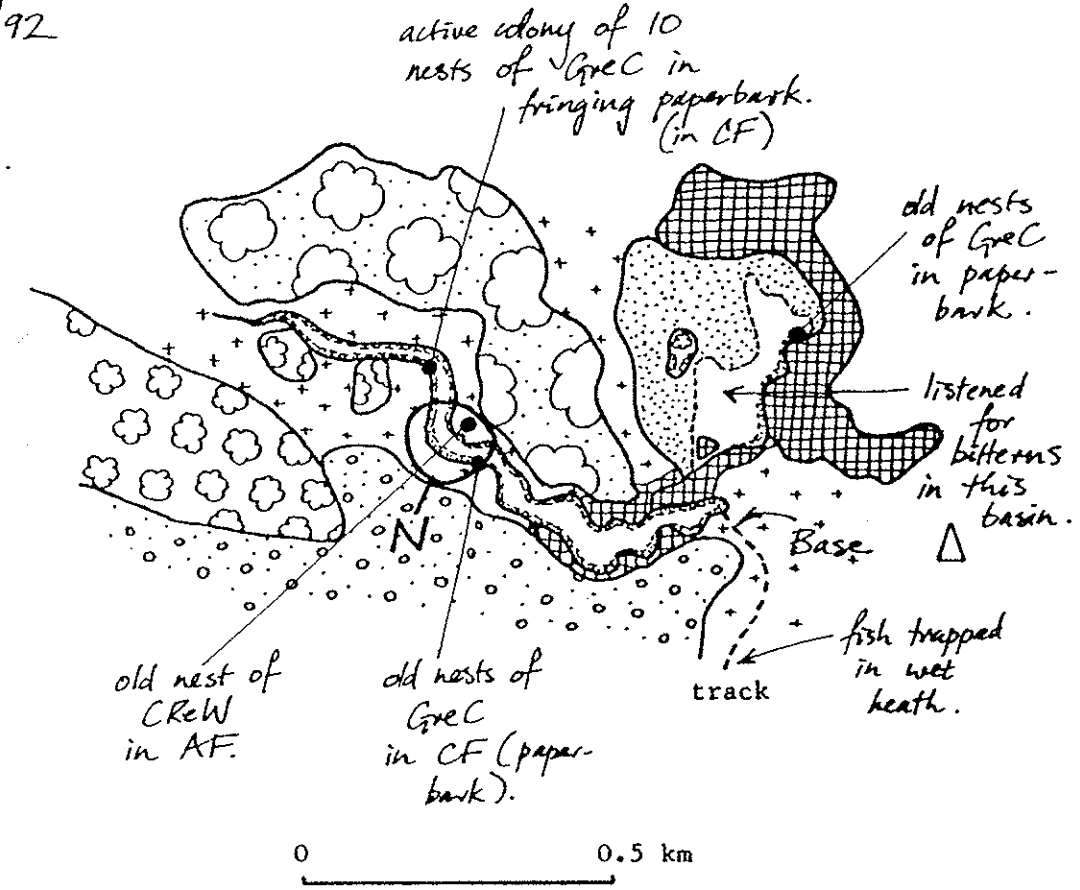
Marri Low Woodland

Karri Forest

water levels high – to outer edge of wetland vegetation.

N = area of intensive nest searching.

- listened for LitB (and imitated calls) between Base and western most cormorant colony.



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE MARINGUP

WETLAND DETAILS

Lat: 34°50' S. Long: 116°12' E. Shire: Manjimup.

Land Status: within D'Entrecasteaux National Park.

CALM Region: Southern Forest. District: Pemberton.
Forestry Sheet (1:50 000): Broke Inlet.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, CF = Cedar Dense Low Forest, OW = Open Water, LS = Low Sedges.

SURVEY DETAILS

Date: 5-6/10/92 Depth: (full) 3.5m near SW shore (up 30+cm from 12/91 level). Salinity 0.2 / ppt
Fringing vegetation was flooded extensively.

Effort: 5/10 boated around lake perimeter in afternoon and evening, stopping (after sunset) to listen for Little Bitterns and mimic their calls to induce calling; also listened for Aust. Bittern at E end; on 6/10, searched for nests in TS in NE, E, SE.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
Dart	2			2	CF*
GreC	1				OW.
PaBD	1				OW.
MusD	5				OW.
Matta	2				TS.
SpCk	2				TS, CF.
PuSn	5				TS.
Totals:	18			2	(including data on other sheets? NO)

species (now/~~earlier~~) = 7, breeding spp (now/earlier) = 0/1.

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: ? LitB, ?? AusB, CReW.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
Dart x 2	old	nil	CF	>1.0m	Agonis juniperina

NOTE: These nests were found in summer 1991-2 surveys and one was active then.

Other notes on species: Weather was bleak at times but was still and fine for the evening/night listening-surveys for calling bitterns — calls would have carried well. Habitat at E end certainly looks suitable for AusB; less certain of suitability of thickets/TS for LitB but TS possible.

ACCESS NOTES

Fishes caught in baited box traps:
- Galaxias occidentalis (3).
- Atherinosoma wallacei (2): with salmon-pink lateral stripes.
- Edelia vittata (3).
- Pseudogobius olorum (2).

Also gilgies (35).

MANAGEMENT CONSIDERATIONS

At this time of year water was high enough to permit boating deep into E part of the wetland, via channels & open areas in TS. Nests were searched for in tallest, thickest clumps of Baumea articulata at the edge of open water. Often there was little by way of tall B. articulata beyond the edges — mostly uniform LS in the "interior" of the swamps.

Notes cont'd

16 LAKE MARINGUP

5-6/10/92

waterlevel up 30-40 cm from 12/91 and all fringing vegetation inundated.

TS Tall Sedges

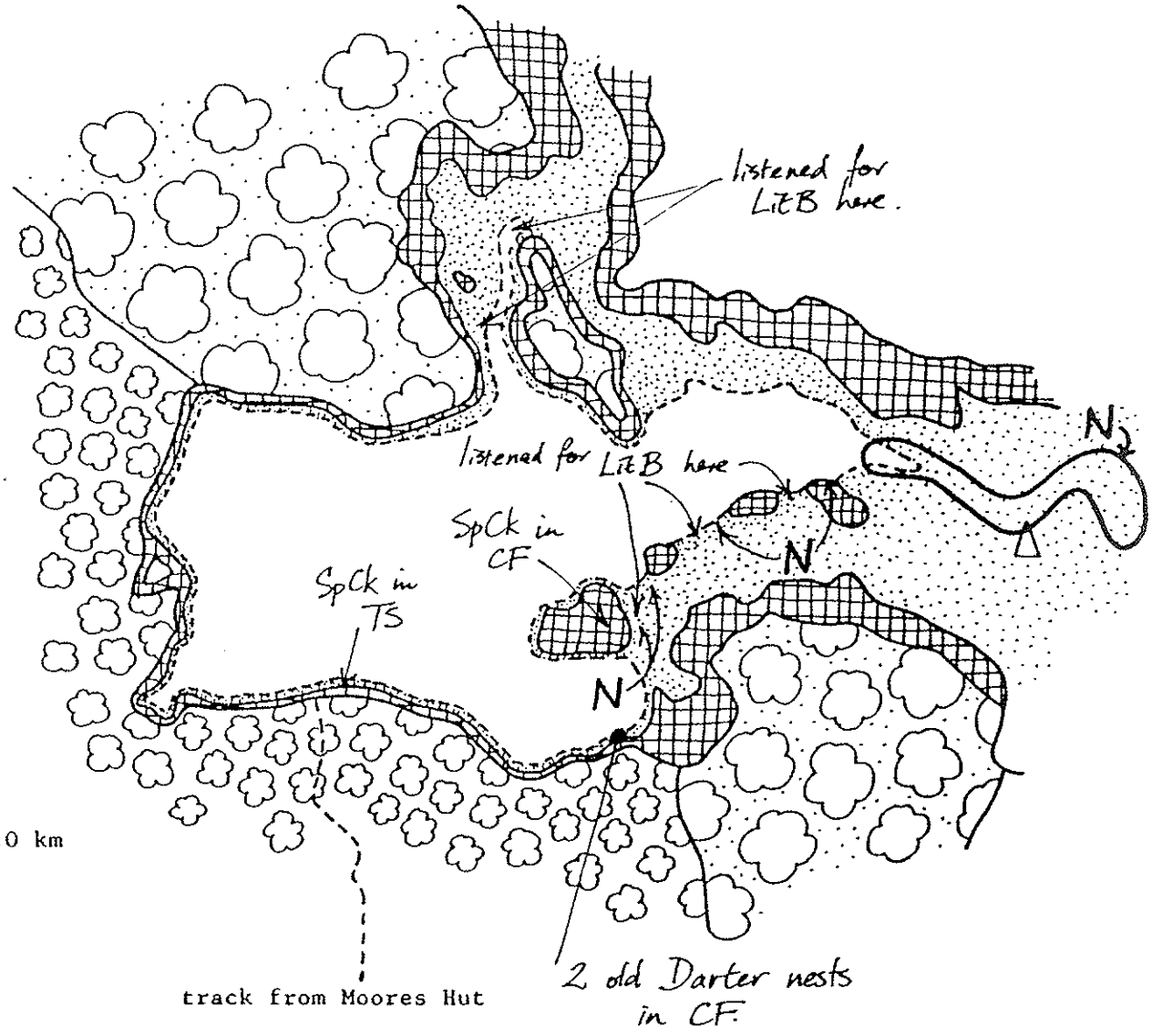
CF Cedar Dense Low Forest

Peppermint Low Woodland over Heath

Karri Forest

LS = Low Sedges (in areas marked as TS).

N O = areas searched intensively for nests (boat access).



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE OWINGUP SWAMP

WETLAND DETAILS

Lat: 35°00' S. Long: 117°04' E. Shire: Denmark.

Land Status: within Quarrum Nature Reserve.

CALM Region: South Coast. District: Albany.
Forestry Sheet (1:50 000): Denmark.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, LS = Low Sedges, CF = Cedar Dense Low Forest,
OW = Open Water, BH = Heath, dominated by Beaufortia & Melaleuca spp.

SURVEY DETAILS

Date: 13-14/10/92 Depth: (full) At least 20cm above 12/91 level. Salinity 0.36 ppt
Fringing vegetation was flooded extensively (to outer edge of wetland basin)

Effort: used boat to gain access to all parts of open water, where listened for calling bitterns both in late part of afternoon and in early morning. Also took boat up Kent River about 2 km to oxbow, and searched intensively for nests in TS & shrubland on SE & E side of lake.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
Dart	6	2			CF*, OW: lake & river.
LiBC	20	10			CF*, OW: lake & river.
SacI	50				overhead.
Swan	6				OW: lake.
Shel	50				OW: lake.
PaBD	70				OW: lake & river.
ManD	2				OW: river.
BbiD	6				OW: lake.
MusD	4	1		1	BH*, OW: lake.
Malla	4				over TS.
Totals:	238	15		1	(including data on other sheets? YES)

species (now/~~earlier~~) = 12, breeding spp (now/~~earlier~~) = 4

ADDITIONAL WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
SpCk	3				Callistachys thicket.
PuSn	2	2			TS.*
LiGd	10				TS.
CReW	5				TS.

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: ? LitB, AusB, BbaR, BlaB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
Dart	active	5 eggs	"CF"	several metres (river channel)	Eucalyptus spp. (? marri) hanging over edge of river upstream of lake.
Dart	active	♀ sitting	"CF"		
LiBC x 10	active	medium-large young	"CF"		
MusD	active	1 egg	BH	0.3m	Melaleuca shrub ⊕
MusD	recently finished use	nil	BH	0.4m	M. rhaphiophylla shrub. ⊙
PuSn	ready to use	nil	TS	0.5m	Baumea articulata
PuSn	almost ready to use	nil	TS	0.5m	" "

NOTES: ⊕ shrub was mixed with smaller shrub & various fine sedges; the MusD egg was warm and a calling male was in OW about 15-20m away. ⊙ This nest used earlier in spring (some down in nest).

Other notes on species:
Flushed a possible Black Bittern from thick forest of Agonis juniperina and eucalypts near water edge in ox-bow (see map) on Kent R. Sighting was very brief and too late for binoculars. Ideal habitat.

ACCESS NOTES

TS may not be tall and dense enough for LitB although some of the flooded thickets of Melaleuca & Callistachys may be suitable for short-term use (too shallow for breeding? or not enough fine sedge underneath). No calls of LitB or AusB heard — conditions for listening were good.

MANAGEMENT CONSIDERATIONS

Fishes caught in baited traps:
Pseudogobius olorum (2) in TS.
Also Koonacs (2).

Notes cont'd

Inundated shrubland of Beaufortia, Melaleuca and fine low sedges had high potential for nests of crakes, especially Baillon's.

Marsh Harriers were giving display flights.

Two Swan & 10 Shel were in wing moult, on OW.

LiBC colony comprised 3 active nests in one tree & 7 in another tree, plus several old nests not counted.

19 OWINGUP SWAMP
13 – 14 / 10 / 92

TS Tall Sedges

CF Cedar Dense Low Forest

BH Beaufortia Heath

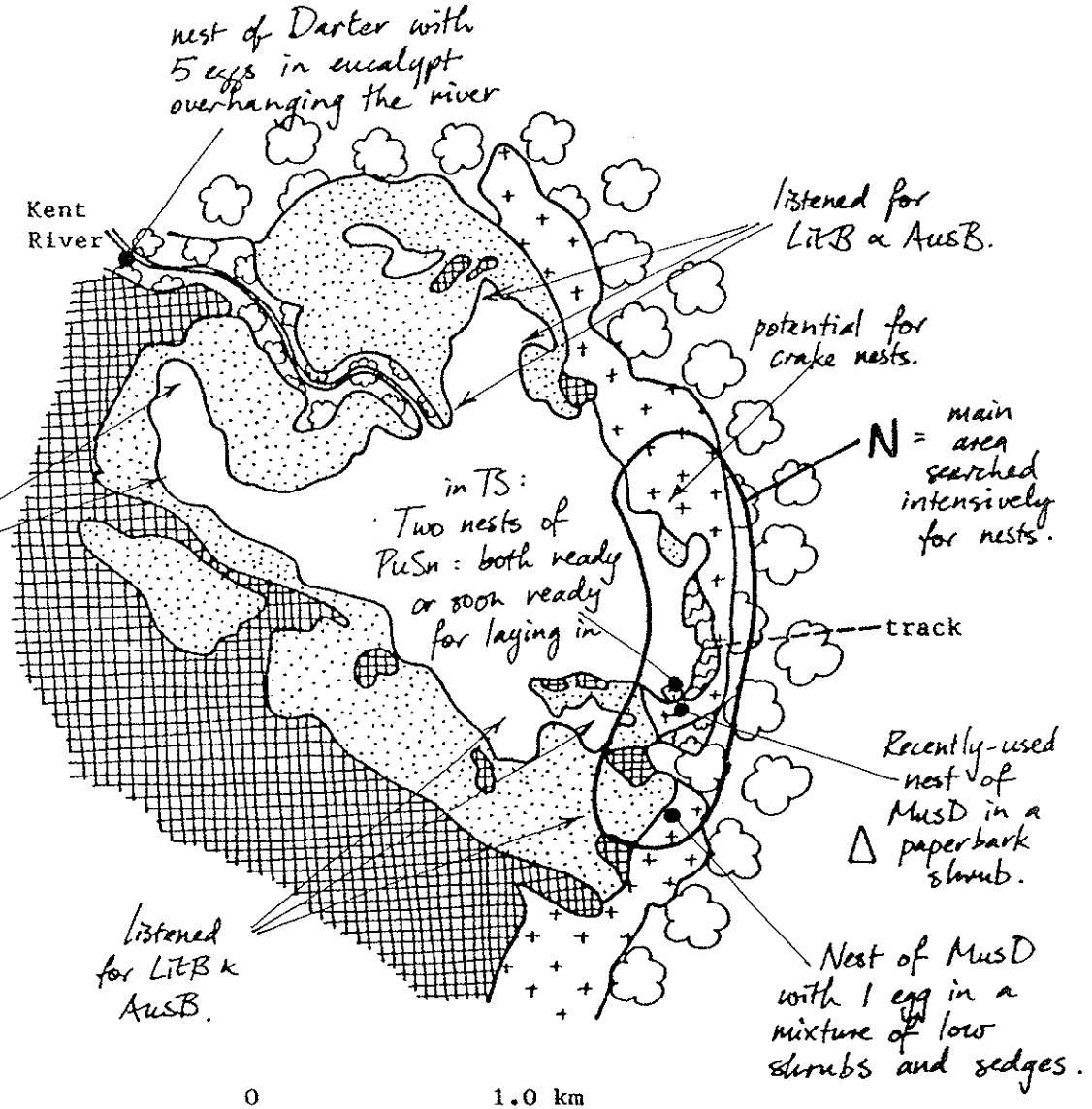
Callistachys Thicket

Paperbark Low Woodland

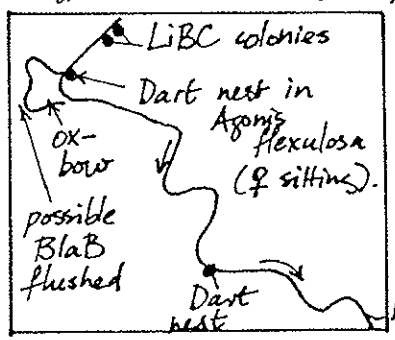
Jarrah Low Woodland over Heath

LS = Low Sedges

water to outer edge of basin & wetland vegetation, i.e. most of BH inundated, in places to 0.5m deep.



KENT RIVER UPSTREAM Δ (smaller scale)



Note: boat access into ox-bow may be impossible in a few months time due to fallen trees being exposed.

Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE BOAT HARBOUR LAKE 1 page 1 of 2

WETLAND DETAILS

Lat: 35° 01' S. Long: 117° 05' E. Shire: Denmark.

Land Status: within Quarrum Nature Reserve.

CALM Region: South Coast. District: Albany.
Forestry Sheet (1:50 000): Denmark.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, OW = Open Water. Also small areas of shrub thicket in far SW.

SURVEY DETAILS

Date: 12-13/10/92 Depth: (full). not measured. Salinity 0.45 ppt
Fringing vegetation was flooded extensively.

Effort: intensive search for nests in TS and shrub (Melaleuca) thicket at far S.W. of wetland; also listening for bitterns at various points on E side.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
SpCk	1				TS and shrub thicket.
PuSn	1				TS and shrub thicket.
Totals:	2				(including data on other sheets? NO)

species (now/~~earlier~~) = 2, breeding spp (now/~~earlier~~) = ϕ

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: LiGd, BbaR, AusB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
NONE FOUND					

Other notes on species:
Conditions were suitable for listening for bitterns calling but none heard. Shrub thickets with TS in them, in far S.W. of wetland, looked fairly suitable for LitB. Surprisingly these thickets had no nests of waterbirds.

ACCESS NOTES

Enter S.W. part of wetland from sandy rises to West.

MANAGEMENT CONSIDERATIONS

Fish caught in baited box traps:
Edelia vittata (23), *Pseudogobius olorum* (3); also gilgie (1), koonac (1).
Fish were abundant in creek running into NE side of lake, and were easily caught with scoop nets at road crossing:
Edelia vittata (300-400), *Nannatherina balstoni* (1), *Galaxias occidentalis* (23).

Notes cont'd

BOAT HARBOUR ROAD LAKES

20 LAKE 1
21 LAKE 2
22 LAKE 3

12-13/10/92.

Wetland full — to outer edges of basin.

Water 0.5m deep in S.W. part.

L = areas where listened for calling bitterns.

TS Tall Sedges

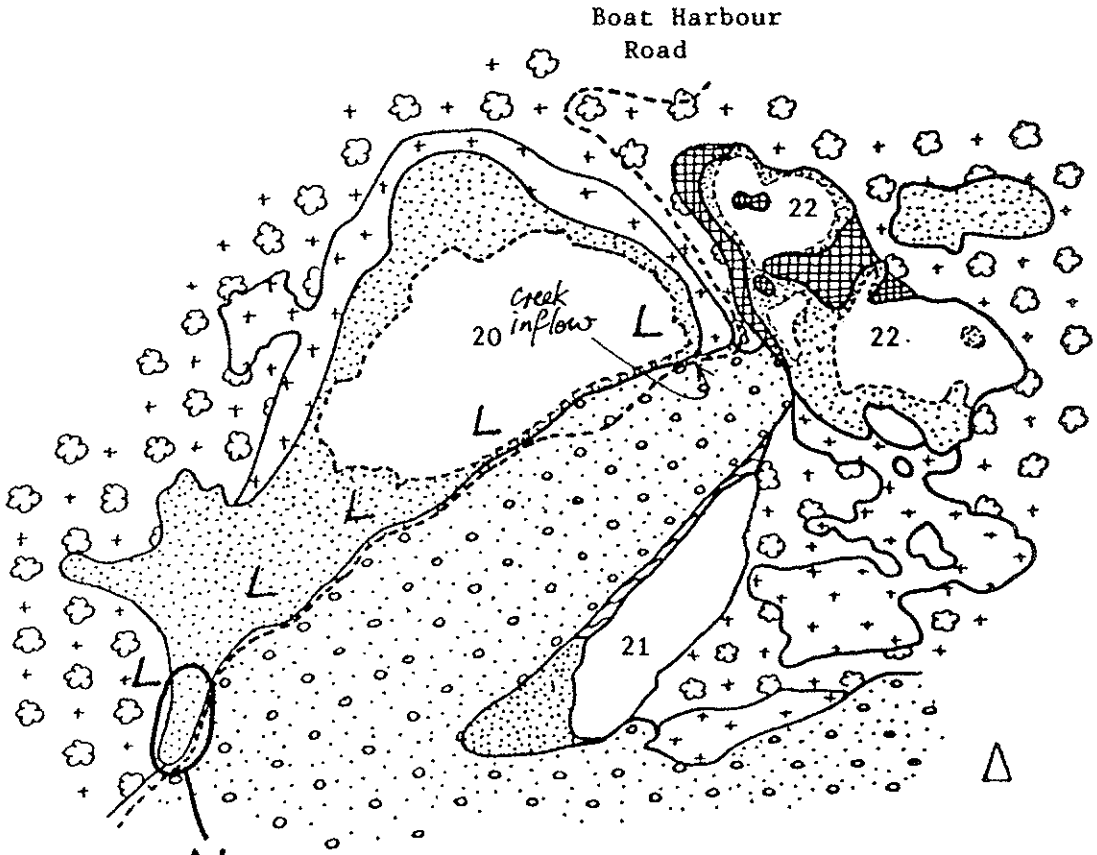
CF Cedar Dense Low Forest

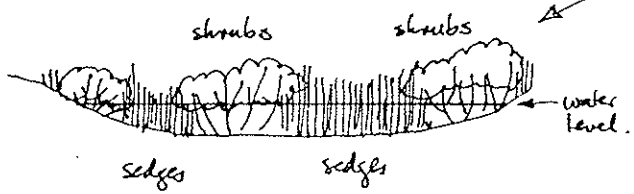
Callistachys Thicket

Beaufortia Heath

Heath Dry

Heath Coastal





Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE BOAT HARBOUR LAKE 2 page 1 of 2

WETLAND DETAILS

Lat: 35°01' S. Long: 117°06' E. Shire: Denmark.

Land Status: within Quarrum Nature Reserve.

CALM Region: South Coast. District: Albany.
Forestry Sheet (1:50 000): Denmark.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, OW = Open Water. Also small area of shrub thicket.

SURVEY DETAILS

Date: 12-13/10/92 Depth: (full). 0.5m near edges. Salinity 0.36 ppt
Fringing vegetation was flooded extensively.

Effort: intensive search for nests in TS (mixed with low sedges) and shrub thicket at S.E. side of swamp; also, listening for bitterns at night from ridge on S.W. side.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
Swan	6		1		OW.
MusD	2				OW.
Matta	1				over TS.
CReW	4				TS.
SpCk	2	1			TS*.
LiGd	1				TS.
Totals:	16	1	1	----	(including data on other sheets? NO)

species (now/~~earlier~~) = 6 , breeding spp (now/~~earlier~~) = 2

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: ?AusB, ??LitB, PuSn.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
SpCk*	new/ready	nil	TS	0.3m	Baumea articulata & B. vaginalis.

Other notes on species: Listened for LitB & AusB at night and morning from sand ridge overlooking SW. side of TS. Conditions good for hearing calls. LitB calls imitated but no response. Typha beds possibly too collapsed, not enough tall green growth yet?
Swan brood: at 6-8 weeks age approx.

ACCESS NOTES

Walked onto peaty substrate supporting low sedges in far SE — reasonably firm but not easy to avoid deeper channels. Low nest potential.

MANAGEMENT CONSIDERATIONS

Notes cont'd

BOAT HARBOUR ROAD LAKES

20 LAKE 1

21 LAKE 2

22 LAKE 3

12-13/10/92.

Water high: to outer edge of basin.

TS

Tall Sedges

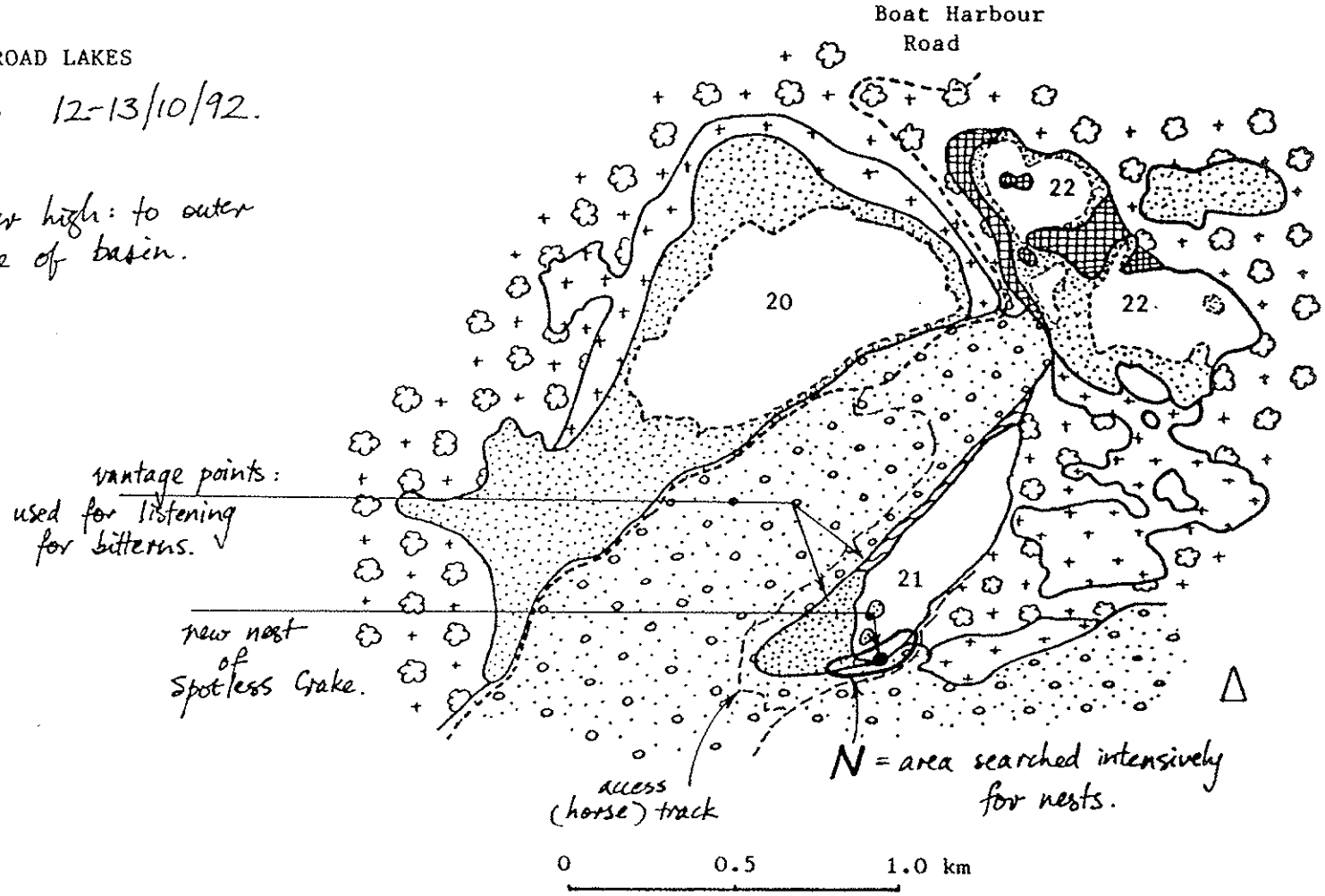
Cedar Dense Low Forest

Callistachys Thicket

Beaufortia Heath

Heath Dry

Heath Coastal



Waterbirds in Wetlands on the South Coast of Western Australia

SUMMARY DATASHEET

LAKE SAIDE

WETLAND DETAILS

Lat: 35°03′ S. Long: 117°28′ E. Shire: Albany.

Land Status: in reserves 20781 (Shire) and 17464 (un-vested).

CALM Region: South Coast. District: Albany.
Forestry Sheet (1:50 000): Denmark.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):

TS = Tall Sedges, CF = Cedar Dense Low Forest, OW = Open Water. Note: the CF includes areas of paperbark woodland (PW) and small patches of shrub thicket occur in the TS.

SURVEY DETAILS

Date: 14–15/10/92 Depth: most of basin inundated; 25 cm deeper than 12/91. Salinity 0.51 ppt
Fringing vegetation was flooded extensively.

Effort: intensive searches for nests in thickets and forest at W end of lake and in patches of TS at edge of OW, scattered around lake; also searching in E basin. Listened for calling bitterns at dusk & early a

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
LiBC	2				OW.
Swan	12		3		OW.
PaBD	20	1			PW (paperbarks)*, OW.
SacI	10				OW.
MaHa	4				overhead TS.
PuSn	7			3	TS*.
CReW	5+				TS.
WfTh	25				overhead.
MusD	6		1	1	TS*, OW.
Shov	2				TS, OW.
Totals:	121	1	4	4	(including data on other sheets? YES)

species (now/~~earlier~~) = 16, breeding spp (now/earlier) = 3/1 extra

ADDITIONAL WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
Hard	6				OW, TS.
BbiD	12				OW.
SpCk	5+				TS.
LiGd	3				TS.
RNHn	1				CF, overhead.
LitB	1				TS.

waterbird species | status of nest | contents | site (WVC) | water depth | main plant species

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: BbaR, ? AusB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
PaBD	active	10 eggs	PW	0.15m	Melaleuca rhaphiophylla.
PuSn	old	eggshells	TS	<0.2m	Typha orientalis
PuSn	old	nil	TS	~0.3m	
PuSn	old	nil	TS	~0.3m	
MusD	old*	eggshells	TS	~0.3m	

A number of old swan nest mounds were found as well.

(* probably was used this season.)

NOTE: PaBD nest was placed in low twiggy branches of a spreading paperbark tree within a thicket; access by bird flying/climbing in; lining of nest bowl was tissue-bark of paperbark. Bird sitting.

Other notes on species:

- Little Bittern was not heard until imitations of calls were given by the observers: several responses were given by the bird, from narrow part of swamp between E and W basins (see map).

ACCESS NOTES

- BbiD were in a fairly tight flock on OW in W basin.
- Potato fields to S of wetland were still shallow-flooded (water being pumped into lake!). At least 10 swan nest mounds on the field bunds and 7 sets of swan broods. About 60 ducks, a few herons in shallows.

MANAGEMENT CONSIDERATIONS

Fish caught in baited traps:
Galaxias occidentalis (2), Pseudogobius olorum (12), Gambusia affinis (abundant !!). Traps set in lake, E-end entry, outflow drain.

Notes cont'd

- Two PaBD were in moult.
- Matta were displaying in flight over the swamp (pre-breeding?).
- No AusB calls heard but habitat suitable.

25 LAKE SAIDE

14-15/10/92

TS Tall Sedges

CF Cedar Dense Low Thicket

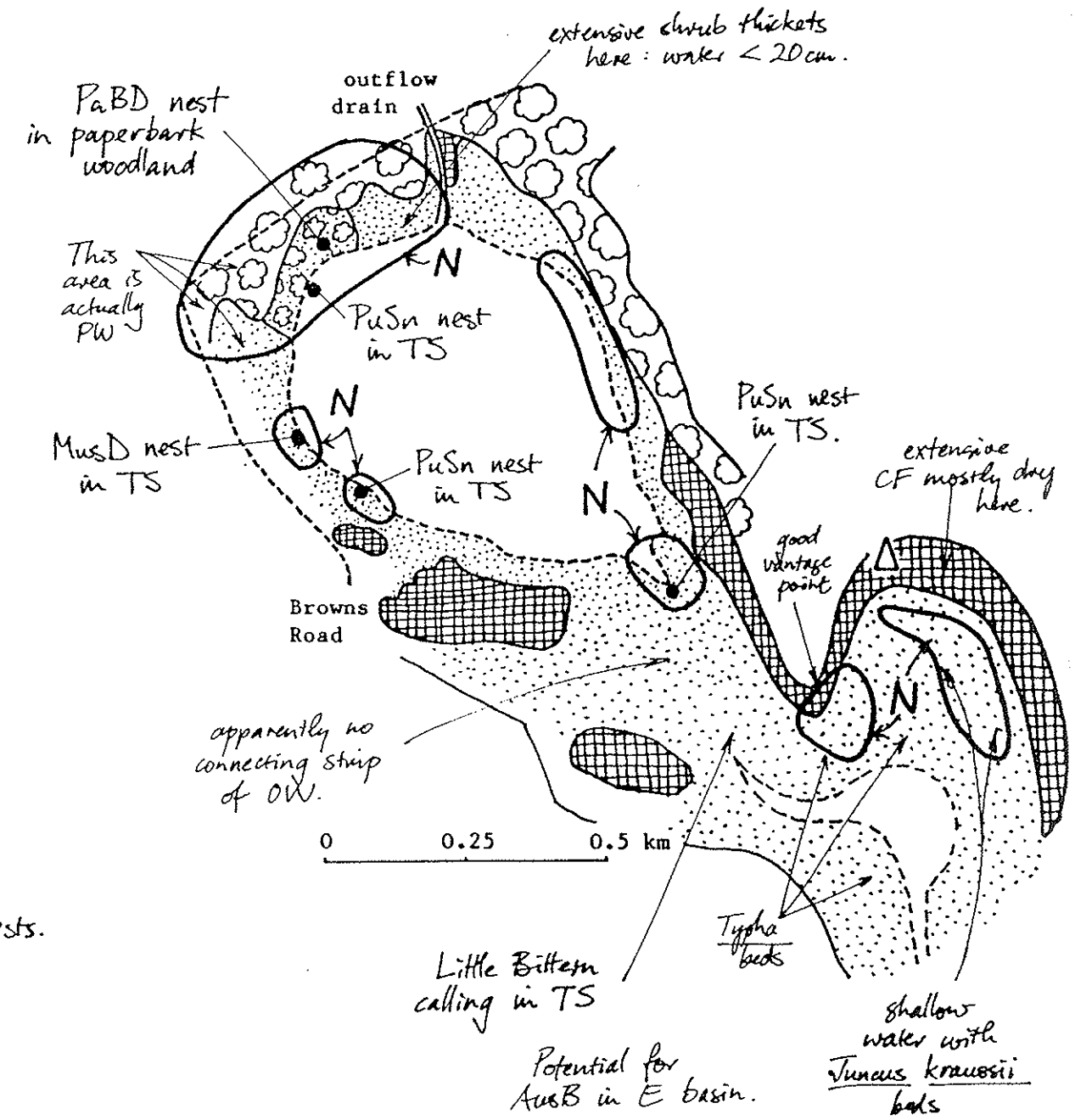
PW Paperbark Low Woodland

Marri-Yate Low Woodland over Heath

water extended through most of the TS and fringing PW/CF but was shallow at outer areas.

Typha beds (TS) only partly re-grown after winter collapse.

N = areas searched intensively for nests.



Waterbirds in Wetlands on the South Coast of Western Austral

SUMMARY DATASHEET

LAKE POWELL (GRASMERE)

WETLAND DETAILS

Lat: 35°01' S. Long: 117°44' E. Shire: Albany.

Land Status: within Powell Lake Nature Reserve.

CALM Region: South Coast. District: Albany.
Forestry Sheet (1:50 000): Redmond.

Wetland Vegetation Communities (WVCs) (C.J.Robinson):
TS = Tall Sedges, CF = Cedar Dense Low Forest, PW = Paperbark Woodland, OW = open water. Couch grass forms mats at edge of

SURVEY DETAILS

Date: 15/10/92 Depth: 0.82 m Salinity 0.33 ppt
Fringing vegetation was flooded extensively.

Effort: intensive searching for nests in W, SW and S of lake in TS, CF & PW; also briefly in TS/CF at far E end. Listened for bitterns at far NW and far NE ends of lake at dusk.

WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
APel	1				OW.
MaHa	2				overhead.
PaBD	95		1		OW, PW.
Shel	15				OW.
BbiD	10				OW.
SiGl	5				OW.
PuSn	3	2			TS*
SpCk	1				TS.
CReW	2				TS: Typha only.
LiBC	2				OW.
Totals:	149	2	2		(including data on other sheets? YES)

species (now/~~earlier~~) = 15, breeding spp (now/~~earlier~~) = 3

ADDITIONAL WATERBIRD DETAILS

species recorded	number counted	active nests	broods (DR)	old nests	WVCs used (* for nest site)
GyTl	2				PW, OW.
Shov	4				OW.
Swan	4		1		OW.
Dart	1				OW.
RNHn	2				PW.

~~waterbird species~~ ~~status of nest~~ ~~contents~~ ~~site (WVC)~~ ~~water depth~~ ~~main plant species~~

WATERBIRD DETAILS cont'd

Other species probably now present in dense inundated vegetation: BaCk, BbaR, LitB.
(* possibly breeding now)

DETAILS OF NESTS FOUND

waterbird species	status of nest	contents	site (WVC)	water depth	main plant species
PuSn	active	4 eggs	TS	0·6m	Baumea articulata
PuSn	active	1 egg	TS	0·6m	

Adult flushed off each nest. Nests were in patches of Baumea detached from shore in the W of the lake near the channel; the Baumea was not particularly dense. Nests were sited at the edge of OW in each case.

An old duck nest site was found low down in a paperbark.

Other notes on species: TS probably not wide/extensive enough for AusB to breed here, especially since much of it (both Typha & Baumea) is choked out with couch grass. The PW at S side of lake comprises substantial area of tall mature paperbarks which may be suitable for breeding by some ducks (in bases of trees) and cormorants/herons/ibises; areas of OW lie between some patches. ↓ to 10+m.

ACCESS NOTES

MANAGEMENT CONSIDERATIONS

Fishes caught in baited traps:
Pseudogobius olorum(s). Gambusia affinis visibly abundant.
A partly eaten mullet (? Aldrichetta sp.) was found at water's edge. Ten tortoises Chelodina oblonga were in the PW.

Notes cont'd

27 LAKE POWELL

15/10/92

water near outer edges of wetland vegetation i.e. wetland full.

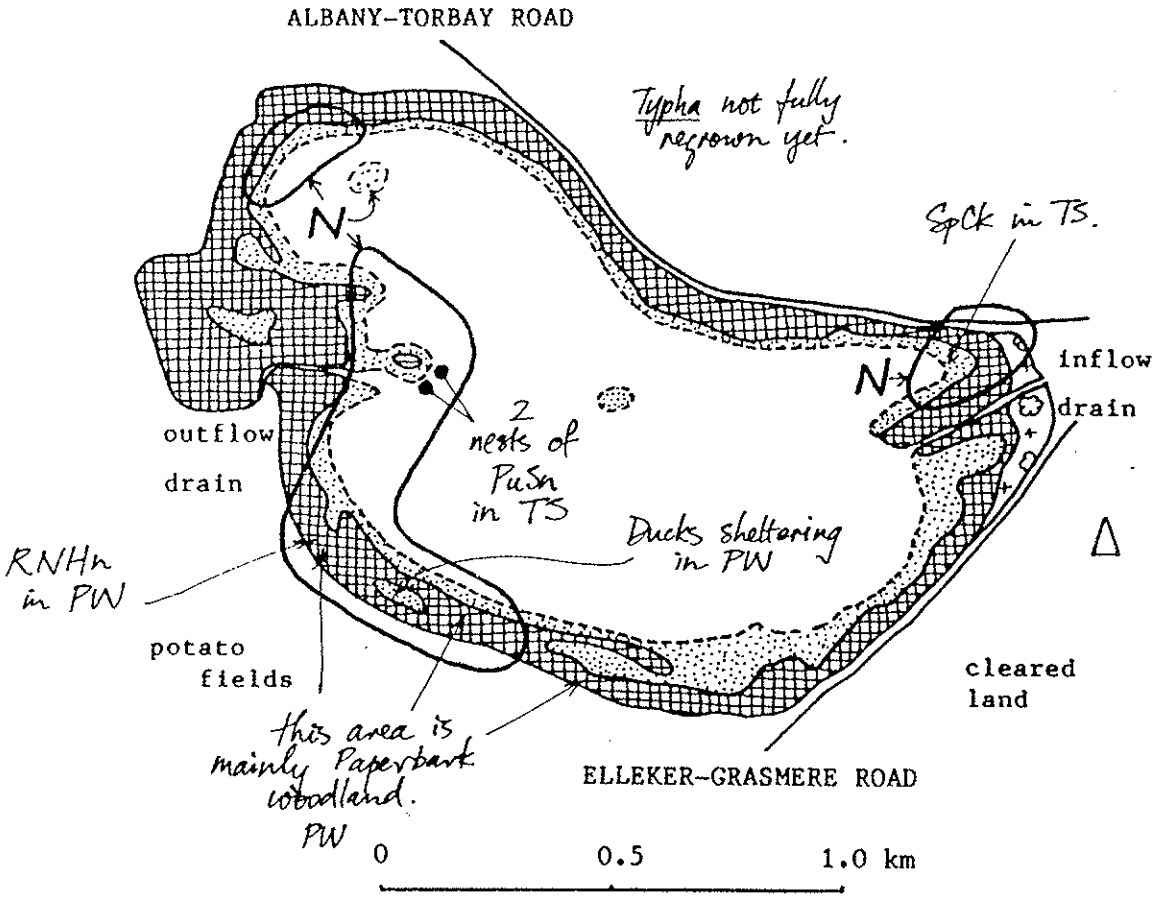
TS Tall Sedges

CF Cedar Dense Low Forest

Heath Dry

PW = Paperbark Woodland.

N = areas searched intensively for nests.



Top and bottom: Nest and eggs of Darter in eucalypt over-hanging Kent River, near entry point of the river into Owingup Swamp, October 1992.

Top and bottom: Backwater of Kent River near Owingup Swamp. Potential breeding habitat for darters and cormorants and possible habitat for Black Bittern.

South-west end of Boat Harbour Lake 2. The sedgeland is probably suitable for breeding by Spotless Crakes.

Top and bottom: Nest and eggs of Pacific Black Duck in paperbark tree in low closed-forest at NW end of Lake Saide, October 1992.

Top: Edge of *Baumea articulata* sedgeland at central-west side of Lake Powell, October 1992. Nest of Purple Swamphen at lower centre.

Bottom: Nest and egg of Purple Swamphen (see top photo).

Top: Open-sedgeland of *Baumea articulata* at central-west side of Lake Powell, October 1992. Nest of Purple Swamphen at lower right.

Bottom: Nest and eggs of Purple Swamphen (see top photo).

Top and bottom: Woodland and low closed-forest of paperbark *Melaleuca rhaphiophylla* at south-west side of Lake Powell, October 1992.