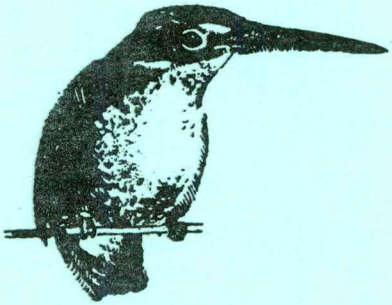
AUSTRALIAN BIRDS



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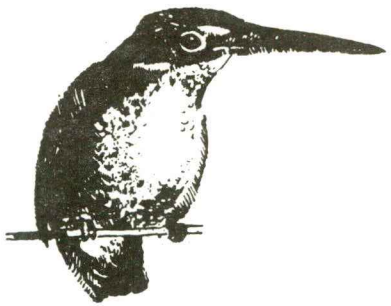

Vol. 19, No. 2 April, 1985

A SURVEY OF THE WATERFOWL AND WADERS OF LAKE ILLAWARRA, NEW SOUTH WALES

KEVIN WOOD

INTRODUCTION

Lake Illawarra is a large coastal lagoon some ten kilometres south of Wollongong, NSW. From general observations spanning many years it appears to be significant as a drought refuge for waterfowl and as a wintering ground for migratory waders, and this study was undertaken as an attempt to quantify the importance of the lake to these and other waterbirds. The lake was sub-divided into 12 areas so that the relative ecological importance of each could be assessed, and 12 censuses, at approximately monthly intervals, were undertaken over a 12-month period. I surveyed only species in the orders: Podicipediformes (grebes), Pelecaniformes (cormorants and allies), Ciconiiformes (herons and allies), Anseriformes (ducks), Gruiformes (crakes and rails), and Charadriiformes (waders, gulls and allies). I also reviewed past records, and mention is made of all waterbird species for which I can trace reports of occurrence on the lake. I know of no reports of any seabirds (Procellariiformes), and only a single report of a Little Penguin *Eudyptula minor* (Sphenisciformes), on the lake

LAKE GEOGRAPHY

The geography and hydrology of Lake Illawarra has been studied in detail (Anon 1976, 1982). Briefly, it is a coastal saline lagoon 9.5 km long and 5.5 km wide, largely surrounded by urban development (Fig. 1). It has an area of 32 km^2, a perimeter of 40 km and a catchment of 200 km^2. The maximum depth is about 3.5 m, with almost 25 per cent of its area less than 1.2 m deep (Fig. 2). Restricted by Windang Bridge, its entrance to the sea consists of small islands surrounded by myriad channels, salt marshes and sand or mud flats. The main channel changes in location and depth depending on rainfall in the catchment area and wind or wave action at the entrance. During recent years it has been about 3 km long, 100 m wide and 2 m deep. The entrance is occasionally completely closed by a sand bar.

Little fresh water enters the lake during dry weather and, because of the barrier formed by the sand bar, the volume of sea water exchanged during each tide cycle is only about two per cent. An appreciable tidal rise and fall occurs in the entrance channel but the main body of water fluctuates only about five cm. Salinity usually approaches that of the sea, but rainfall in the catchment has a marked effect on both lake level and salinity. After heavy rain the level may rise 1.5 m and the salinity may fall to 25 per cent of that of sea water, but such a surge is usually discharged within about four days.

The extensive marginal shallows, including the underwater delta barrier shelf, support a dense growth of sea-grasses (Fig. 2). *Zostera* sp. (eel-grass) is predominant, but *Ruppia* spp. are also common. Most exposed margins and tidal flats consist of sand or sand and mud mixtures (50-95 per cent sand).

METHODS

Twelve censuses were undertaken between May 1982 and May 1983 but I began preliminary work in June 1981 to gain familiarity with tidal influence, access and favoured habitats. The lake was divided into 12 areas (A-L, see Fig. 1) and the number of individuals of each bird species was recorded in each. The area surveyed is enclosed by the high water mark and the sand bar at the entrance; surrounding waterways such as Mullet Creek, Macquarie Rivulet and Wollungurry Creek were not included.

Censuses, all conducted on foot, were made at intervals of approximately one month. Boat access to deeper water was not considered necessary because nearly all birds were seen at depths of less than two metres. I used a 17 x 60 mm telescope and 8 x 40 mm binoculars, and coverage was considered reasonably complete.

RESULTS

The results of the survey are presented in Tables I and II. The following discussion deals mainly with this survey but also contains references to species recorded in the past but not during my

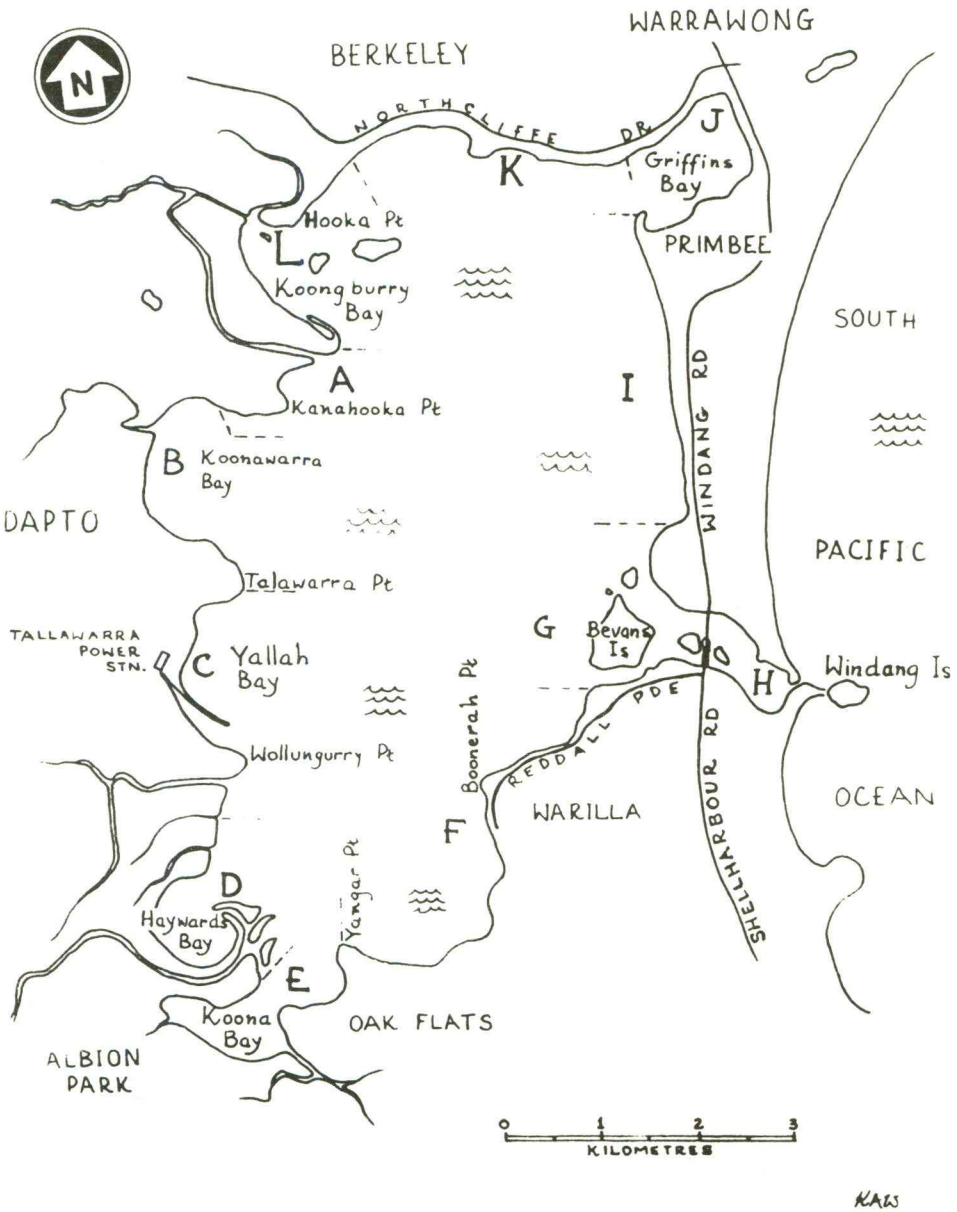

Figure 1 Map of Lake Illawarra, showing census areas and major geographic features

survey. It focuses on population levels, seasonal fluctuation, habitat preference and distribution.

GREBES (Podicipedidae)

Although previously recorded as uncommon except for occasional large aggregations on the backwaters of the lake (Gibson 1977), Hoary-Headed Grebes *Podiceps poliocephalus* were common all year, favouring the western edge of the delta barrier shelf (Area H). Rafts often contained 300+ birds feeding actively in association with Silver Gulls. Several Great Crested Grebes *P. cristatus* were present in deeper waters of Koonawarra Bay during May 1982, when lake salinity was average and stable. Subsequent to the survey, a flock of 39 was recorded in the same area on 25 August 1984 (L.E. Smith, pers. comm.). I did not record the Australian Little Grebe *P. novaehollandiae*. It occurs only rarely; I know of no sightings between June 1979 and May 1984, but its presence was noted by Howarth & Grant (1982) in 1979. This grebe tends to avoid saltwater habitats and was not, for example, recorded by Gosper (1981) in similar environments during an extensive survey of the Hunter and Richmond River estuaries elsewhere in New South Wales.

PELICAN (Pelecanidae)

The population of Australian Pelicans *Pelecanus conspicillatus* was evenly distributed and stable during the survey (average count 190). Birds usually rested on favoured banks remote from disturbance.

DARTER (Anhingidae)

Two Darters *Anhinga melanogaster* were seen in Area C on 3 August 1982. The species is rare on the lake, generally preferring fresh water

Cormorants (Phalacrocoracidae)

Four species occur regularly on the lake. Preferred roosts were sand flats in Areas G and H, and trees on Picnic and Bevans Islands. Little Pied Cormorants *Phalacrocorax melanoleucos* were easily the most numerous but Little Black Cormorants *P. sulcirostris* were also common. Counts of Great Cormorants *P. carbo* generally ranged between about 20-60, but 268 were recorded in early August 1982. Pied Cormorants *P. varius* were least numerous and preferred more remote locations such as the sand bank north-west of Bevans Island, rocks off Hooka and Gooseberry Islands, and tree-root debris in Macquarie Rivulet delta.

HERONS AND EGRETS (Ardeidae)

White-faced Herons *Ardea novaehollandiae,* Great Egrets *Egretta alba* and Little Egrets *E garzetta* were the most common species Counts of White-faced Herons typically ranged from about 20-30, but 75 were counted in early September 1982, when water level was very low

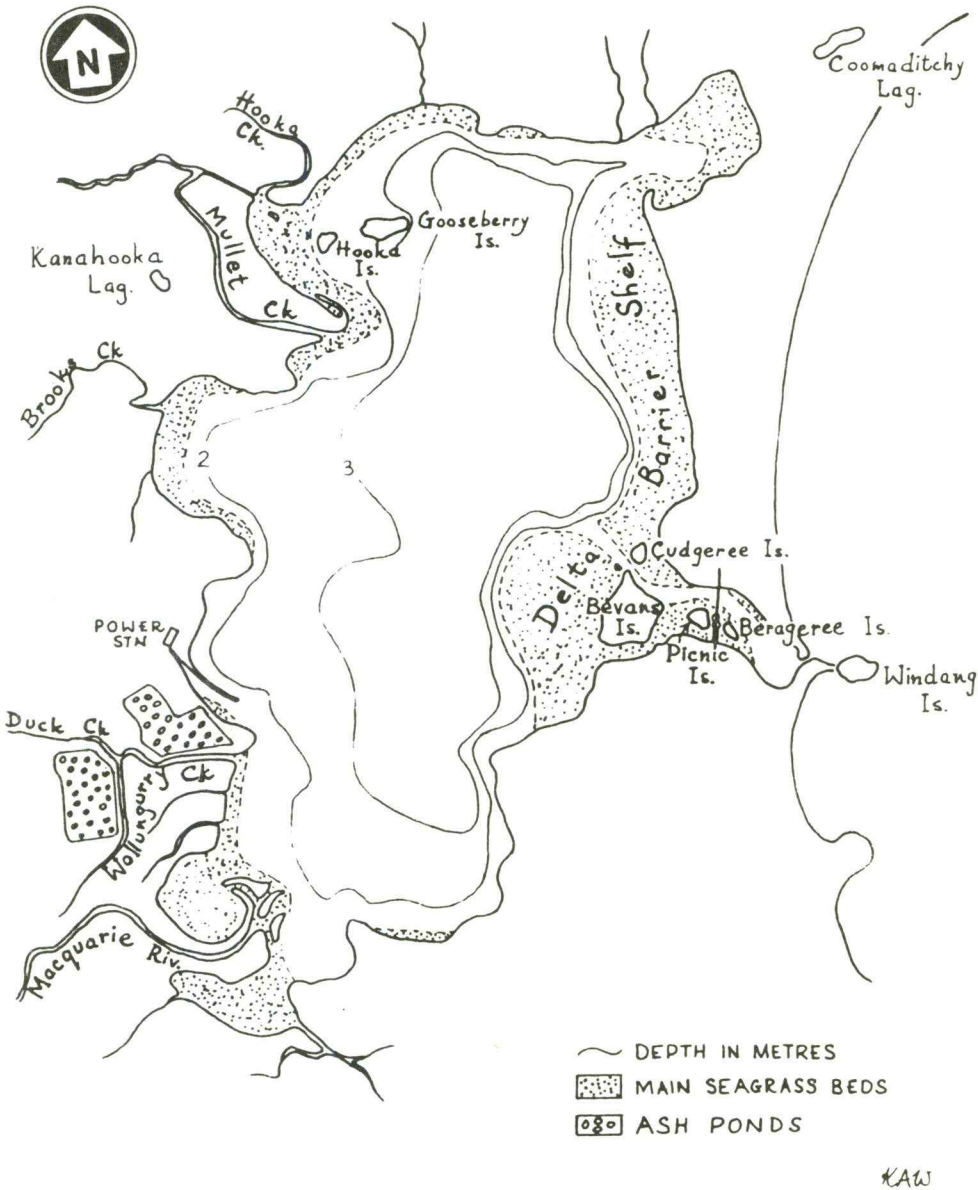

Figure 2 Map of Lake Illawarra, showing depth contours and major ecological features

after protracted dry weather; most were foraging in shallow sea-grass beds around Cudgeree and Bevans Islands. Little Egrets (average count 11) were almost as common as Great Egrets (average count 14), and there was no marked fluctuation in numbers of either species. Cattle Egrets *Ardeola ibis* were recorded irregularly in small numbers.

Plumed Egrets *E. intermedia,* Mangrove Herons *Butorides striatus,* Rufous Night Herons *Nycticorax caledonicus,* and Black Bitterns *Dupetor flavicollis* were recorded only occasionally. The two last-named were first noted in February 1983 at Macquarie Rivulet delta, which supports a relatively large stand of swamp oak *Casuarina glauca.* I subsequently noted Rufous Night Herons on 19 March 1983, and I saw one Black Bittern on 10 March, one on 17 March, and another on 28 May 1983. Shy and easily overlooked, both species may be resident. Although I did not record them on any census, about six Rufous Night Herons roost daily in *Pinus insignis* trees at nearby Primbee and fly out at dusk each night to feed, usually northwards towards Griffin Bay but sometimes southwards towards Korungulla Swamp (R.N. Imisides, pers. comm.). Because single birds have sometimes been spotlighted while feeding on the lake foreshores it is probable that this group uses the lake and Korungulla Swamp as feeding grounds all year round. The Pacific Heron *Ardea pacifica,* Little Bittern *Ixobrychus minutus* and Australasian Bittern *Botaurus poiciloptilus* have been occasionally recorded in the past.

STORKS (Ciconiidae)

The Black-necked Stork *Xenorhynchus asiaticus* was recorded only prior to the survey.

IBISES AND SPOONBILLS (Plataleidae)

Royal Spoonbills *Platalea regia* (average count 20) and Sacred Ibises *Threskiornis aethiopica* (average count 49) were evenly distributed and nearly constant in numbers. Yellow-billed Spoonbills *P. flavipes* were seen on five censuses but in very small numbers, and I saw Straw-necked Ibises *T. spinicollis* only once, resting on the sand bar off Hooka Point.

SWANS AND DUCKS (Anatidae)

Black Swans *Cygnus atratus* were consistently recorded in good numbers in all sea grass areas, but most preferred the large delta barrier shelf (Areas G and I). My maximum count was 750 (on 7 April 1983), but totals of 1000 birds have previously been recorded (Gibson 1977).

The Grey Teal *Anas gibberifrons* was by far the most common duck. In the first ten counts the maximum number of birds was 2820, but on the last two censuses numbers had dropped dramatically following good rains in the Murray-Darling region on 19 and 20 March 1983. The response of this species to rainfall was discussed by Frith (1982) who argued that it can detect heavy rains more than 100 kms away and will move to newly flooded areas within a few days. Approximately half of the Grey Teal censused were resting on mud and sand banks along margins with extensive growth of common reed *Phragmites* sp., the remainder were either loafing or feeding in shallow water. Areas G, I and K often contained large numbers. My survey

TABLE 1 Total counts of species at Lake Illawarra on each census, May 1982—April 1983

	Wed 5 May 1982	Sat 30 May	Tue 3 Aug	Wed 1 Sep	Wed 15 Sep	Tue 8 Oct	Sat 30 Oct	Fri 17 Dec	Thu 10 Feb	Thu 10 Mar	Thu 7 Apr	Thu 28 Apr 1983
Great Crested Grebe	2	3										
Hoary-headed Grebe	226	950	368	204	205	160	127	641	280	296	198	645
Australian Pelican	211	177	222	195	164	163	224	162	139	145	176	286
Darter			2									
Great Cormorant	45	25	268	45	62	60	35	43	34	65	58	113
Pied Cormorant	27	2		9	5		14	24	22	8	9	6
Little Black Cormorant	138	165	231	93	129	162	150	205	110	33	94	178
Little Pied Cormorant	276	324	533	194	216	309	288	350	310	465	477	265
White-faced Heron	22	12	36	75	60	17	18	16	50	37	30	8
Cattle Egret	65	3	1								7	4
Great Egret	4	11	17	16	12	7	22	9	11	24	22	11
Little Egret	7	6	10	6	20	8	9	13	4	21	17	10
Black Bittern										1		
Sacred Ibis	52	35	70	57	63	2	62	55	55	43	78	11
Straw-necked Ibis									7			
Royal Spoonbill	2	25	20	37	26	7	28	5		25	39	21
Yellow-billed Spoonbill				3			3	1		1	4	
Black Swan	405	270	540	180	210	175	143	600	605	675	750	705
Pacific Black Duck	2	26	8		19	1	2			3	15	
Mallard		2										
Grey Teal	1710	1860	1750	2380	1990	2820	2420	2500	1910	1480	405	230
Chestnut Teal	330	174	255	368	205	205	163	320	303	248	190	126
Blue-winged Shoveler	25	31	19			10	1					
Hardhead		10										
Maned Duck						5						
Musk Duck	1	5	1						5		4	
Spotted Crake									2			
Dusky Moorhen	13	10	8	9	5	4	2	9	10	11	10	7

TABLE 1. continued

	Wed 5 May 1982	Sat 30 May	Tue 3 Aug	Wed 1 Sep	Wed 15 Sep	Tue 8 Oct	Sat 30 Oct	Fri 17 Dec	Thu 10 Feb	Thu 10 Mar	Thu 7 Apr	Thu 28 Apr 1983
Purple Swamphen										1		
Eurasian Coot	18	45	55	35	23	20	25	11	21	9	70	76
Pied Oystercatcher		2	5			1		4	4	3	2	2
Masked Lapwing	27	4	30	7	9	10	13	11	32	15	11	11
Lesser Golden Plover						1	35	35	27	60	6	
Double-banded Plover	1	20	25	1	1				3	15	22	24
Red-capped Plover	2	6	16	18	9	11	11	17	13	18	7	22
Black-winged Stilt		3			5	6	8			6		1
Ruddy Turnstone					16		4					
Eastern Curlew	4	1	11	15	16	9	17	16	32	18	3	7
Grey-tailed Tattler			2	2	1	1	4	10	3	1	6	9
Greenshank	1	2	1	4	7	25	32	18	61	24	30	5
Japanese Snipe						1						
Black-tailed Godwit												1
Bar-tailed Godwit	31	14	36	114	102	174	157	182	133	125	57	29
Red Knot				10		19	8					
Sharp-tailed Sandpiper				6	154	165	459	782	266	85		
Red-necked Stint		10	4	4		7	75	135	190	52		17
Curlew Sandpiper					10	65	56	170	25	3	10	
Silver Gull	2004	937	2250	281	376	254	555	1903	4406	4385	4140	4383
Kelp Gull	8		2	3					2	3	4	5
Whiskered Tern							33					
Caspian Tern	17	26	28	10	4	6	14	3	2	1	43	31
Common Tern									2			
White-fronted Tern				7		100						
Little Tern						35	100	200	210	160	41	
Crested Tern	3	6	21	20	60	900	13	11	23	8	23	36

TABLE 2. Total counts of species found in each census area at Lake Illawarra, May 1982—April 1983. For each species and at each site, the maximum and minimum counts are shown above the average count (total recorded over all censuses, divided by 12, to nearest whole number)

	A	B	C	D	E	F	G	H	I	J	K	L
Great Crested Grebe		3-0										
		<1										
Hoary-headed Grebe		51-0		5-0		25-0	200-0		900-0	35-0		
		9		<1		3	55		279	4		
Australian Pelican	16-0	24-3	40-0	18-2	46-4	63-3	75-5	32-0	40-0	45-3	15-0	65-0
	4	11	9	9	14	23	47	14	11	23	3	23
Darter			2-0									
			<1									
Great Cormorant	9-0	10-0	12-0	31-1	7-0	74-0	25-0	10-0	9-0	4-0	115-0	56-0
	2	4	3	10	2	8	10	4	3	1	10	13
Pied Cormorant	5-0		8-0	12-0	6-0	2-0	8-0	1-0			10-0	12-0
	<1		1	2	1	<1	2	<1			1	4
Little Black Cormorant	11-0	31-0	26-0	104-0	15-0	9-0	200-0	15-0	11-0	8-0	9-0	48-0
	2	6	5	19	6	1	72	4	2	2	2	16
Little Pied Cormorant	32-0	39-0	36-9	70-0	29-0	81-10	250-65	26-0	33-5	62-0	93-0	55-5
	10	14	21	19	12	27	129	10	19	26	21	24
White-faced Heron	1-0	5-0	2-0	3-0	3-0	4-0	45-1	2-0	15-0	4-0	6-0	4-0
	<1	1	<1	2	1	2	16	<1	4	1	2	1
Cattle Egret		3-0		6-0	50-0	15-0		1-0		1-0		
		<1		1	4	1		<1		<1		
Great Egret	1-0	1-0	3-0	2-0	3-0	2-0	15-1	1-0	12-0	3-0	1-0	1-0
	<1	1	1	1	1	1	6	<1	2	1	<1	<1
Little Egret	2-0	4-0	1-0	4-0	3-0	3-0	11-0	1-0	6-0	4-0	1-0	2-0
	<1	1	<1	1	1	1	4	<1	1	1	<1	<1
Black Bittern				1-0								
				>1								
Sacred Ibis	9-0	10-0	2-0	27-0	5-0	10-0	34-1	12-0	12-0	11-0	15-0	10-0
	1	3	1	4	2	3	19	4	3	4	2	2
Straw-necked Ibis												7-0
												1
Royal Spoonbill	1-0	19-0		5-0	8-0	1-0	21-0	4-0	4-0	14-0	1-0	13-0
	<1	2		1	2	<1	8	1	<1	3	<1	1
Yellow-billed Spoonbill		4-0		5-0								3-0
		<1		<1								<1
Black Swan	21-0	25-0	144-0	53-0	15-0	56-0	385-8		524-0	312-0	62-0	125-0
	2	10	12	20	2	4	153		130	54	9	54

TABLE 2. continued

	A	B	C	D	E	F	G	H	I	J	K	L
Pacific Black Duck		2-0		15-0	1-0		10-0	6-0	6-0	6-0	2-0	8-0
		<1		2	<1		2	1	1	1	<1	1
Mallard											2-0	
											<1	
Grey Teal	55-0	220-0	150-0	152-36	314-35	211-8	640-15	44-0	950-5	702-83	447-0	183-0
	7	104	64	71	110	79	221	12	529	328	177	37
Chestnut Teal	6-0	52-0	21-0	128-10	163-25	49-0	44-0		78-0	59-0	114-0	10-0
	1	17	6	42	63	8	13		36	20	20	2
Blue-winged Shoveler				8-0	2-0				6-0	31-0		8-0
				1	<1				1	5		1
Hardhead		10-0										
		1										
Maned Duck				5-0								
				<1								
Musk Duck		3-0		5-0			1-0					
		1		1			<1					
Australian Spotted Crake									1-0	1-0		
									<1	<1		
Dusky Moorhen										13-2		
										8		
Purple Swamphen										1-0		
										<1		
Eurasian Coot										76-9		
										34		
Pied Oystercatcher			2-0	4-0	2-0			2-0				2-0
			1	1	<1			<1				<1
Masked Lapwing	2-0	2-0	6-0	6-0	5-0	4-0	9-0		1-0	8-0	7-0	7-0
	<1	<1	2	3	1	1	1		<1	3	1	3
Lesser Golden Plover					35-0			7-0		3-0		21-0
					7			1		<1		3
Double-banded Plover				2-0			1-0	22-0				14-0
				<1			<1	7				2
Red-capped Plover		2-0	2-0	5-0			2-0	12-0				16-0
		<1	<1	1			<1	5				6
Black-winged Stilt							5-0		6-0	5-0		
							<1		1	1		

TABLE 2. continued

	A	B	C	D	E	F	G	H	I	J	K	L
Ruddy Turnstone	16–0 1	2–0 <1	1–0 <1			1–0 <1						
Eastern Curlew		1–0 <1	1–0 <1	2–0 <1	2–0 <1	3–0 1	18–0 7	3–0 1		1–0 <1	2–0 <1	6–0 2
Grey-tailed Tattler			2–0 <1		4–0 <1	1–0 <1	9–0 1	6–0 1		1–0 <1		
Greenshank		5–0 1	1–0 <1	1–0 <1	2–0 <1	3–0 1	55–0 12	6–0 1	3–0 1	5–0 1	1–0 <1	2–0 1
Japanese Snipe					1–0 <1							
Black-tailed Godwit								1–0 <1				
Bar-tailed Godwit	20–0 2	41–0 8	12–0 2	10–0 5	15–0 4	18–0 2	95–2 42	55–0 17	12–0 2	5–0 1	30–0 3	13–0 4
Red Knot							10–0 1	19–0 2				
Sharp-tailed Sandpiper		270–0 29	20–0 2	21–0 4	75–0 8	45–0 5	330–0 81	8–0 1	30–0 4	22–0 4	36–0 3	60–0 19
Red-necked Stint		10–0 1	6–0 1		20–0 2	5–0 1	25–0 2	150–0 25				45–0 9
Curlew Sandpiper		29–0 3	40–0 3	4–0 <1	74–0 6		129–0 11		1–0 <1	5–0 1	9–0 1	35–0 3
Silver Gull	56–10 22	270–21 90	75–11 34	70–10 38	280–22 74	160–17 97	280–33 136	450–15 175	220–10 75	750–21 223	2200–15 801	1010–12 399
Kelp Gull			2–0 <1					8–0 2		2–0 <1		
Whiskered Tern							3–0 <1			30–0 3		
Caspian Tern		2–0 <1	13–0 3	15–0 4	2–0 1	1–0 <1	25–0 3	21–0 3	1–0 <1	1–0 <1		14–0 2
Common Tern								2–0 <1				
White-fronted Tern								100–0 9				
Little Tern							100–0 15	210–0 47				
Crested Tern	1–0 <1	4–0 1	8–0 1	5–0 1	1–0 <1	2–0 <1	4–0 1	900–0 89				3–0 1

was conducted during a period of severe drought over much of inland Australia; the large numbers of Grey Teal (consistently approaching or exceeding 2000 birds) frequenting the lake throughout the survey, together with the abrupt decline following good rains in the interior, strongly suggests that Lake Illawarra is an important drought refuge for this species.

The less common Chestnut Teal *A. castanea* was found in greatest numbers in Areas D and E. Most were feeding. The aquatic plants *Ruppia* and *Lamprothamnium* predominate in Area I, and *Gracilaria* in Areas D and E (Anon. 1976). Delroy (1974) reported that in the saline habitat of the Coorong, South Australia, both Chestnut and Grey Teal fed almost exclusively on tubers of *Lamprothamnium* and *Ruppia,* while Norman and Mumford (1982) also found that *Ruppia* was well represented in the diet of Chestnut Teal shot in the saline Gippsland Lakes, Victoria. This teal's preference for the *Gracilaria*-rich Areas D and E during my survey suggests that this plant may also be an important food for Chestnut Teal at Lake Illawarra. Unlike the Grey Teal, numbers of Chestnut Teal did not markedly decrease after the rains of 19 and 20 March 1983, which is consistent with the view that the Chestnut Teal is a sedentary species showing little dispersal associated with rainfall (Frith 1982).

The Pacific Black Duck *A. superciliosa* was observed on nine censuses but in relatively small numbers (average count 6). The birds did not appear to favour any particular area, and were recorded in all but three. 20-30 Blue-winged Shovelers *A. rhynchotis* were present between May and October 1982, mostly in Griffins Bay, their presence also no doubt drought-induced, since their preference is normally for freshwater swamps (Gibson 1977, Frith 1982). Musk Ducks *Biziura lobata* preferred the deeper water of Koonawarra and Haywards Bays and were seen on five censuses, always in small numbers (max. 5).

Mallard *A. platyrhynchos,* Pink-eared Duck *Malacorhynchus membranaceus,* Hardhead *Aythya australis,* Maned Duck *Chenonetta jubata* and Australian Shelduck *Tadorna tadornoides* were each recorded only once. Both Pink-eared and Maned Duck flocks were seen on separate occasions after heavy rain in the catchment area. Four Pink-eared Duck had been seen for some time previously at nearby freshwater Kanohooka Lagoon and its rise in water level may have caused them to search elsewhere for food. Similarly, Hardheads were almost always present on Kanohooka lagoon and the only sighting on the lake (10 birds in nearby Koonawarra Bay on 30 May 1982) may have been birds temporarily disturbed from this more permanent freshwater habitat. Howarth & Grant (1982) mention two Australian Shelducks which frequented the lake for several days in 1979, but I recorded the species only once — a flock of 14 seen in February 1983. I am not aware of any record on the lake since. In contrast, I regularly saw several on nearby Albion Park Lagoon throughout the summer of 1983-84.

All ducks, except Musk Duck, that were sighted on the water were resting or feeding at depths less than about one metre.

CRAKES, SWAMPHENS AND COOTS (Rallidae)

Griffins Bay is very shallow (with depths gradually increasing from its eastern shore to 1.5 m), supports diverse aquatic vegetation (including algae), and is shielded from disturbance from

nearby heavy vehicular traffic by beds of common reed, *Phragmites* sp. Rallids were seen only in this bay during the survey, except for a single record of the Australian Spotted Crake *Porzana fluminea* in Cudgaree Bay. Dusky Moorhens *Gallinula tenebrosa* and Eurasian Coots *Fulica atra* were seen on every census in consistent numbers (average counts 8 and 34 respectively). The presence of three juvenile Dusky Moorhens in company with adult birds on 17 December 1982, and markedly lower counts in October (presumably due to adults being hidden at nests) indicates that this species successfully bred in the reeds in late 1982. Eurasian Coots fed in shallow water close to the eastern shore. The sighting of a lone Purple Swamphen *Porphyrio porphyrio* also in Griffins Bay in February 1983 coincided with the drying up of nearby Coomaditchy Lagoon, which normally supports a small resident population. The Australian Spotted Crake was seen only when the water level was low, in late afternoon or on overcast days, but it is certainly locally more common than previously thought (Gibson 1977 (Addendum), and Morris, McGill & Holmes 1981). The Banded Landrail *(Rallus philippensis,* Lewin's Rail *Rallus pectoralis* and Marsh Crake *Porzana pusilla* have each been observed prior to this study but were not recorded during it, although Banded Landrails (max. 6) were subsequently seen often during February 1985 foraging among rotting *Zostera* near Hooka Park (Area F). When disturbed they took cover in adjacent rushes *Juncus* spp.

PAINTED SNIPE (Rostratulidae)

The Painted Snipe *Rostratula benghalensis* was not recorded during the survey, and I can trace only a single previous record, in March 1970 (Gibson 1977).

OYSTERCATCHERS (Haematopodidae)

Pied Oystercatchers *Haematopus longirostris,* which show a marked preference for the local estuarine habitats, were present on eight of the twelve censuses, always in small numbers and usually on the estuary shoals east of Windang Bridge and the western foreshores around Hooka Point, Tallawarra Point, Macquarie Rivulet delta and Koona Bay. I am aware of only one record of the Sooty Oystercatcher *H. fuliginosus* on the lake (R.N. Imisides pers. comm.).

PLOVERS (Charadriidae)

Three resident and five migrant species were recorded. Noted on all censuses (average count 15), Masked Lapwings *Vanellus miles* breed and feed on open fields nearby and were commonly seen loafing or preening on the lake. Red-capped Plovers *Charadrius ruficapillus* were also seen during all censuses (average count 12), but were found in only two areas — the entrance shoals east of Windang Bridge, and the sand bar off Hooka Point (Areas H and L). Distraction displays and the presence of dependent young indicated that the species bred at or close to these areas. Although previously recorded, the Black-fronted Plover *C. melanops* was not noted during this study and my only (subsequent) observation is of two birds at Kully Bay during dredging operations in July 1984. It normally prefers freshwater margins.

The Lesser Golden Plover *Pluvialis dominica,* Grey Plover *P. squatarola,* Mongolian Plover *C. mongolus*, and Large Sand Plover *C. leschenaultii* are Palaearctic migrants arriving in the region during September-October and departing April-May Though not recorded during the survey, Large Sand Plovers have been seen on the entrance shoals in the past (Gibson 1977). Some 30-35 Lesser Golden Plovers were present between October 1982 and March 1983 (maximum count 60 on 10 March 1983), preferring the samphire flats at the north-western end of Koona Bay where 20-25 birds were regularly seen. The Grey Plover, though rare in NSW, was seen twice on the entrance shoals. Although previously recorded in good numbers (for example, Gibson (1977) recorded 100 birds on the entrance shoals in 1974), only one Mongolian Plover was seen during the survey period. I have noted an abrupt decline in the number of this species since about 1978, and a corresponding increase in disturbance from dogs, trail bikes and other vehicles. The species is still recorded in good numbers in other comparable coastal areas in New South Wales, e.g. Shoalhaven Heads (Pegler, 1983), Port Stephens (Pegler, 1980) and Boat Harbour (pers. obs.), which suggests that Mongolian Plovers are extremely vulnerable to human disturbance.

Approximately 20 Double-banded Plovers *C. bicinctus* were found regularly from April to September, mostly either at the Hooka Point sand bar or the eastern entrance shoals (Areas H and L). Similar in habits to Mongolian Plovers, these birds are present during the winter months when human disturbance is much reduced.

AVOCETS AND STILTS (Recurvirostridae)

Black-winged Stilts *Himantopus himantopus* were found in small numbers (max. 8) on six censuses when salinity was lower than normal. They preferred the foreshore of Windang Road and Griffins Bay. Neither the Banded Stilt *Cladorhynchus leucocephalus* nor the Red-necked Avocet *Recurvirostra novaehollandiae* were recorded during the survey, but the former has been recorded on a few previous occasions (Gibson 1977), and a group of 21 Red-necked Avocets was seen on the east entrance shoals on 7 July 1984 (L.E. Smith and others, pers. comm.) — the first record of the species in the Illawarra region.

WADERS (Scolopacidae)

Three Palaearctic migrant waders (Eastern Curlew *Numenius madagascariensis,* Bar-tailed Godwit *Limosa lapponica* and Greenshank *Tringa nebularia*) were recorded on every census, even during the (austral) winter when most individuals are at their breeding grounds in the northern hemisphere. In particular, substantial numbers of Bar-tailed Godwits over-wintered; that this is a regular occurrence is indicated by my sightings of 75+ off Hooka Point throughout July and August 1981 during my preliminary work at the lake. Numbers of Greenshanks and Bar-tailed Godwits were markedly higher in spring than at other times, but counts of Eastern Curlews were much more stable throughout the year (average count 12, range 1-32). A total of 61 Greenshanks, an unusually large number, was seen on 10 February 1983, when the lake was lower than normal; 55 of these were scattered around the south and west margins of

Bevans Island feeding actively on a dense congregation of aquatic insects In general, the waders showed no obvious preference for one area over another

Whimbrels *N. phaeopus* were not seen and I know of only one previous record, in 1955 (McGill & Lane 1955). This species prefers mangrove mud flats and rocky platforms and shores in coastal New South Wales and there is little suitable habitat at Lake Illawarra. A lone Black-tailed Godwit *L. limosa* was seen on seven occasions during April and May 1983, mainly on the entrance shoals east of Windang Bridge. Grey-tailed Tattlers *T. brevipes* were present on most censuses but in small numbers (max. 10). The birds showed a distinct preference for feeding and loafing on the southern flats on Picnic and Berageree Islands. Ruddy Turnstones *Arenaria interpres* prefer the rocky tidal headland at Bellambi Point (Mills 1984) and the Five Islands but in the survey area a flock of 16 was found on rocks at Kanahooka Point in September 1982, four were recorded during the census of 30 October 1982 and eight were seen in September 1982 at Boonarah Point.

Sharp-tailed Sandpipers *Calidris acuminata,* Curlew Sandpipers *C. ferruginea,* and Red-necked Stints *C. ruficollis* occurred in mixed flocks. They were low in over-wintering numbers but built up to a substantial population in summer. The Sharp-tailed Sandpiper was the fifth most numerous species overall. They were found all around the lake during the summer months, but concentrations formed in some localities depending on water level (and therefore food supply). Together with Curlew Sandpipers, they were often found feeding amongst rotting sea grass on sandy flats at the east entrance (near the northern bank protected by *Phragmites*); south of Picnic Island; north-west of Bevans Island; at Hooka Point sand bar, and Koonawarra Bay. Although some Red-necked Stints associated with Sharp-tailed Sandpipers and Curlew Sandpipers all around the lake, most preferred the sandy, less weedy, estuarine shoals to the east of Windang Bridge. Here they often associated with plovers.

Sanderlings *C. alba* were seen regularly on the entrance shoals during February, March, and April 1983, often in company with Red-necked Stints. In the past, Sanderlings have been considered scarce with only a few records of one to four birds in the survey area at Windang (Gibson 1977). Most of the 1983 sightings occurred either during or soon after heavy seas.

Red Knots *C canutus* were found only during September and October 1982, and in relatively small numbers. In addition to the sightings on census days, I found 10 birds on 4 October and 22 birds on 13 October 1982. In all cases, the Red Knots were feeding with Bar-tailed Godwits in Areas G or H. During preliminary investigation in 1981, I also noticed Red Knots in small numbers during these months and in similar circumstances. Thus Red Knots, though common elsewhere in coastal New South Wales throughout the summer (Morris, McGill & Holmes 1981), apparently occur at Lake Illawarra predominantly in early spring.

Six other waders (Japanese Snipe *Gallinago hardwickii,* Common Sandpiper *T. hypoleucos,* Terek Sandpiper *T terek,* Great Knot *C. tenuirostris,* Pectoral Sandpiper *C. melanotos* and Broad-billed Sandpiper *Limicola falcinellus*) are rare on the lake. None was recorded during

the survey except for a single Japanese Snipe which I flushed from low samphire *Sarcocornia* sp. at the north-western end of Koona Bay on 8 October 1982

GULLS AND TERNS (Laridae)

I recorded 11 species, the most common of which was the Silver Gull *Larus novaehollandiae* which breeds in large numbers on the nearby Five Islands in late spring. In 1978, Gibson (1979) estimated that the Five Islands supported a breeding population of 50,000 pairs, this number having grown from about 1,000 pairs in 1940. My counts at Lake Illawarra were below 2250 until December 1982, but my largest counts (of 4000+. mainly comprising adults and immatures at rest along the north-western foreshores) were between February and April 1983. This increase late in the survey is attributed to post-breeding dispersal from the Five Islands and a new food source resulting from the establishment nearby, late in 1982, of the Unanderra waste disposal depot.

The Kelp Gull *L. dominicanus,* which also breeds at the Five Islands where it is gradually increasing in numbers (Lane 1979), was found on seven censuses in small numbers, usually at the east entrance (Area H). During the survey, it was most common on the entrance shoals after the breeding season. Juveniles comprised more than half of birds counted in the last four censuses.

Crested Terns *Sterna bergii* also breed at Five Islands (Lane 1979), and were found on all censuses. Numbers were relatively stable (average count 20, range 30-60), but 900 birds were counted on 8 October 1982; all of these were on sand flats near the mouth of the lake and some were engaged in courtship behaviour.

The Little Tern *S. albifrons* was found in reasonable numbers throughout the summer, with a distinct peak in December 1982. Some were in breeding plumage. Little Terns were found only in Area H (the east entrance), with two exceptions: 100 were found on the sand bar to the north-west of Bevans Island on Saturday, 30 October 1982, in company with many waders. None were found on the east entrance shoals on this day, and a similar effect was noted during the only other Saturday census; that of 30 May 1982. I attribute this to the extremely high level of human recreational activity at the most easterly entrance shoals on weekends, which severely disrupts the normal activities of birds in this area and highlights the importance of the shallow sand bar to the north-west of Bevans Island as a refuge.

Caspian Terns *Hydroprogne caspia* were present on all counts in small numbers (average count 15), showing a preference for the entrance and western foreshores. Unusually high numbers occurred during April 1983 (about 30-40 birds), in contrast to a maximum of only three birds sighted at any time during the previous three months. The census of 30 October 1982 provided the only record of Whiskered Terns *Chlidonias hybrida* when a total of 33 birds was found, most resting on weed in Griffins Bay. Most were in part-breeding plumage. White-fronted Terns *S. striata* were recorded twice on the east entrance shoals (7 on 1 September, and

100 on 8 October 1982), while the Common Tern *S. hirundo* was recorded only once — two birds on the east entrance shoals on February 1983. I have found these migratory terns more common in some years than others.

On 15 December 1984 I observed a single White-winged Tern *C. leucoptera* resting on the eastern estuary shoals in company with 170+ Little Terns and 33 Common Terns, the first record of the species for Lake Illawarra and the Country of Camden (Gibson 1977, Morris, McGill & Holmes 1981). The Pacific Gull *L. pacificus,* Fairy Tern *S. nereis* and Gull-billed Tern *Gelochelidon nilotica* have each been recorded occasionally in the past but were not found during the survey.

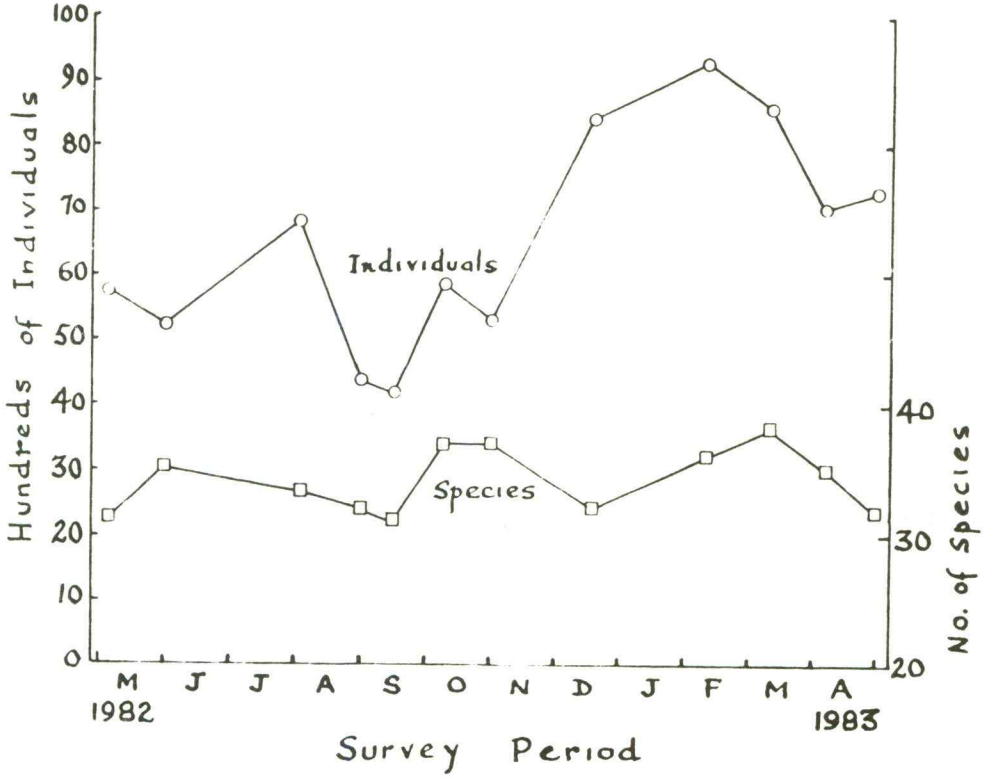

Figure 3. Fluctuation in numbers of species (bottom) and number of individuals (of all species combined, top) at Lake Illawarra, May 1982—April 1983

DISCUSSION

Figures 3 and 4 summarize my census data through time and between areas. Areas G, I, K and J contained the largest numbers of individuals (totals of all species surveyed) but there was little variation in the number of species recorded between areas. Area K, though poor in species, was among the most productive areas in total number of birds (although this result is heavily influenced by the large number of Silver Gulls frequenting the area), while Area A was poor in both species and individuals. In general, the richest areas were at the northern end of the lake: the western entrance shoals around Bevans Island, the delta barrier shelf, Griffins Bay, the northern shoreline adjacent to Northcliffe Drive, and Koongburry Bay.

There was little fluctuation in total number of species recorded through the year, and species lists for each census ranged only from 31 to 38. The total number of individuals, however, did fluctuate markedly, approximately doubling from a low of 4184 in September to a peak of 9312 in the following February.

As already noted, almost all birds were seen in water depths of less than two metres, a region which comprises about 30 per cent of the total lake area of 32 km^2. Figure 3 thus implies that, at least occasionally, bird populations on Lake Illawarra may approach a total of 10,000 individuals at a density of nearly 1000 birds per km^2. While a very large proportion of this total consisted of Silver Gulls, and useful comparative data with other Australian wetlands seem scanty, this density appears high, especially in view of the marked concentration in the north-eastern sector of the lake (Areas K, J, I and G).

The entrance shoals to the west of Windang Bridge (Area G) appear very similar to those to the east of the bridge (Area H), and the species lists compiled for the two areas over the survey period were almost identical, yet Area G contained well over twice as many individuals as Area H. I have no data on comparative prey abundance between the two areas, but the only obvious difference between them is that human recreational activity is very much more intense at Area H. If the two areas are really as similar as they appear, then this might reflect the unfavourable effects of human activities on bird populations at the lake.

COMPARISON WITH OTHER WETLANDS

Results of surveys of water birds in other wetlands of south-eastern Australia have been published by Loyn (1978), Pegler (1980 and 1983) and Gosper (1981). Table III compares these surveys and includes the wader densities of the areas studied, the predominant species, and (in particular) the population of Sharp-tailed Sandpipers. This comparison suggests that Lake Illawarra has a relatively high wader population, especially of Sharp-tailed Sandpipers. National wader counts coordinated by the Royal Australasian Ornithologists Union in February of each year since 1981 has resulted in estimates (of the total Australian wintering population)

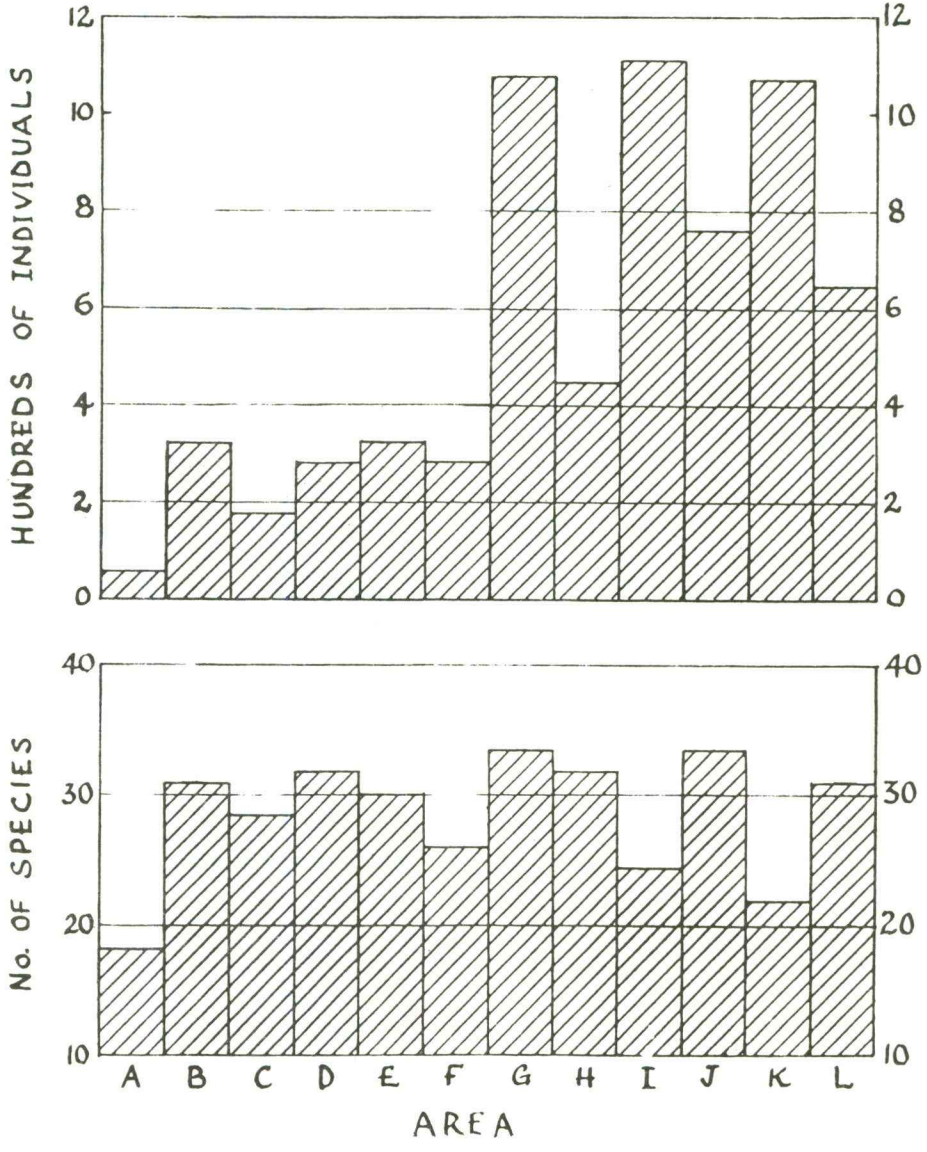

Figure 4. Total number of species and of individuals (of all species combined) for each census area at Lake Illawarra, May 1982—April 1983

for Sharp-tailed Sandpipers of 62,010 in 1981, 99,066 in 1982, 37,101 in 1983 and 36,338 in 1984 (Lane & Jessop 1984). These estimates were obtained by methods which seem comparable with my own. If 37,101 is accepted as the population of Sharp-tailed Sandpipers in Australia during the summer of 1982-83 (concurrent with my survey), then my peak count at Lake Illawarra of 782 (on 17 December 1982) represents about 2.1 per cent of the total. Further census work is desirable and this comparison must be treated with some caution; but it nevertheless suggests that Lake Illawarra may be important as a wintering area for Sharp-tailed Sandpipers. Under the terms of the Ramsar Convention, any wetland which holds greater than one per cent of the national known population of a wader species is considered to be of international significance.

TABLE 3. Comparison of Lake Illawarra with other coastal wetlands in south-eastern Australia.

wetland	census period	total wader population (max)	estimated intertidal area (km^2)	wader density ($birds/km^2$)	population of 2 most abundant species	population of Sharp-tailed Sandpipers
Westernport Bay	Oct 1973-Oct 1974	17000	270	60	CS 5600 RNS 5300	1000
Hunter River estuary	Feb 1970-Jan 1973	8620	14.6	590	CS 1200* BTG 1050*	720*
Richmond River estuary	Dec 1972-Jan 1974	1870	5.7	330	BTG 330* RNS 210*	74*
Lake Illawarra	May 1982-Apr 1983	1594	3.8	420	STS 782 RNS 190	782
Shoalhaven-Crookhaven estuary	Dec 1981	1067	3.5	310	BTG 300 RNS 282	35
Port Stephens (northern shore)	Dec 1979-Jan 1980	978	4	250	BTG 266 GTT 245	4

key: CS = Curlew Sandpiper
RNS = Red-necked Stint
BTG = Bar-tailed Godwit
STS = Sharp-tailed Sandpiper
GTT = Grey-tailed Tattler

Records marked (*) from D.G. Gosper (pers. comm.); other data from Loyn 1978 (Westernport Bay); Gosper 1981 (Hunter and Richmond estuaries); Pegler 1980 (Port Stephens); Pegler 1983 (Shoalhaven-Crookhaven estuary); and this study.

CONCLUSION

This study indicates that Lake Illawarra is of considerable ornithological importance, and among the most important wetlands in the region (see also Howarth & Grant 1982). A total of 87 species have been reported, of which 55 were encountered on my regular censuses during 1982-83. Twenty-two species appeared on every census, and 43 were seen on two or more counts. Ten species (Silver Gull, Grey Teal, Hoary-headed Grebe, Crested Tern, Sharp-tailed Sandpiper, Black Swan, Little Pied Cormorant, Chestnut Teal, Australian Pelican, Little Black Cormorant and Little Tern) reached populations exceeding 200 individuals at least once during the survey. Howarth & Grant (loc. cit.) encountered 24 species in their surveys in 1979, all but one of which I also regularly encountered. They did not, however, extend their surveys to include the Charadriiformes; if this group is deleted, my own comparable list (*i.e.* recorded on regular counts) was 30 species.

Lake Illawarra makes an important contribution to maintaining Palaearctic waders in south-eastern Australia, especially Sharp-tailed Sandpipers, and a significant number of waterfowl use the lake as a refuge in periods of drought in the interior. Most birds utilise the shallow margins (to about the 2-metre contour, or about 30 per cent of the total surface area) rather than deeper waters at the centre. The entrance shoals and the eastern and northern shores are especially important in terms of numbers of individuals. Species diversity is nearly constant in all areas, although several species exhibit distinct habitat preferences within the lake. The entrance shoals, Griffins Bay and Koongburry Bay are especially important when the number of individuals and of species are considered together. Bird populations seem adversely affected by human disturbance, especially that resulting from such factors as trail bikes, vehicles and dogs.

I found that wader feeding grounds are almost always available on the margins and estuary of the lake and, unlike most other tidal wetlands in New South Wales, flock roosting does not occur at high tide. I hope that Lake Illawarra will be preserved in its present state because in the coastal areas of New South Wales, Goodrick (1970) has shown that 60 per cent of the prime water-and shore-bird habitat has already been destroyed.

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Kevin Wood, 7 Eastern Avenue, Mangerton NSW 2500

A WANDERING TATTLER AT WINDANG ISLAND, WOLLONGONG, NSW

MIKE DOYLE, ALISTAIR DRAKE, AND DIERK VON BEHRENS

On 26 March 1983, during a Canberra Ornithologists Group field trip to the Wollongong area, we located a Wandering Tattler *Tringa incana* feeding on tideline rocks at Windang Island, off the mouth of Lake Illawarra, NSW. The bird was initially seen in the company of a small party of Grey-tailed Tattlers *Tringa brevipes,* but when this group was flushed the Wandering Tattler separated from it. A few minutes later the bird was found further along the shore, this time feeding alone. It was then observed closely for about twenty minutes and during this time it became less active and allowed us to approach to about ten metres; excellent views were obtained through at 25x tripod-mounted telescope and a detailed field description was taken.

Field Description:

SIZE AND SHAPE Slightly larger than accompanying Grey-tailed Tattlers, but very similar in shape.

PLUMAGE Crown, back of neck, and entire dorsum plain slaty grey, the crown very slightly darker than the neck and back. Superciliary white, distinct in front of the eye but faint behind it. Eyestripe grey, almost black in front of eye. Ear coverts and chin streaked grey and white, the streaking merging into barring on the breast. Breast, upper belly and flanks barred in a distinct zig-zag pattern, slaty grey and white; these markings much more distinct (both heavier and darker) than those of the Grey-tailed Tattlers. Centre of belly, from legs to vent, plain white. Undertail coverts barred slate grey on white, the bars very distinct. A patch of uniform grey on the flank in front of the undertail coverts. Eyelids white.

FLANK PATTERN Uniform grey on back, wings and tail.

BARE PARTS Legs yellow. Bill straight, fairly stout, about 1.25 times as long as the head, dark grey shading to dull pink at the base of the lower mandible. Nasal aperture (naris) long and triangular; the nasal groove, which could be seen clearly when viewing the inactive bird through the telescope at ten metres, extended about two-thirds of the way along the length of the bill.

BEHAVIOUR Fed actively on wave-washed rocks, or perched quietly on the top of a boulder a metre or two back from the water's edge. Occasionally bobbed its tail.

VOICE When flushed, gave a rapid sequence of about eight short whistles.

The bird can be identified as a Wandering Tattler in almost full breeding plumage by the heavy dark barring of the underparts, and especially of the undertail coverts; the commoner Grey-tailed Tattler has white undertail coverts, even when in breeding plumage (Pizzey, 1980). The identification is confirmed by the call: in the calls of the Grey-tailed Tattler the notes are fewer and longer. The comparatively large size and the long nasal groove also indicate that the bird was a Wandering Tattler.

The Wandering Tattler is a rare but probably regular non-breeding summer visitor to the coast of eastern Australia (Pizzey *loc. cit.*). The only previous record for the Illawarra district is a specimen taken at Five Islands (about ten kilometres north-east of Windang Island) in 1913 (Gibson 1977); this is the southernmost locality at which it has been recorded in New South Wales (Morris, McGill & Holmes 1981), or indeed in Australia (Blakers, Davies & Reilly 1984). Our bird was thus at the extreme southern limit of its distribution in Australia. Wandering Tattlers may be under-recorded, however, as they are difficult to separate from Grey-tailed Tattlers in the field. We thank A.K. Morris, A.E.F Rogers, E.S. Hoskin, A.P. McBride and T.R Lindsey for their comments on an earlier draft of this note.

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NOTICE TO CONTRIBUTORS

Contributors are requested to observe the following points when submitting articles and notes for publication

1 Species, names, and the order in which they occur are to be in accordance with "Handlist of Birds in New South Wales" A.K. Morris, A.R. McGill and G. Holmes 1981 Dubbo: NSWFOC

2 Articles or notes should be typewritten if possible and submitted in duplicate. Double spacing is required.

3 Margins of not less than 25mm width at the left hand side and top, with similar or slightly smaller at the right hand side of pages.

4 No underlinings and no abbreviations except as shown in the examples.

5 Photographs should be glossy finish and not too small.

6 The *Style Manual,* Commonwealth Government Printing Office, Canberra (1966) and subsequent editions will be the guide for this Journal.

7 Diagrams should be on plain white paper drawn with india ink. Any lettering is to be professional style or lightly pencilled.

8. Dates must be written "1 January 1975" except in tables and figures where they may be abbreviated.

9 The 24–hour clock will be used, times being written 06:30, 18:30 for 6.30 a.m. and 6.30 p.m. respectively.

10 Mr, Mrs, Dr are not followed by a full stop.

11 In text, numbers one to ten are spelt; numbers of five figures or more should be grouped in threes and spaced by a thin gap. Commas should not be used as thousands markers.

12 References to other articles should be shown in the text— B.W. Finch and M.D. Bruce (1974) stated. and under heading

REFERENCES

Finch, B.W and M.D. Bruce 1974 The Status of the Blue Petrel in Australian Waters Aust Birds **9**, 32–35

13 Acknowledgements to other individuals should include Christian names or initials.

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