

Most waders use the mudflats during both spring and autumn passage, and as a wintering site. The most abundant waders were Dunlins Calidris alpina (up to 9000 birds) and Sanderlings Calidris alba (about 4000 birds). We saw Sanderlings only in December and February. Other numerous wintering waders, occurring at least in some hundreds, were Ringed Plovers Charadrius hiaticula, Kentish Plovers Charadrius alexandrinus, Grey Plovers Pluvialis squatarola, Little Stints Calidris minutus, Redshanks Tringa totanus, Curlews Numenius arquata and godwits. However, the pattern of occurrence differed between species. Grey Plovers and Ringed Plovers were particularly numerous on spring passage, and few occurred during autumn. Similarly, few Dunlins occurred on autumn passage. In contrast, numbers of Curlews, godwits and Kentish Plovers were similar in spring and autumn. Few Little Stints or Whimbrels Numenius phaeopus were present outside migration periods.

In addition to wintering and passage waders, we found small populations of breeding Little Ringed Plovers Charadrius dubius and Kentish Plovers.

Other birds that used the Dubai Creek mudflats in appreciable numbers during migration and for wintering were Grey Herons Ardea cinerea, Reef Herons Egretta gularis, Greater Flamingoes Phoenicopterus ruber (especially during spring and autumn), Teal Anas crecca, and Slender-billed Gulls Larus genei. In spring, there is a large passage (up to 500 - 600 birds each hour) of terns, particularly Gull-billed Terns Gelochelidon nilotica, Caspian Terns Hydroprogne tschegrava and Little Terns Sterna albifrons, westwards along the coast.

The only waders that we found elsewhere than the Dubai Creek mudflats were in Saffa Park. This park is grassland, with avenues of trees, and with a pond of semi-treated sewage at its centre. The sewage is sprayed as fertiliser over the park at dawn and dusk. Between September and April, the pool was used by between 1 and 5 Red-necked Phalaropes Phalaropus lobatus. About 40 Ruffs Philomachus pugnax (both males and females) and 10 - 15 Golden Plovers Pluvialis apricaria fed on the grassland throughout the winter. The park is also an important spring and autumn stopover site for passerine migrants.

We estimated that peak numbers of over 15000 birds used the Dubai Creek mudflats. Little is known of the importance of the Arabian Gulf for migrant and wintering wader populations. However, it seems probable that the Dubai Creek mudflats are an important wintering and migration stopover for several species of waders. We think that the numbers of waders using Dubai Creek may be increasing, possibly as a consequence of nutrient enrichment from increased sewage outflow in recent years. Presumably the passage birds belong to populations that spend the winter in eastern Africa. The importance of Dubai, and other parts of the Arabian Gulf, to waders warrants further investigation. Anyone interested in visiting Dubai should contact Mike West.

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WADER STUDIES IN AUSTRALIA: A REVIEW OF WADER COUNTS

by Brett A. Lane, John D. Martindale and Clive D.T. Minton

Introduction

In the last ten years, interest in waders in Australia has expanded dramatically. Prior to then, little was known of their broad distribution patterns and population numbers. This paper reviews the expansion of knowledge in the last thirty years and presents the results of the most recent comprehensive counts conducted over the last three years.

History

Australia is largely empty, with 80% of its population living within 100 kilometers of the coast. Its coastline displays great geographic variation, stretching for over 19,000 kilometers. In the North of the continent, much of it is remote and inaccessible. The same holds for much of the inland of the continent. In most years, the inland is desert, but occasionally, provided the rains are heavy enough, extensive temporary wetlands develop.

Information on waders around population centres has been published in a variety of journals. Wall (1953) wrote the first comprehensive review of the wader populations in an area (Hobart, Tasmania). Since then, numerous accounts have been published; for the Adelaide region (Glover 1954; Boehm 1960, 1964; Beruldsen 1972), Sydney area (Hindwood & Hoskin 1954) and Melbourne (Wheeler 1955; Smith 1962, 1964, 1966, 1967). Liddy (1955, 1960) was the first to publish information from an inland area (Mt Isa in North-west Queensland). The waders of inland South-west New South Wales were reviewed by Hobbs (1958a, 1958b).

Amiet (1957) was the first to conduct a regular, systematic survey of waders, at a site on Moreton Bay, Brisbane, Queensland. In addition, he presented results of a number of spot counts at sites near population centres on the Queensland coast between Brisbane and Cairns. The general account by Thomas (1968) was the last one covering a substantial period, and updated information in Wall's (1953) paper.

There were two characteristics of this period: 1) information was available and published only from the immediate vicinity of population centres, reflecting the mobility (or immobility) of people interested in waders, and 2) with the exception of Amiet's (1957) work in Brisbane, no studies involving regular counting of waders at a site, either throughout the year, or from year to year, were done.

The next systematic survey of waders at a site was not done until the 1960's, in the Hobart area (Thomas 1973), and the methods used formed the basis for much subsequent work. In the early 1970's, two surveys involving regular counting, at Westernport Bay, near Melbourne and Botany Bay in Sydney were started. Both surveys were stimulated by the potential threat of encroaching urban and industrial development. Westernport Bay has been counted ever since at intervals of two months. The results of the earlier counts were presented by Loyn (1978). These were the first surveys to cover all known high tide roosts in an estuary, and involved a team of co-ordinated volunteers.

Both the Westernport and Botany Bay surveys gave many people the opportunity to become familiar with waders, and demonstrated for the first time in Australia what could be achieved by a co-ordinated voluntary effort.

The Last Three Years

In December 1979, the Victorian Wader Study Group organised the first comprehensive count of all sites known to hold waders along the Victorian coast. Over 90 volunteers were involved and over 80,000 waders were counted. For the first time, this enabled the comparative significance to be assessed on a statewide basis.

Fifteen months later, with the formation of the Australasian Wader Studies Group, a nation-wide count was attempted. Good coverage was achieved from the Adelaide region around the South-east coast to Brisbane, including Tasmania, and around Perth in Western Australia. Only four limited locations were counted in the huge stretch of coast from Cairns around the North of the continent to Perth. The 2,000 kilometers between Perth and Adelaide was covered unevenly, but much of the coast is unsuitable for waders. Over 300 volunteers participated and nearly 400,000 birds were counted. In July 1981 a winter count was conducted, and although the turnout was not as good, some worthwhile data was gathered. In February 1982 a further national count involving over 300 people was held, and included an aerial survey of the Gulf of Carpentaria and Cape York Peninsula (nearly half the Northern coastline of Australia). Much better coverage was achieved and over 630,000 waders were counted. Table 1 presents the results of this count on a state by state basis.

Table 1. State by state summary of birds counted, participants and sheets received, National Wader Count, Summer, 1982.

State	No. birds	No. people	No. sheets
Victoria	136,661	118	156
South Australia	305,509	97	94
Western Australia	43,980	27	87
Queensland	14,351	43	49
New South Wales	12,859	35	51
Tasmania	12,509	10	10
Northern Territory	2,784	5	10
Aerial Survey (Gulf)	130,000	-	-
Grand Total	658,655	335	472

From the outset it was realised that the greatest problem facing wader studies in Australia was how to explore the remote Northern coastline. In August and September 1981, the first North-west Australia Wader Studies Expedition was organised, with the backing of the Royal Australasian Ornithologists Union and a number of private companies. This was the first time aerial surveying techniques had been used in Australia to determine the population and distribution of waders. In the Broome - Port Hedland area, this was followed up with ground counts and banding activities. In December 1981, further aerial surveying was conducted in the Gulf of Carpentaria and on the coast of Cape York.

The last two years of comprehensive ground and aerial counts have resulted in an unprecedented increase in our knowledge of the distribution and abundance of Australia's wader populations. There are still gaps which must be filled if a total picture is to emerge. Figure 1 and Table 2 show the areas so far discovered which hold over 10,000 waders in mid-summer (Northern Hemisphere winter). Table 3 gives a breakdown of the known populations of species which occur in Australia.

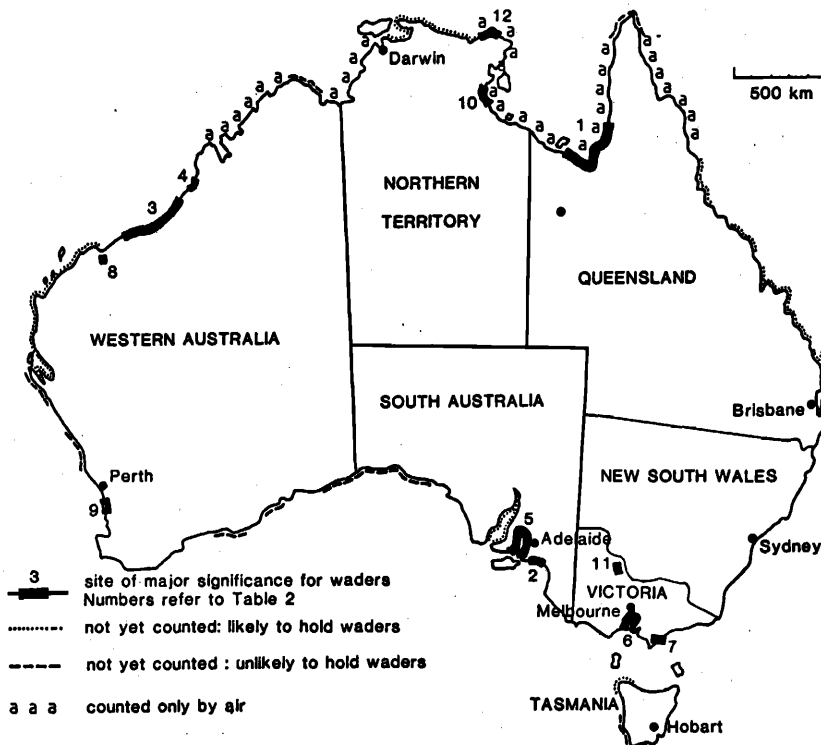


Figure 1. Sites of significance to waders in Australia.

Table 2. Known distribution of wader populations in Australia

Sites with more than 10,000 birds

1. Nassau River - Point Parker, Queensland (South-east Gulf of Carpentaria)	226,700
2. The Coorong, South Australia	214,100
3. Eighty Mile Beach, Western Australia	102,400
4. Roebuck Bay, Western Australia	78,200
5. St. Vincent Gulf, South Australia	67,200
6. Port Phillip Bay-Bellarine Peninsula, Victoria	65,800
7. Corner Inlet, Victoria	29,000
8. Leslie Salt Works, Port Hedland, Western Australia	28,400
9. Peel Inlet, Western Australia	19,000
10. Roper River Mouth, Northern Territory (South-west Gulf of Carpentaria)	13,700
11. Kerang-Swan Hill Lakes, Victoria	13,100
12. Buckingham Bay-Castlereagh Bay, Arnhem Land, Northern Territory	11,100
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Total for 12 major sites	868,700
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Elsewhere in Victoria	42,100
Elsewhere in South Australia	90,700
Elsewhere in Western Australia	24,000
Elsewhere in Queensland	20,300
Elsewhere in Northern Territory	17,700
Tasmania	12,500
New South Wales	13,100
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Total for other places	220,400
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<u>GRAND TOTAL</u>	1,089,100

These totals are based on non-synchronous counts within the one season with the exception of St. Vincent Gulf which was only fully covered in February 1981 and the maximum count for Port Phillip Bay in February 1981. Totals include migratory AND non-migratory species.

The Future

The future will require much more work. Funding has been obtained for annual expeditions to Northern Australia for the next three years (overseas visitors are always welcome to participate!). In August - September 1982 another expedition to the Broome - Port Hedland area was organised and in subsequent years, the South-east Gulf of Carpentaria may be visited.

Those gaps which remain can only be filled using aerial survey techniques. Although aerial surveys have proved invaluable in locating major concentrations of waders, they do have their limitations. Species identification for all but the most distinctive waders (e.g. Black-tailed Godwits *Limosa limosa*) is virtually impossible, necessitating follow-up ground work from boats or helicopters. This will be difficult, since the coast from Cairns to Broome is difficult to approach and fringed with mangroves, salt flats and tidal rivers with their various reptilian inhabitants!

Australasian wader sites holding more than 50,000 birds

1: South-east corner of Gulf of Carpentaria, North Queensland. The Gulf of Carpentaria is a very shallow yet extensive area of sea. At low tide, extensive mudflats are exposed. These are lined at the high tide mark with mangroves, backed by saline flats which flood in the highest tides and during the wet season (for a detailed account of these flats see Crawford 1980). Unlike the previous areas, which are relatively accessible, the Gulf coast is only serviced by a handful of rough tracks. Thus, it has only been surveyed from the air. The waders found in this area, which stretches about 100 kilometers north and 50 kilometers west of Karumba, include large numbers of Black-tailed Godwits. Substantial numbers of the two knot species *Calidris canutus* and *C. tenuirostris*, small calidris, plovers, Eastern Curlews *Numenius madagascariensis* and Whimbrel *N. phaeopus* are present also.

The site has been fully surveyed twice from the air; in December 1981 and February 1982. Difficulties in identifying species from aircraft have allowed only a general picture to emerge. The numbers of each species are not known, with the exception of the Black-tailed Godwit, which is quite distinctive in flight (total 51,000, December 1981). The total number of waders seen from the plane was over 226,000 in December and 130,000 in February. The former count makes it the most significant wader site yet discovered in Australia.

2: The Coorong and Murray-mouth Lakes, South Australia. This is a complex system of lakes and lagoons at the mouth of Australia's largest river system. Two extensive freshwater lakes artificially isolated from the sea by barrages and a 60 km. long narrow lagoon separated from the ocean by sand dunes (The Coorong), are the main features. During summer, the shallower end of the Coorong, furthest from the sea, slowly dries out, exposing saline flats.

The wader population totals 214,100 birds. It is characterised by large numbers of small calidrids: Red-necked Stint *Calidris ruficollis* 62,000, Curlew Sandpiper *C. ferruginea* 21,000 and Sharp-tailed Sandpiper *C. acuminata* 52,000 birds. In addition, the saline-loving endemic Banded Stilt *Cladorhynchus leucocephalus* occurs in large numbers (59,000).

3: Eighty Mile Beach, North-west Western Australia. This area has only been recently studied for the first time, in August-September 1981, as a part of the North-west Australia Wader Studies Expedition, organised by the Australasian Wader Studies Group. Despite its name, it is, in fact, a 250 km. long continuous beach with a width of up to 5 km. of mudflats exposed at low tide. Tidal ranges throughout Northern Australia are high compared to the south. Most areas experience from four to nine metre tides, with the highest being in the Broome - Port Hedland area.

Table 3. Known populations of waders in Australia

More than 1,000 birds.	No. of birds counted
Red-necked Stint <i>Calidris ruficollis</i>	222,586
*Banded Stilt <i>Cladorhynchus leucocephalus</i>	103,460
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	102,409
Curlew Sandpiper <i>Calidris ferruginea</i>	89,737
Black-tailed Godwit <i>Limosa limosa</i>	51,000
Bar-tailed Godwit <i>Limosa lapponica</i>	48,110
Great Knot <i>Calidris tenuirostris</i>	44,649
Red Knot <i>Calidris canutus</i>	29,519
*Red-capped Plover <i>Charadrius ruficollis</i>	27,615
*Black-winged Stilt <i>Himantopus himantopus</i>	19,049
Large Sand Plover <i>Charadrius leschenaultii</i>	16,981
*Red-necked Avocet <i>Recurvirostra novaehollandiae</i>	15,701
*Masked Lapwing <i>Vanellus miles</i>	9,185
Eastern Curlew <i>Numenius madagascariensis</i>	6,817
Greenshank <i>Tringa nebularia</i>	5,102
Ruddy Turnstone <i>Arenaria interpres</i>	4,519
Grey Plover <i>Pluvialis squatarola</i>	4,348
*Pied Oystercatcher <i>Haematopus ostralegus</i>	4,169
Sanderling <i>Calidris alba</i>	3,157
Oriental Pratincole <i>Glareola maldivarum</i>	3,011
Mongolian Plover <i>Charadrius mongolus</i>	3,206
Grey-tailed Tattler <i>Tringa brevipes</i>	2,639
Lesser Golden Plover <i>Pluvialis dominica</i>	2,070
Oriental Plover <i>Charadrius veredus</i>	1,603
*Red-kneed Dotterel <i>Erythropus cinctus</i>	1,258
Whimbrel <i>Numenius phaeopus</i>	1,185
Other Species	
*Bush Thick-knee <i>Burhinus magnirostris</i>	4
*Beach Thick-knee <i>Burhinus neglectus</i>	12
*Painted Snipe <i>Rostratula benghalensis</i>	4
*Sooty Oystercatcher <i>Haematopus fuliginosus</i>	878
*Hooded Plover <i>Charadrius rubricollis</i>	468
*Black-fronted Plover <i>Charadrius melanotos</i>	388
Little Curlew <i>Numenius minuta</i>	195
Wood Sandpiper <i>Tringa glareola</i>	72
Common Sandpiper <i>Actitis hypoleucos</i>	229
Marsh Sandpiper <i>Tringa stagnatilis</i>	537
Terek Sandpiper <i>Tringa terek</i>	326
Latham's Snipe <i>Gallinago hardwickii</i>	313
Pectoral Sandpiper <i>Calidris melanotos</i>	23
Long-toed Stint <i>Calidris subminuta</i>	40
Broad-billed Sandpiper <i>Limicola falcinella</i>	610
Ruff or Reeve <i>Philomachus pugnax</i>	4
*Australian Pratincole <i>Stiltia isabella</i>	116
Asian Dowitcher <i>Limnodromus semipalmatus</i>	130
<hr/> Total identified species	827,434
<hr/> Total unidentified (aerial survey)	261,666
<hr/> GRAND TOTAL (rounded)	1,089,100

* = Species which are not trans-equatorial migrants
 + = Figure likely to be an underestimate

Like most areas in Northern Australia, Eighty Mile Beach has a very different species assemblage to Southern Australia. 102,400 waders have been counted here, and it is probably one of the principle wintering and/or passage areas in the East Asian/Pacific region for Large Sand Plover *Charadrius leschenaultii* (2,700 birds) and Great Knot *Calidris tenuirostris* (21,800 birds). Small calidrids (excluding Sharp-tailed Sandpipers) total nearly 50,000, Bar-tailed Godwits *Limosa lapponica* over 7,000 and Red Knots over 15,000. It is not known how these August - September numbers compare to mid-summer populations, or when peak populations occur.

4: Roebuck Bay, Broome, North-west Western Australia. This site was first surveyed in August - September 1981 and again in October 1981. The results presented in Table 1 are maxima for species. Population increases and changes in species composition between the two dates suggest that the area may be an important staging post for some species before further southward migration.

This site is just north of the previous one and holds similar waders in slightly lower numbers. It is a wide bay (30 kilometers in diameter) with extensive mudflats exposed at low tide. There are a number of areas of sandy beaches which provide suitable high tide roosts. Again, in combination with Eighty Mile Beach, this must make North-west Western Australia one of the most important wintering and/or passage areas for Large Sand Plover and Great Knot (Roebuck Bay totals 13,000 and 17,000 respectively). The total number of birds which use the area is at least 78,200. Bar-tailed Godwits are particularly abundant (24,000 birds).

5: St. Vincent Gulf, South Australia. This is one of the two South Australian Gulfs. The other, Spencer Gulf, has not yet been comprehensively surveyed, but preliminary observations suggest that it may also be a significant wader wintering area. The northern halves of these Gulfs have a considerable tidal range, and, at low tide, extensive mudflats are exposed. There are two saltworks along the shores of St. Vincent Gulf, one at the north end (Price) and another half way down the east shore just north of the City of Adelaide. These are both extremely important as high tide roosts and supplementary feeding areas. They also provide extensive habitat for over 5,000 Banded Stilts.

There is a larger variety of waders at this site, with larger species such as knots (both species) and godwits being present in good numbers compared to other southern Australian sites. The small calidrids dominate, however, comprising about 43,000 of the total 67,200 birds.

6: Port Phillip Bay, Victoria. Of all the significant wader sites in Australia, this is the most altered by human activities. It is 50 kilometers in diameter and bounded on the north and east by the suburban sprawl and industry of Melbourne (pop. 2,800,000). Primary wader sites within the Bay are Altona, Queenscliff/Swan Bay and Werribee Sewerage Farm. The last area consists of 250 square kilometers of grass filtration paddocks and lagoons, and is highly enriched by sewage.

It is largely inhabited by the smaller calidrids in very high feeding densities. Knots, godwits and curlews are found in small numbers at the southern end of the Bay near the ocean entrance in the vicinity of Mud Islands and Swan Bay. Large numbers of birds also inhabit the evaporation ponds of the three large saltworks on its western and southern shores.

The Bay holds a total population of 65,800 birds. Of these about 60,000 are Red-necked Stints (29,000), Curlew Sandpipers (20,000) and Sharp-tailed Sandpipers (11,000).

Acknowledgements

The collection of the data presented here has involved the efforts of many people who have willingly devoted time and energy to the task. In particular the following people and organisations have been most helpful: The more than 300 volunteers who have helped in the national wader counts, and who are the backbone of the whole project, Dr. Roger Guard of Cairns and Messrs. Stephen Garnett and Ian Carruthers of Townsville, for conducting aerial surveys of Cape York and the Gulf of Carpentaria, Mr. Don Jeans and Mr. Peter Goldstraw, pilots for the North-west Expedition in 1981, The Federal Departments of Health and Transport for providing places on coastal surveillance planes for aerial surveying of remote coastline in Northern Australia.

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Postscript

Between 14 and 19 November 1982, members of the Australasian Wader Studies Group made an expedition to the north-western coast of Australia. Ground and aerial surveys revealed the following wader totals:

Roebuck Bay	106,726
Roebuck Bay to Eighty Mile Beach	23,805
Eighty Mile Beach	336,850
Eighty Mile Beach to Port Hedland	30,020
Port Hedland Saltworks	66,533
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Total Broome to Port Hedland	563,934

This survey was made later in the season, and in a different season, to those described in the paper.

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REVIEWS AND ABSTRACTS

Meininger, P.L. and Mullie, W.C. 1981. The Significance of Egyptian Wetlands for Wintering Waterbirds. Copies available (price US \$20) from The Holy Land Conservation Fund, 150 East 58th Street, New York, NY 10155, USA.

Summary by the authors

This report deals with the results of the Netherlands Ornithological Expeditions to Egypt in the winters 1978/79 and 1979/80. The major aim of the expeditions was to carry out counts of wintering waterbirds in the Egyptian Wetlands and to collect information on the threats to these wetlands.

In chapter 3, a description is given of each wetland area. The dates of visits, methods of counting, observers, estimated coverage and results of the counts are also mentioned. Significant features of, and threats to, the area are discussed.

Lake Maryut (31.08 N, 29.56 E) and Lake Idku (31.15 N, 30.15 E) seem to be of little importance for wintering waterbirds. However, these lakes may well be important staging areas for migratory birds in autumn and spring. Both lakes are threatened by land reclamation and bird-catching. Lake Maryut receives industrial pollution and in Lake Idku dredging of the bed, clearing of weeds and intensification of fisheries are further problems. Bird counts in autumn and spring and a census of breeding birds are recommended.

Lake Burullus (31.30 N, 30.50 E), 462 km², is a waterbird wintering area of international importance, with possibly over half a million birds wintering. The most important species counted are Wigeon (35,600), Shoveler (63,500), Pochard (8,300), Ferruginous Duck (6,580), Coot (153,500), Black-headed Gull (36,000) and Whiskered Tern (17,500).

Land reclamation, particularly along the southern shore of this lake, may be considered the main threat to this area. Further reclamation should be prevented and the lake and adjacent marshes should be made a wildlife reserve. It is recommended that more counts in autumn, winter and spring, and a breeding bird survey be carried out.

Lake Manzala (31.08 N, 31.56 E) is the largest Delta lake (1,200 km²) and a wintering area of international importance for waterbirds (over 300,000 birds wintering). The most important species counted are Shelduck (1,000), Shoveler (8,800), Coot (51,300), Avocet (1,840), Kentish Plover (6,500), Little Stint (6,200), Redshank (3,400), Black-headed Gull (24,000) and Whiskered Tern (7,400).

Reclamation of marshes and fishfarms (mudflats) should be stopped and (at least part of) the lake should be made a wildlife reserve. Shooting and trapping of waterbirds should be completely forbidden, and such prohibition enforced.

Wadi Natrun (30.25 N, 30.13 E) does not seem to be of major importance for wintering waterbirds. Better counts of waders and a census of breeding birds are recommended.

Lake Qarun (29.25 N, 30.40 E) is another wintering area of international importance for waterbirds. The most important species counted are Great Crested Grebe (3,440), Black-necked Grebe (10,800), Shoveler (11,700), Tufted Duck (5,650), Coot (18,800) and Slender-billed Gull (1,240). Counts in autumn and spring and a census of breeding birds are recommended. Hunting by foreign tourists is a serious threat to the significance of the area and therefore should be forbidden.

Wadi Ruwayan (29.10 N, 30.23 E) may develop as an important area for birds in the (near) future. This is a complex of newly created desert lakes, in which succession of flora and fauna has just started.

Lake Timsah and the Bitter Lakes (31.17 N, 32.25 E) seem to be of little importance for wintering waterbirds, but our counts were incomplete.

El Malaha near Bur Fuad (31.15 N, 32.19 E) is a very important wintering area for waterbirds, e.g. Black-necked Grebe (1,300), Cormorant (2,200), Greater Flamingo (6,400), Shelduck (825), Slender-billed Gull (5,430). Moreover, in this area are breeding colonies of Greater Flamingo and of Slender-billed Gull. More complete counts in winter, autumn and spring as well as a census of breeding birds are strongly recommended. It is suggested to make El Malaha and the adjacent marshes a wildlife reserve. Any land reclamation and drainage of fresh water from the irrigation projects of northern Sinai into El Malaha should be prevented. Taking eggs and catching Flamingos should be prohibited and the rules should be enforced.