Monitoring of Bird Populations in the Environs of Fisherman Islands: 1992-1993

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1 Introduction

The report covers the period of monitoring of bird populations between November 1992 and June 1993. It is the second report on birdlife of Fisherman Islands. The first report, entitled *Assessment of Bird Populations of the Environs of Fisherman Islands* (Driscoll 1992), documented the local birdlife and established the location and importance of roost sites and intertidal feeding areas. The present report focuses on monitoring changes in bird distributions and any impact of large scale upgrading of the port facility. Strategies are proposed to help ameliorate adverse effects of the construction program.

Changes at Fisherman Islands over the last twelve months have followed the Port of Brisbane Authority strategic plan and involved major road works in the south and the establishment of further reclamation paddocks and bund walls. As a consequence, areas of mangrove and claypan have been destroyed and the shoreline on the northern end of the island has changed appreciably. The principal roost site on the island, around a lagoon at the northern end of the island, is still being used by birds. However, the lagoon continues to be filled with mud and the surrounding foreshores are constantly being altered. There have also been further habitat encroachments along the eastern side of the island, particularly at the back of the "cove", which has been noted for its importance to birdlife.

The impact of these changes and engineering options that may ameliorate the long term impact of these developments are discussed in this report. The report is also intended as an interim record of the birdlife and as a consolidation of the previous study. Much of the information from the previous study is presented in the context of data from recent fieldwork.

The other major aspect of the report is the presentation of counts of waders taken at roost sites in other parts of the Bay. These counts have been made by members of the Queensland Wader Study Group (special interest group of the Queensland Ornithological Society Inc.) for the period March 1992 to May 1993 and are given in full in a recent report to the Coastal Management Unit of the Qld Department of Environment and Heritage (Driscoll *et al.* 1993). There has been a free flow of information between QWSG and the Port Authority and it was always intended that studies on birdlife by the Port Authority be integrated with a broader assessment of wading birds by QWSG throughout Moreton Bay.

Observations were made of fine scale habitat preference of waders but the data are too few to be conclusive. However, a previous study by Stewart (1990) of birds feeding at Thorneside and Luggage Point is used to illustrate some of the points relevant to management of intertidal areas around Fisherman Islands.

Banding and leg flagging of birds at Fisherman Islands has also continued and these results are presented in the context of the general program of wader banding being undertaken around the Bay by QWSG. Banding of resident and migratory waders has been useful for

determining site fidelity of individuals and for documenting local bird movements and movements along the Asian/Australasian Flyway.

2 Methods

The initial sampling period consisted of three days in the field in late October and early November 1992, followed by six days fieldwork early in February, three days late in March and three days in June. In addition, several other visits were made to the area to conduct roost counts or to cannon net. Cannon netting was conducted successfully on 3 occasions between October 1992 and March 1993.

The study area was the same as that outlined in Driscoll (1992) with the exception that the Wynnum area and Green Island were not visited and there was insufficient time to sample terrestrial birds in mangroves. The main areas of mangrove have remained largely untouched since the last report. In future, monitoring in mangroves could be resumed to gain an appreciation of any changes to the avifauna of mangroves.

Claypans on Fisherman Islands and the surrounding intertidal mudflats and seagrass beds were sampled as well as the roost sites identified in the previous study. The southern shoreline of the Boat Passage was sampled on several occasions and single visits were made to Luggage Point and St Helena Island at low tide. These additional observations were necessary to ascertain changes in birdlife in neighbouring areas over time.

Observations were concentrated at sites which were identified in the previous study as being typical of a certain type of habitat, or which had distinctive characteristics. Sites have been identified in the tables and figures in this report on the basis of labelling they were given for the October sampling reported in Driscoll (1992). Much of the data from the earlier study are presented again in the context of comparisons over time.

The technique of sampling feeding birds at low tide (scan counts) was the same as used previously and in other studies around Moreton Bay (e.g. Thompson 1990, Driscoll 1991). Scan counts are primarily intended to give the percentage representation of the different species being counted and are not a measure of the absolute number of birds in an area. Exposed intertidal areas are sampled using a telescope (20x lens) and records of birds made within a radius of up to 150 m of a point through an arc of between 40° and 340°. Sites were mostly approached by canoe but also from the land so that bird counts were not necessarily taken from the edge of the water. Observations are made within 90 minutes of low tide.

Problems arise because birds tend to withdraw from the observer. Secondly, it is difficult to be precise about the boundaries of an area being observed for each scan and thirdly, birds often feed in clumps and concentrate in different areas as the tide changes. In the four sampling periods, 6, 14, 16 and 9 scan counts were made in November, February, March

and June respectively. This is in addition to the scan counts made in August 1991, October 1991 and January 1992 (11, 25, and 11 respectively).

The other main sampling technique involves estimating the total number of birds at high tide roosts. Counts were conducted at the main Fisherman Islands roost on seven occasions between November and June. Getting a reliable count of all species at a high tide roost is very difficult although for some species this is more practical. These include the Bar-tailed Godwit and Eastern Curlew which can act as "key" species. Numbers of other wader species can be inferred using the ratio of low tide scan counts of other species to that of the key species, assuming there is a fairly accurate estimate of the numbers of the key species from the roost counts.

Many incidental observations of birds and conditions were made but only where these add to the details outlined in Driscoll (1992) have they been included in this report. The banding was conducted by QWSG in accordance with permits, guidelines and procedures given by the Australian Bird Banding Scheme and Qld National Parks and Wildlife Service.

As for the previous report, data from scan counts are subjected to classification analyses using counts of waders only, providing a species was observed during at least two scan counts. Details of the analysis technique were given in Driscoll (1992), although the approach differs a little in the present context, as explained in the results section.

3 Roost counts

3.1 Migratory waders

3.1.1 Species of note

The pattern of seasonal change in several of the migratory waders can be seen through a compilation of data from a number of roost sites between March 1992 and May this year (Appendix F). The species chosen for illustrating these changes and which are considered in Figure 3 for Fisherman Islands, is on the basis of a report by the Australasian Wader Studies Group (Watkins 1993). Moreton Bay is considered significant internationally for its numbers of Lesser Golden Plover, Mongolian Plover, Grey-tailed Tattler, Eastern Curlew, Bar-tailed Godwit, Curlew Sandpiper and Pied Oystercatcher. Similarly, the area is significant nationally for Whimbrel, Terek Sandpiper and Ruddy Turnstone. These species, together with the Great Knot and Red-necked Stint, which are relatively common in the Bay region, constitute a core set of species to focus upon. However, numbers of Lesser Golden Plover, Terek Sandpiper and Ruddy Turnstone are not high at most roost sites because they tend to roost alone in small groups at a range of isolated sites. Therefore, roost counts for Mongolian Plover, Eastern Curlew, Whimbrel, Grey-tailed Tattler, Bar-tailed Godwit, Great Knot, Red-necked Stint, and Curlew Sandpiper are presented in Figure 3 and Appendix F. Data for Lesser Golden Plover, Terek Sandpiper and Ruddy Turnstone are tabulated only (Appendix E). In addition counts of the three most common resident waders found at

Fisherman Islands are presented graphically in Figure 3. Roost counts of the total number of migratory waders for Fisherman Islands are given in Figure 1.

3.1.2 Species using the sites

Despite changes to the northern foreshore at Fisherman Islands high numbers of waders have persisted in using the area as a roost site. In addition to the data presented in Figures 1, 2 and 3, a complete record of the counts made here and on the claypan on the south eastern side of the Island is tabulated in Appendix E. These data include counts made in the previous survey as is the case for Figures 1 and 3. The main roost has now been counted on 13 occasions and the claypan on 7 occasions. The high diversity of species using the main roost has also persisted over time and there appears to have been higher numbers of some species using the roost site during the summer of 1993 than during the previous summer. These species include Curlew Sandpiper, Mongolian Plover, Large Sand Plover, Pied Oystercatcher and possibly Great Knot (Figure 3, Appendix E). Unfortunately, there are no formal count records going back prior to 1991, although I have seen large numbers of birds using the old sand spit out from Bishop Island as a roost site in 1989 and 1990.

The species of wader most numerous on the main roost at Fisherman Islands include Great Knot, Curlew Sandpiper (both of which feed mostly at Luggage Point), Bar-tailed Godwit, Mongolian Plover, Large Sand Plover and, at certain times of the year, Red Knot (spring) and Grey-tailed Tattler (autumn). In addition, significant numbers of Grey Plover and Black-tailed Godwit occur at the site, neither of which is particularly common elsewhere in the Bay. Of the resident species, the Pied Oystercatcher, Black-winged Stilt and Red-necked Avocet are invariably numerous at the main roost site (Figure 3). The Red-necked Avocets represent by far the largest, most consistent concentration of this species recorded for the Brisbane region. The claypan roost on the Island also caters for Eastern Curlew, Whimbrel, Sharp-tailed Sandpiper and other species in lower numbers (Marsh Sandpiper, Greenshank) (Figure 3, Appendix E).

Together with the Lytton roosts, the claypan on Fisherman Islands holds a large group of Eastern Curlew, about 400 birds in summer, making the area one the more significant sites in the Moreton Bay region for this species whose total world population is no more than 20 000 (Watkins 1993). Eastern Curlew are mostly feeding on the intertidal areas to the east of Fisherman and Whyte Islands.

3.1.3 Significance of Fisherman Islands roost sites

In addition to indicating the changes over time in wader counts at roost sites on Fisherman Islands, Figures 1 and 2 illustrate the general significance of Fisherman Islands by incorporating data from a number of other locations. Figure 1 shows three high counts for Fisherman Islands during summer this year due to concurrent high numbers of Bar-tailed Godwit, Great Knot, Curlew Sandpiper, Mongolian Plover (Figure 3) and a range of other

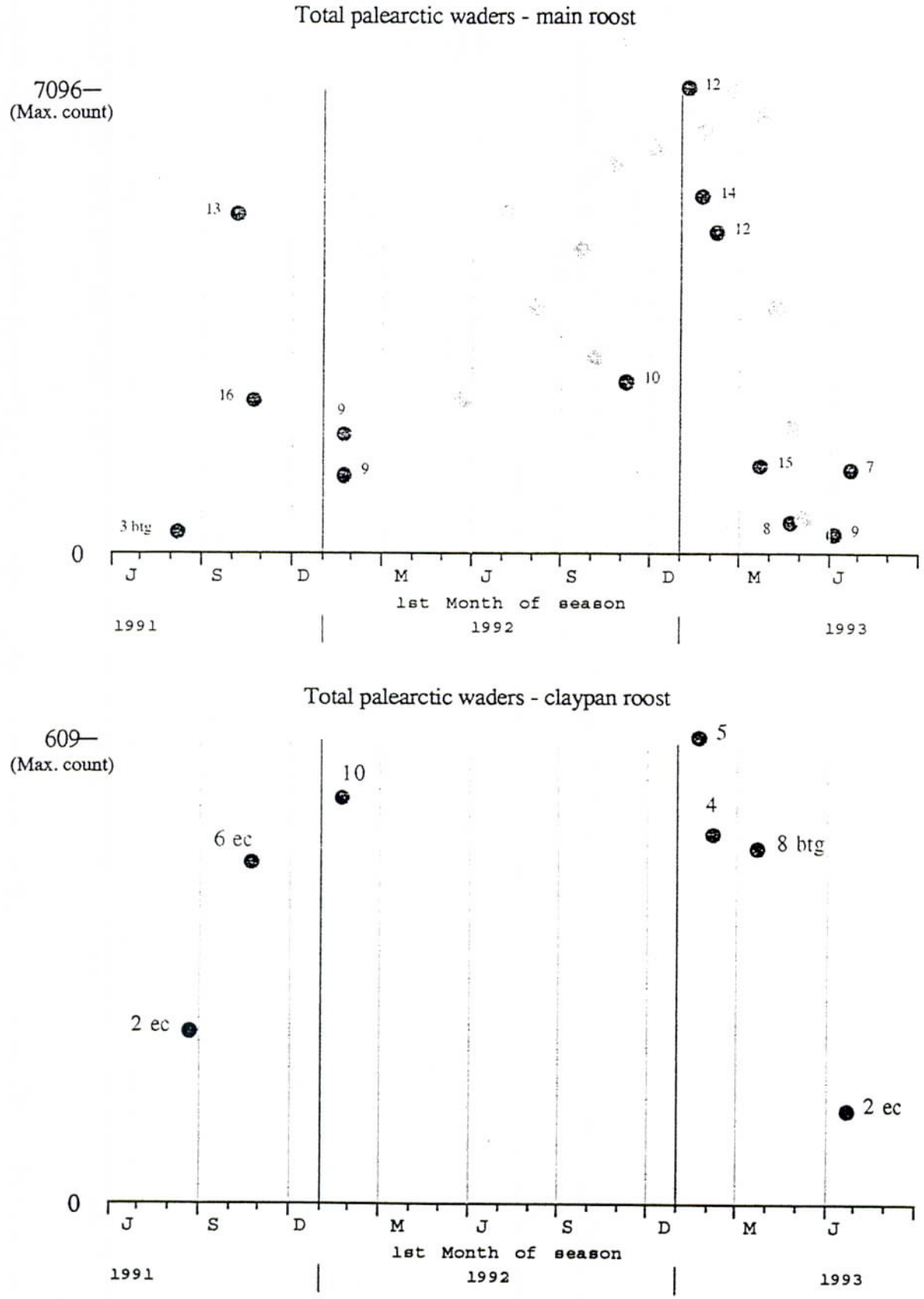
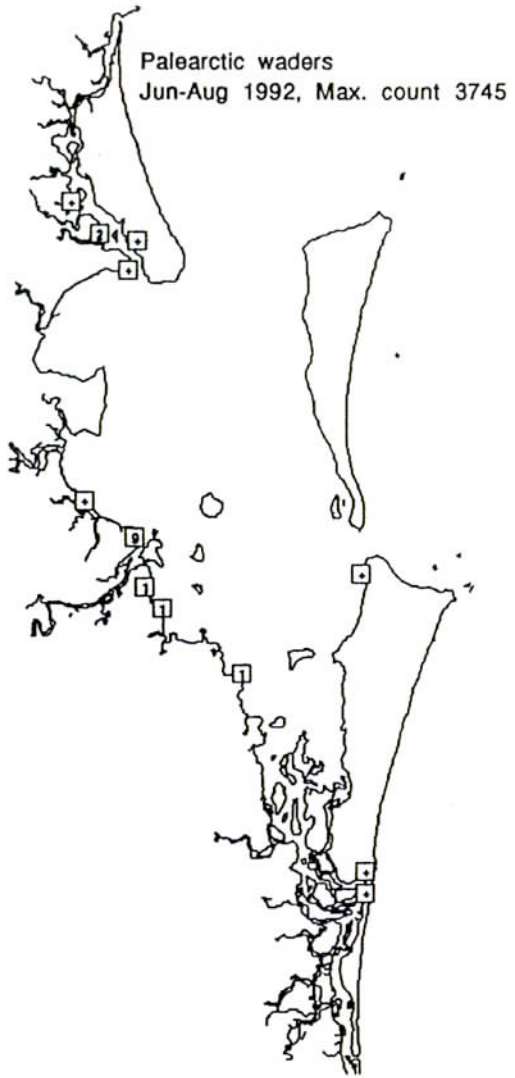


Figure 1. Counts of total palearctic waders (migratory waders, excluding Double-banded Plover) at the two main high tide wader roosts on Fisherman Island between August 1991 and June 1993. The number of palearctic wader species for each count is given as labels, and where a single species made up more than 50% of the total the species initials are given (ec - Eastern Curlew, btg - Bar-tailed Godwit). The vertical axis ranges from 0 to the maximum count recorded. The grey dots on the top graph represent the total counts of palearctic waders made at five site in the central Moreton Bay Region (excluding Fisherman Island sites) (see Appendix F).



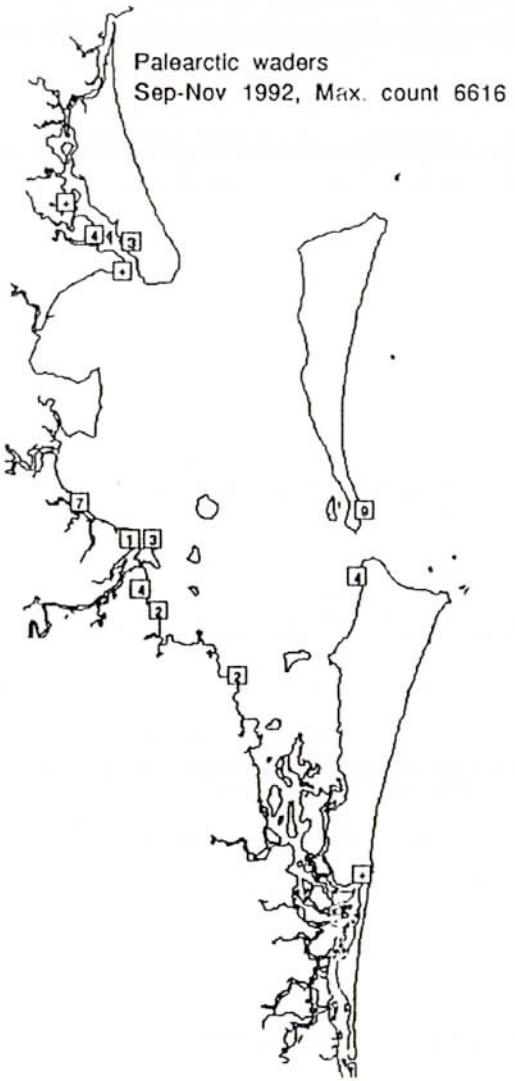
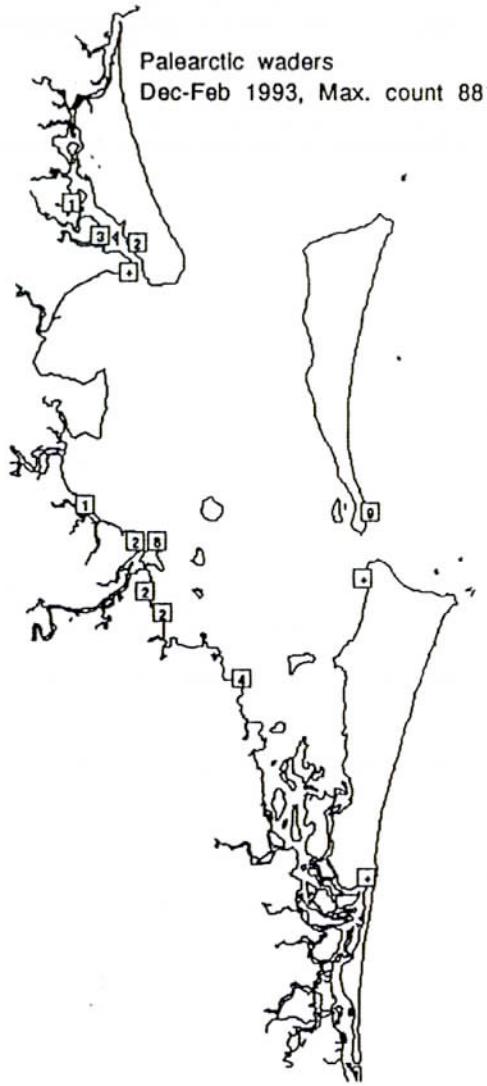


Figure 2 - Maximum counts of palearctic waders for five seasons at a selection of high tide roost sites throughout Moreton Bay. Data collected by members of QWSG between March 1992 and May 1993. Data for March to May for 1992 and for 1993 are presented on the same map (lower right)
For each season, the maximum count across all sites is given in the heading. In the case of March to May, two values are given, the first for 1992 and the second for 1993. Roost sites are marked on the map as squares if any counting was undertaken at that roost in the relevant season. Sites were not all counted with the same regularity and data for some nearby sites have been combined for presentation. (e.g. data for the two roosts on Fisherman Island, the main roost and the claypan have been combined).



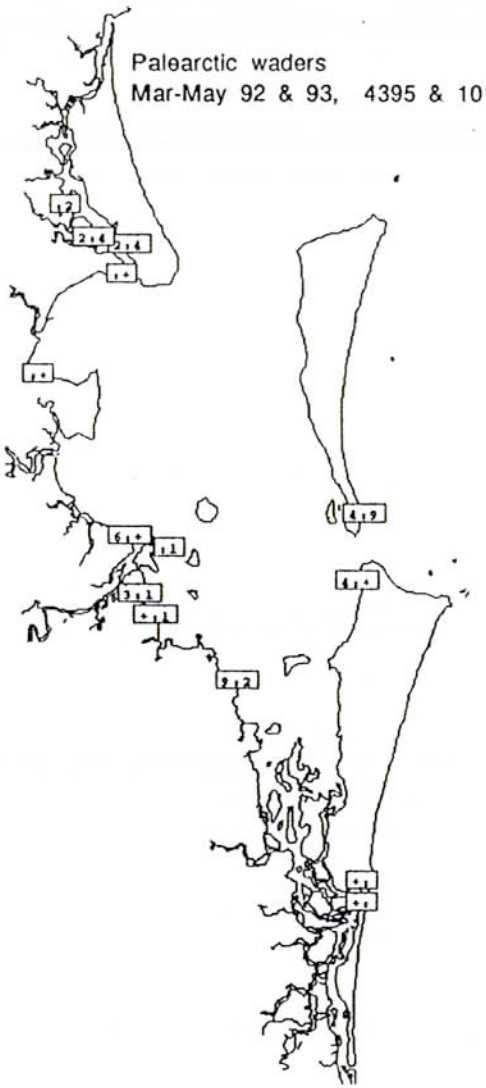


Figure 2 ctnd . A value in a square represents the proportion of the maximum count at any site for the season that was recorded as a maximum for the particular site. That is, "9" indicates the site had at least one count that was more than 90% of the maximum for any site, as given in the heading for the map. A value of "1" indicates the maximum count for the site was between 10% and 20% of the maximum for any site. A value of "+" indicates palearctic waders were recorded but the count was less than 10% of the maximum for any site. In the case of March to May, values for the two years are separated by a colon, but the same rules apply.
Not all high tide roosts are considered. Many roost sites in Moreton Bay and Pumicestone Passage have not been counted and others counted less than on three occasions. Such sites are not shown on the maps.

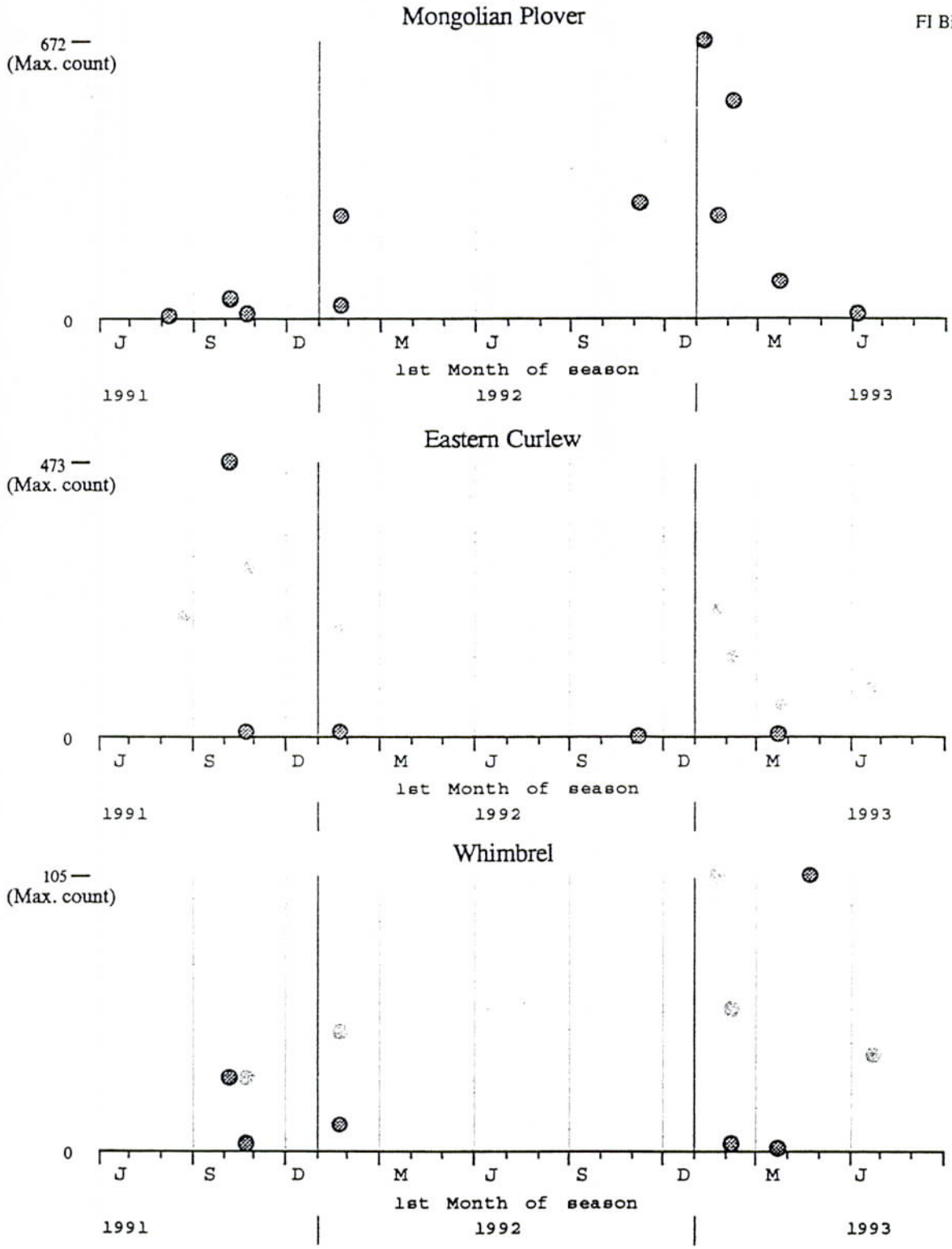
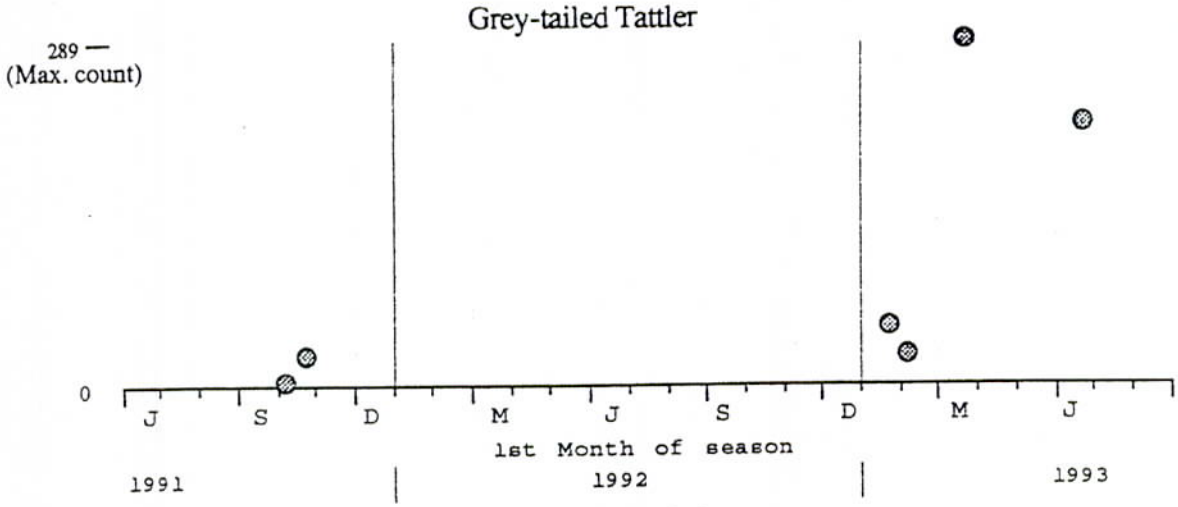


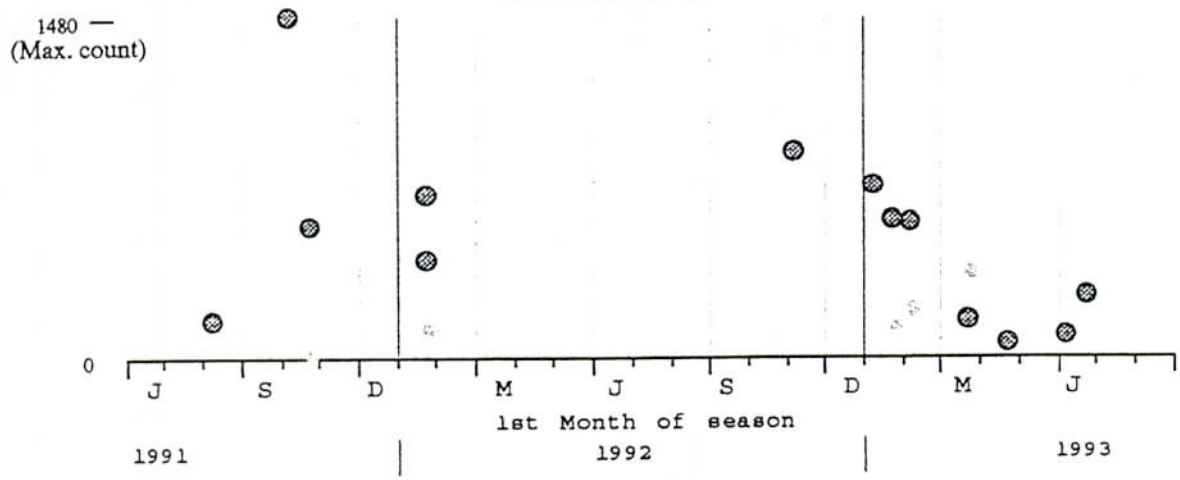
Figure 3. High tide roost counts from the main roost at Fisherman Island of eight species of migratory wader and three resident species (last three) for the period between August 1991 and June 1993. Species selection was based on the international or national importance of Moreton Bay as habitat for the species and/or their abundance at the sites.

Counts from the claypan roost on Fisherman Island are also given and represented by light grey symbols.

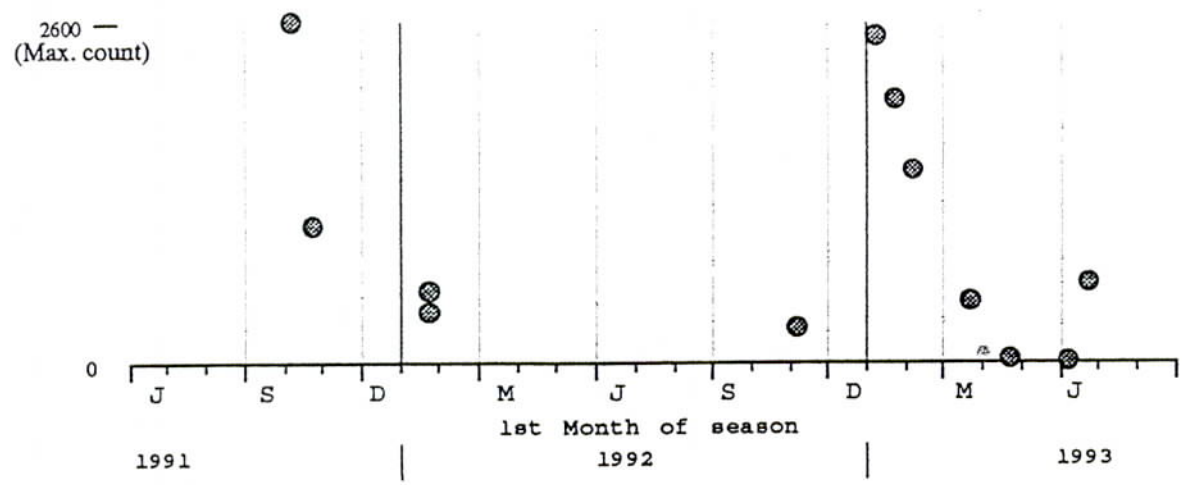
Grey-tailed Tattler



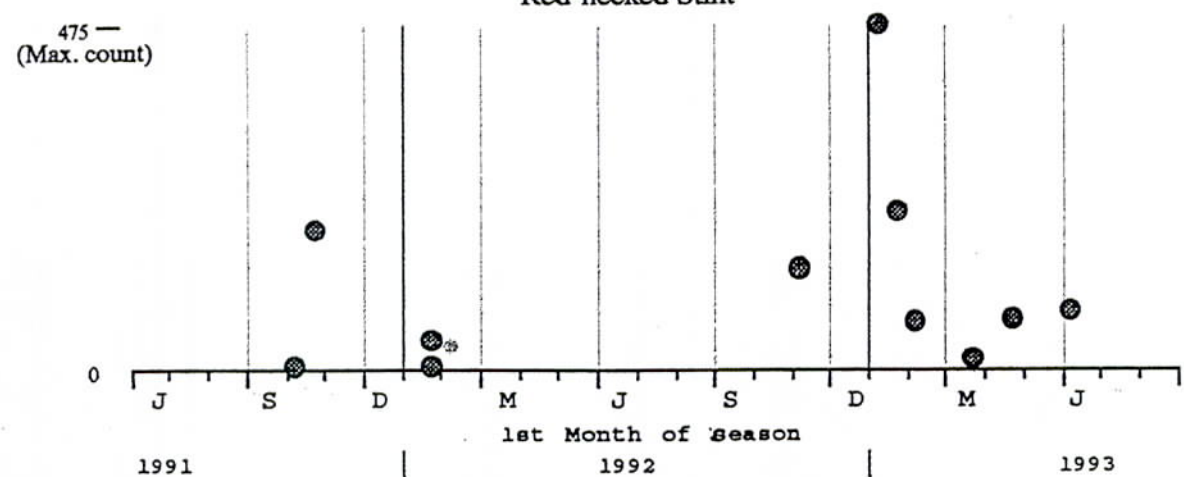
Bar-tailed Godwit



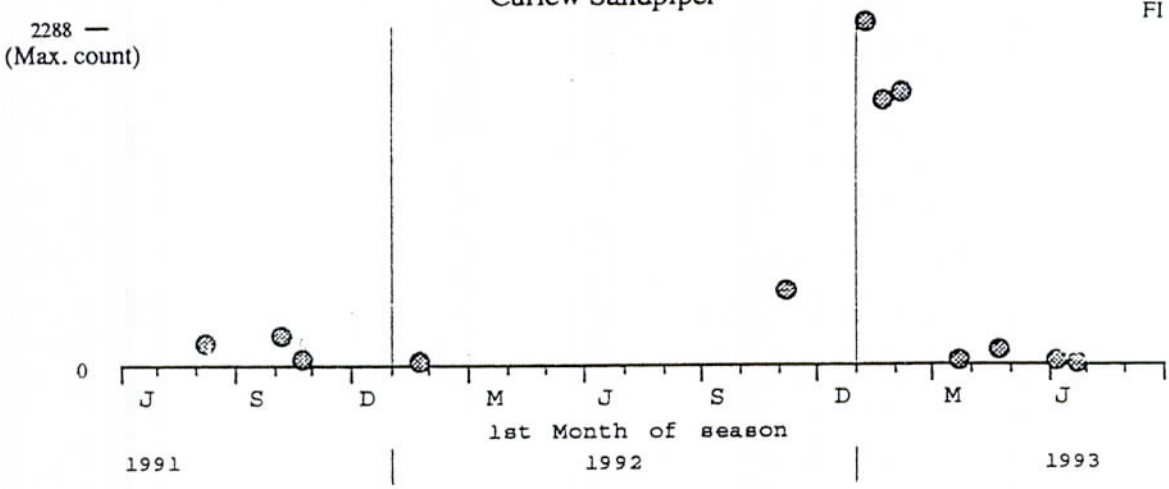
Great Knot



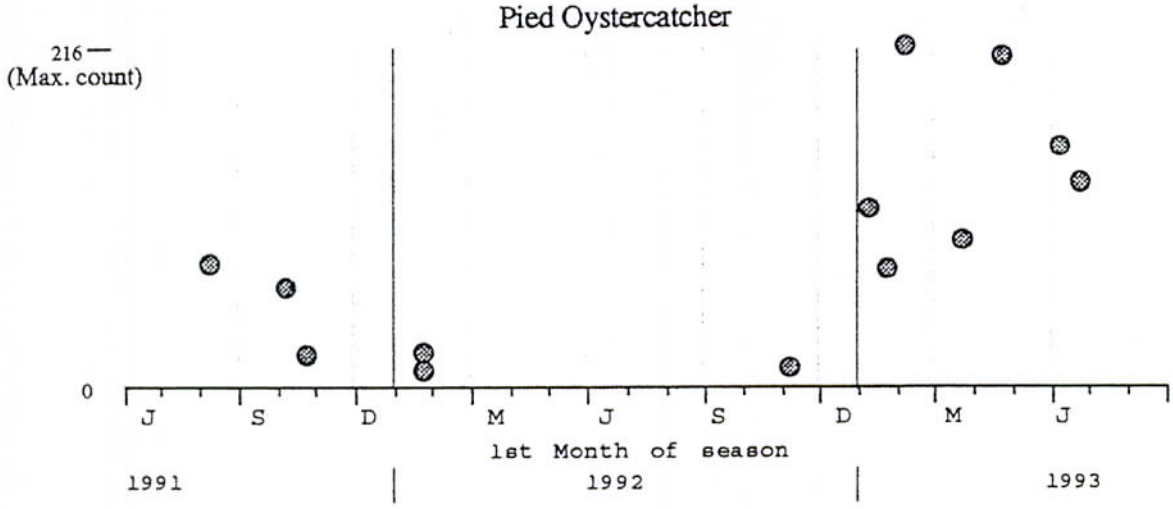
Red-necked Stint



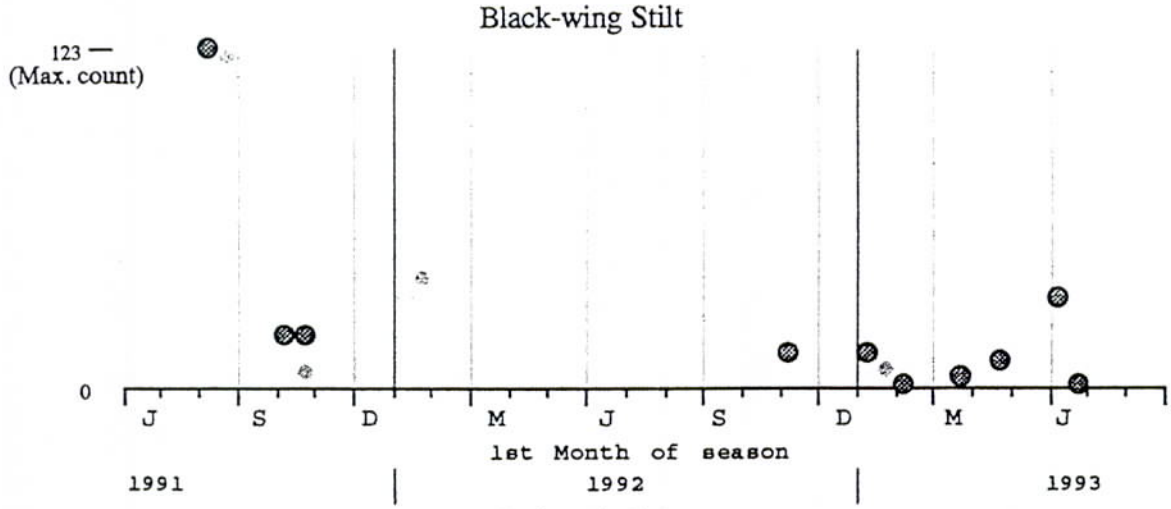
Curlew Sandpiper



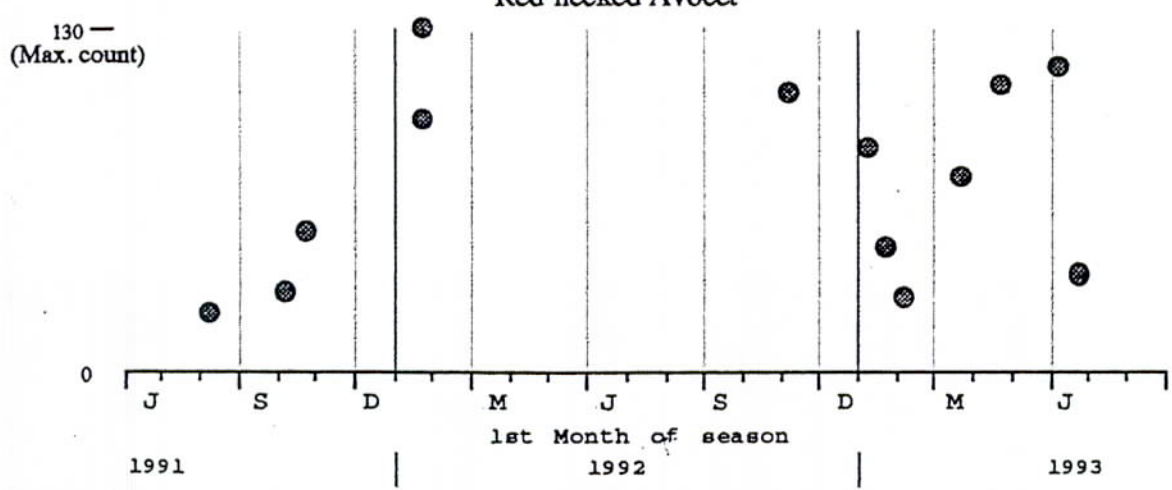
Pied Oystercatcher



Black-wing Stilt



Red-necked Avocet



species (Appendix E). In fact the numbers counted at the Fisherman Islands roost are of the same magnitude as the total counted from a combination of five other sites, namely Amity Spit, Luggage Point, Manly Harbour and Cleveland (Figure 1 and see Appendix F for more details).

In a further compilation of data undertaken in Driscoll *et al.* (1993), a total of approximately 20 000 migratory waders appeared to be using roost sites in the central Bay region from Moreton and Stradbroke Island across to the mouth of the Brisbane River and down to Cleveland. About a third of this tally is birds using the Fisherman Islands roosts. The estimate for migratory waders using Moreton Bay over summer (not including birds en route during migration) is approximately 50 000 (Thompson 1991, Driscoll *et al.* 1993) and of these, perhaps 15% roost on Fisherman Islands.

Another assessment of the importance of Fisherman Islands as a roost site is given in Figure 2 where it is ranked, on the basis of total migratory waders, second only to Moreton Island in summer and equally important as a handful of other sites in spring (records were less consistent for other times of the year when sampling has been less thorough).

As noted in the previous report, birds roosting at the main site on Fisherman Islands come in from feeding areas from Juno and Luggage Point, and from the expansive feeding areas to the east and south of Fisherman Islands. These areas differ substantially in the species they cater for best and as a consequence Fisherman Islands roost sites cater for a wide range of species.

3.2 Other species

High numbers of waterbirds and seabirds also roost on Fisherman Islands (Appendix E). A number of terns occur on the main roost site used by waders and include the Crested Tern, Caspian Tern, Gull-billed Tern, White-winged Tern and Little Tern. Whereas the former three species are sedentary or partially migratory, the White-winged Tern and Little Tern are migrants and occur at Fisherman Islands in highest numbers during summer and autumn. The Little Tern especially, forages in shallow waters around Fisherman Islands. The eastern subspecies of the Little Tern is considered "vulnerable" (Garnett 1992) and many individuals of this subspecies would occur at Fisherman Islands.

There are also consistently high number of Silver Gulls at the Fisherman Islands roost and Australian Pelicans and other species of cormorants and the Darter can also be found there (Appendix E).

Recent winter counts of birds at the main roost indicate that despite the relative lack of many migratory waders and terns, counts of resident wader species remained high (Figure 3) and two other species, the Chestnut Teal and Little Black Cormorant increased in numbers (Appendix E).

The waterbirds which mostly roost at the back of the cove have also been consistently recorded over the period of both studies with some large, temporary influxes in the number of Sacred Ibis since March this year. The Great Egret, Little Egret, White-faced Heron, Royal Spoonbill and Sacred Ibis that were noted roosting in trees and on embankments at the back of the "cove" (Driscoll 1992) are now far more confined to a thin strip of habitat at the back of the cove and the claypan in the south east of the island. The construction program is restricting bird activity on this part of the island by eliminating roosting and loafing sites. Nevertheless, numbers are similar to the previous year with maximum counts occurring in June of 155 Royal Spoonbill, 170 White-faced Heron, 200 Sacred Ibis and 34 Great Egret.

4 Scan counts of feeding birds

The recently recorded intertidal feeding activity is consistent with information taken from the previous study and indicates continued intensive use of the intertidal zone, especially the muddy cove and seagrass beds on the eastern and south eastern sides of the island. There remains an impressive array and density of both waterbirds and waders feeding on these mudflats and seagrass beds that warrants continued observation. So far, there appears to be little diminution of activity in spite of changes that are occurring around the western and northern periphery of the cove.

The approach taken to evaluating the scan counts is based upon their location and time of sampling. Scan counts have been identified according to the month of sampling and in accordance with the location of scan counts undertaken in October 1991. The data from October 1991 were used to classify scan counts, identified by locations A to Y, into groups which were depicted as zones or habitat types showing differences in the percentage contribution of wader species to the scan counts. The resulting "zones" are employed for the following appraisal of data from the recent study and assessed in conjunction with the earlier results. However, as a preliminary confirmation of this approach the latest set of data was subjected to classification analyses, one for each of the 4 months of sampling, November 1992, February 1993, March 1993 and June 1993.

4.1 Preliminary classifications

The classifications were run slightly differently to those described in the earlier report due to the loss of access to the original computer programs. The Euclidean distance has been employed in formulation of dissimilarity matrices and the farthest neighbour (complete linkage) sorting strategy was employed. These mathematical options were considered quite similar to those used previously (Gower's General Similarity Coefficient and flexible sorting with beta set at -0.25). The zones mentioned below were described in Driscoll (1992) and are discussed in the following section.

For February samples, the sites tended to separate as predicted with 4 of the 5 sites within the MAIN zones grouping together, the single SAND and single MIX site separated out as

single member groups and a COVE site and COMB were placed together in a group. Results for the other months were less affirmative of the original results for October 1991. This could be expected for June and March when seasonal influences are likely to alter the spatial pattern of bird distributions. Unfortunately, the November scan counts showed inconsistent results but were too few to be adequately compared with data from October 1991.

4.2 Temporal changes within intertidal zones

The principal zones defined in the previous study were MAIN, COVE, and SEAG (seagrass) with areas having less distinctive species composition being termed COMB (combined) and MIX (mixture). Individual sites were also depicted for their significance and they included the main roost site at low tide (not relevant now due to site changes), a staging site in the boat passage were birds collected as they moved to and from high tide roosts (STAG), Luggage Point (LUGG) and other sites around St Helena and Wynnum which were variously categorised. The data have been evaluated for each of the principal zones or sites and particular note is made of areas where physical changes have occurred due to port development. Firstly, overall comparisons are made between the two study periods and between each of the seven months when data have been collected since August 1991.

Figure 4 shows the percentage contribution to scan counts of all waders recorded for each of the study periods from the zones MAIN, SEAG, COVE, MIX, STAG and LUGG. The data show very little difference between these periods and what difference does occur may well be due to the bias in when samples were taken within each period and where. For example the higher proportion of Eastern Curlew for the first study period is probably due to the August sample when Eastern Curlew had begun to return to Australia but other species of wader were still absent. Other minor differences are in the ratio of Lesser Golden Plover, Red Knot, Great Knot and Curlew Sandpiper and will be considered in assessing the individual zones.

Overall temporal changes are given in Figure 5 where data from the zones MAIN, SEAG, COVE, MIX, STAG and LUGG have been combined. The winter samples (August 1991 and June 1993) show the most similar pattern in numbers with the presence of far fewer species than at other times and the predominance of Black-winged Stilts, and Eastern Curlews in August (see comment above). The highest numbers of waterbirds (egrets, spoonbills and ibis) tend to be out on the intertidal zones at this time of year as well (see Section on "Other birds"), but the data being presented are confined to species of wader. A number of the migratory species can still be found during the winter months and it is interesting that virtually the same collection of these species are recorded for both winter samples.

The other samples that could be expected to be most similar are the summer samples, January 1992 and February 1993. This is largely the case and in both months the five

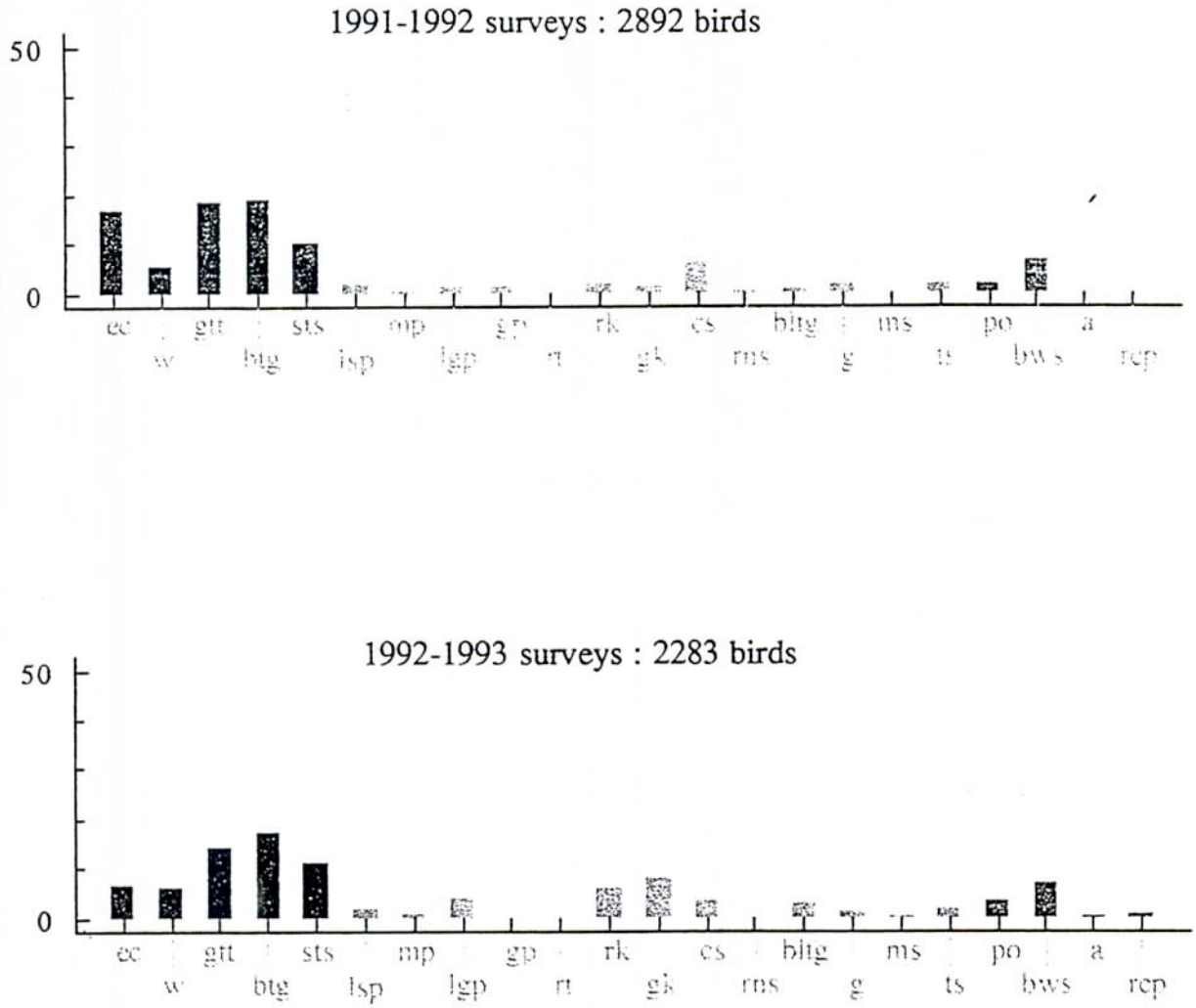


Figure 4. Percentage contribution of species of wader to scan counts taken for each of the two studies undertaken on intertidal areas near Fisherman Islands (Driscoll 1992 and the present study). The number of birds in the respective samples is given in the heading to the graphs.

The data are a compilation of zones categorised as MAIN, SEAG, COVE, MIX, STAG and LUGG (see Section on *Temporal changes in intertidal areas*). The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species.

The species represented are as follows:

ec - Eastern Curlew	w - whimbrel	gtt - Grey-tailed Tattler
btg - Bar-tailed Godwit	sts - Sharp-tailed Sandpiper	lsp - Large Sand Plover
mp - Mongolian Plover	lgp - Lesser Golden Plover	gp - Grey Plover
rt - Ruddy Turnstone	rk - Red Knot	gk - Great Knot
cs - Curlew Sandpiper	rns - Red-necked Stint	bltg - Black-tailed Godwit
g - Greenshank	ms - Marsh Sandpiper	ts - Terek Sandpiper
po - Pied Oystercatcher	bws - Black-winged Stilt	a - Avocet
rcp - Red-capped Plover		

"principal" species (first five, Figure 5, as determined during the last study) are the most numerous. A difference lies in the proportion of Sharp-tailed Sandpipers that is higher in February 1993 and it is noteworthy that none were recorded in March 1993 indicating that the species may be moving through Moreton Bay on migration as early as February.

It is known that the highest numbers of Sharp-tailed Sandpipers occur in Moreton Bay during the southward migration (October and November) but the pattern of occurrence on the intertidal areas around Fisherman Islands remains a little puzzling and will be monitored carefully.

One could expect considerable differences in the results for October, November and March because migratory species are moving through the Bay, arriving or departing, and doing so at different times and with different rates of movement. Many of the features of the data presented, such as the apparent early arrival and departure of Eastern Curlew, the high numbers of Red Knot in October and November and the apparent delayed departure of Grey-tailed Tattlers are in keeping with data from roost counts collected by QWSG over the past 15 months.

4.2.1 Details for each zone

The scan count results for the MAIN zone are shown in Figure 6. Its characteristics tend to be maintained between years for winter, (August and June), spring (October and November) and summer (January and February). The Grey-tailed Tattler and Sharp-tailed Sandpiper (in spring in particular) are the characteristic common species of this zone. Large Sand Plovers and Lesser Golden Plovers are also normally present but in much lower numbers.

To avoid re-iterating some of the general comments regarding temporal changes noted above, for the following feeding zones only a selection of the data for particular months will be shown graphically.

The deeper intertidal areas of seagrass (SEAG) are frequented by the taller species of wader including Eastern Curlew, Whimbrel and Bar-tailed Godwit and although all three occur in the MAIN and other zones they tend to predominate in SEAG. Getting data from the SEAG zone can be difficult and only records for August 1991, October 1991, November 1992 and February 1993 are presented in Figure 7. The Grey-tailed Tattler and Sharp-tailed Sandpiper can also utilise this zone effectively (see November, Figure 7), perhaps at much lower low tides.

The relative lack of Grey-tailed Tattlers and the normal occurrence of the other species, Curlew Sandpiper, Terek Sandpiper, Large Sandpiper, Black-tailed Godwit and Black-winged Stilt, are the characteristics of the COVE zone. This was so for the both summer

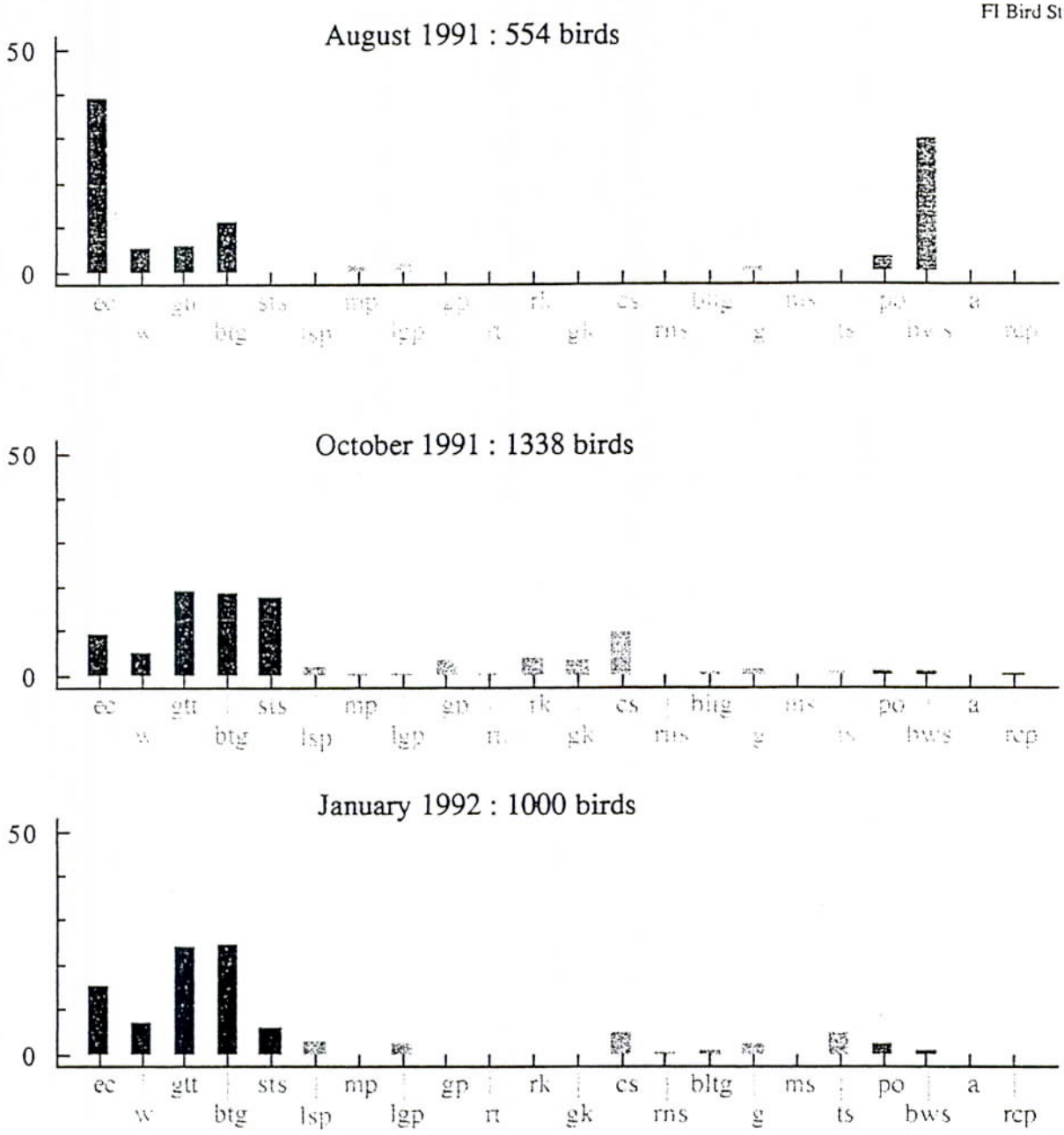


Figure 5. Percentage contribution of species of wader to scan counts taken in each month when sampling was undertaken on intertidal areas near Fisherman Islands. The data are a compilation of zones categorised as MAIN, SEAG, COVE, MIX, STAG and LUGG (see Section on *Temporal changes in intertidal areas*). The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species.

The species represented are as follows:

ec - Eastern Curlew	w - whimbrel	gtt - Grey-tailed Tattler
btg - Bar-tailed Godwit	sts - Sharp-tailed Sandpiper	lsp - Large Sand Plover
mp - Mongolian Plover	lgp - Lesser Golden Plover	gp - Grey Plover
rt - Ruddy Turnstone	rk - Red Knot	gk - Great Knot
cs - Curlew Sandpiper	rns - Red-necked Stint	bltg - Black-tailed Godwit
g - Greenshank	ms - Marsh Sandpiper	ts - Terek Sandpiper
po - Pied Oystercatcher	bws - Black-winged Stilt	a - Avocet
rcp - Red-capped Plover		

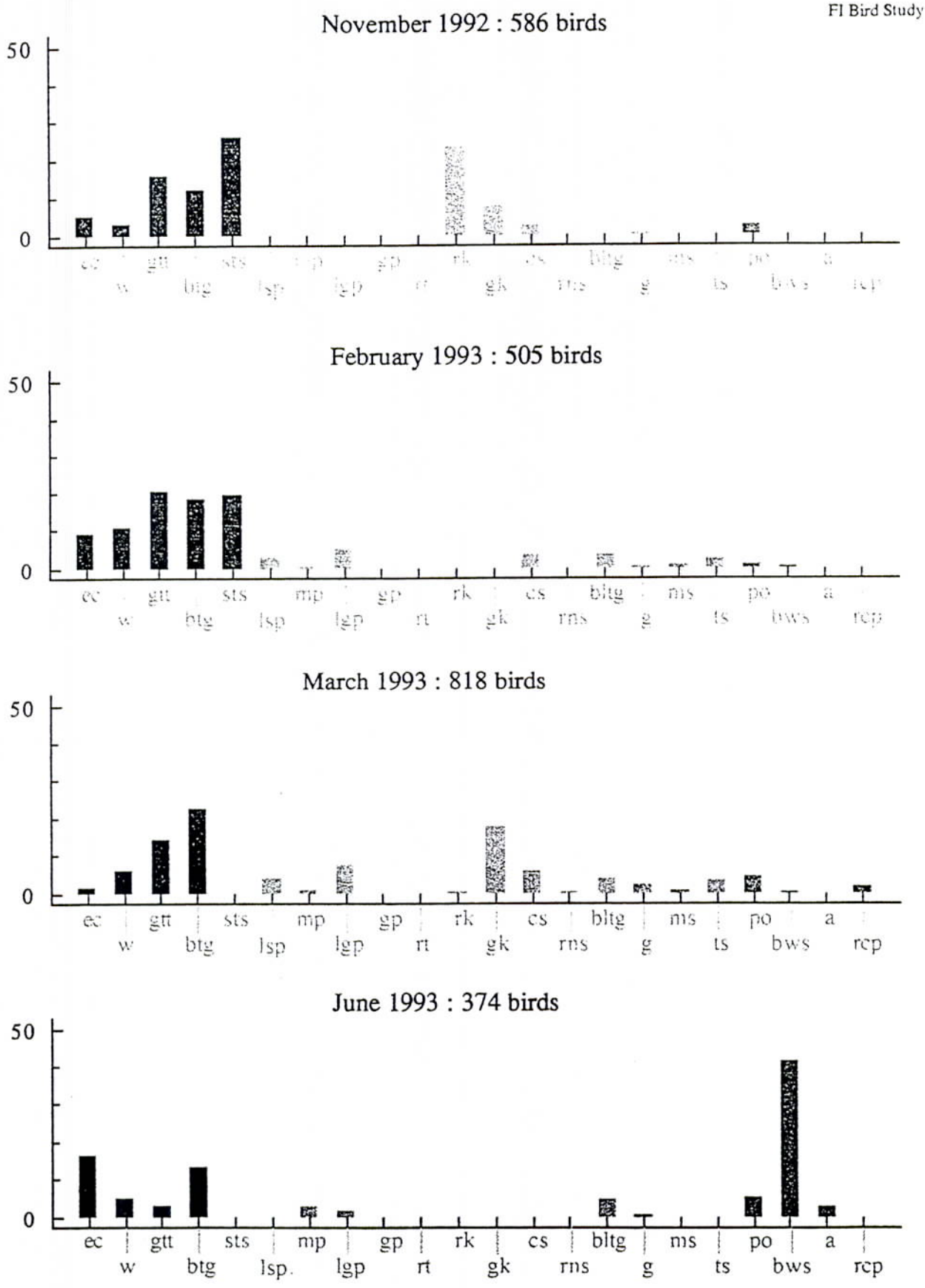


Figure 5. ctnd.

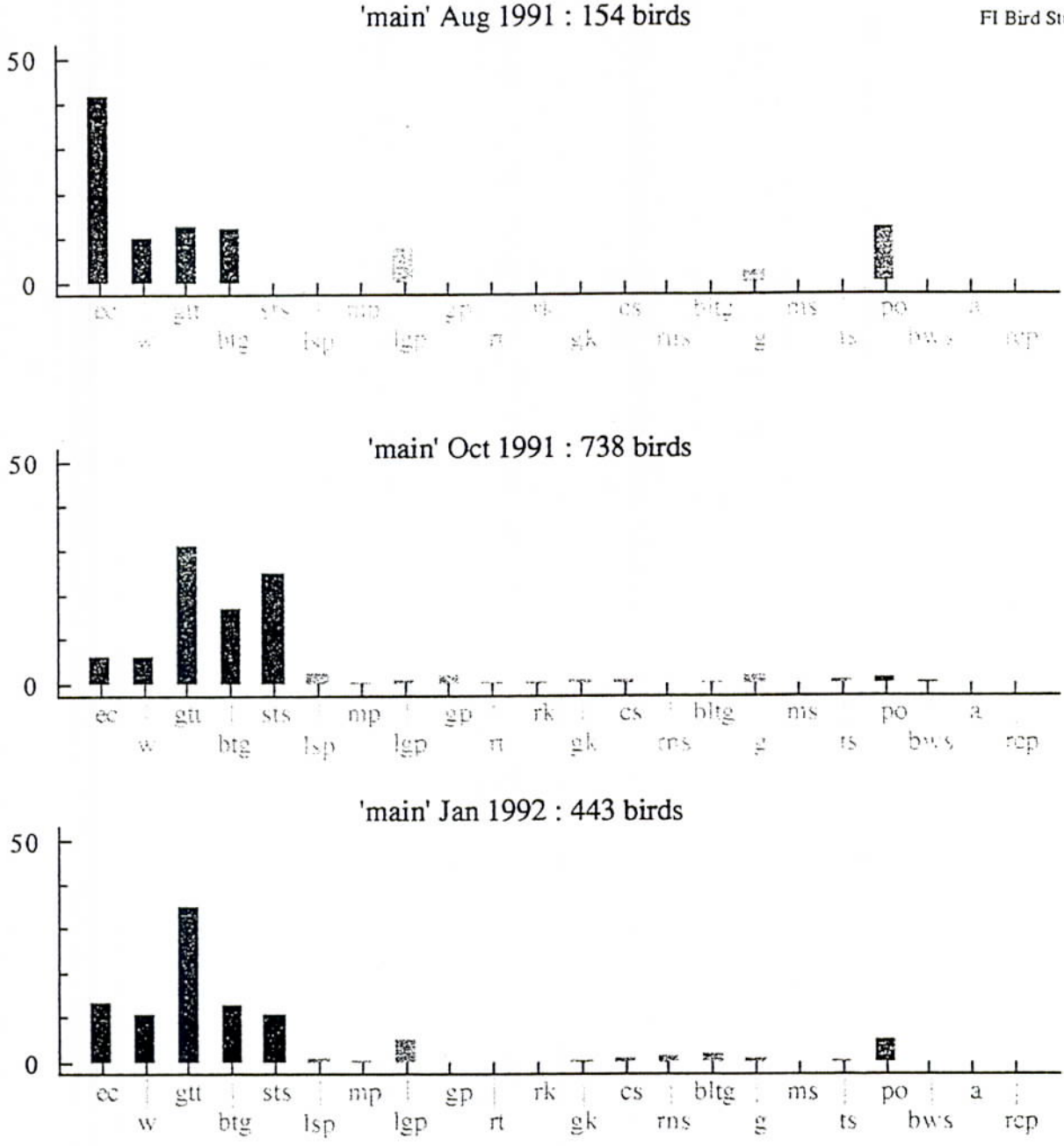


Figure 6. Percentage contribution of species of wader to scan counts in the MAIN zones taken in seven months between August 1991 and June 1993. The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then 4 resident species.

The species represented are as follows:

ec - Eastern Curlew	w - whimbrel	gtt - Grey-tailed Tattler
btg - Bar-tailed Godwit	sts - Sharp-tailed Sandpiper	lsp - Large Sand Plover
mp - Mongolian Plover	lgp - Lesser Golden Plover	gp - Grey Plover
rt - Ruddy Turnstone	rk - Red Knot	gk - Great Knot
cs - Curlew Sandpiper	rns - Red-necked Stint	bltg - Black-tailed Godwit
g - Greenshank	ms - Marsh Sandpiper	ts - Terek Sandpiper
po - Pied Oystercatcher	bws - Black-winged Stilt	a - Avocet
rcp - Red-capped Plover		

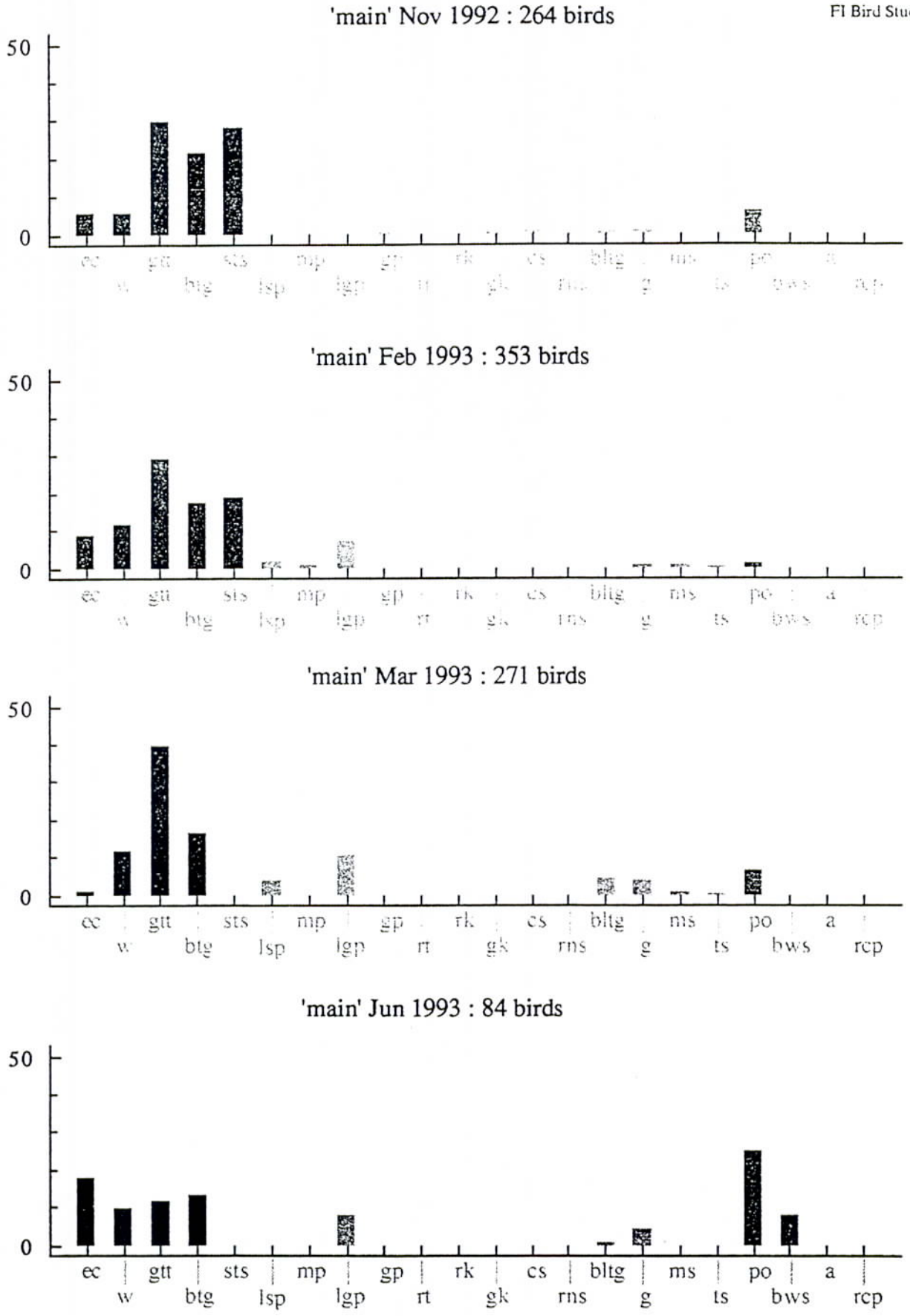


Figure 6. ctnd.

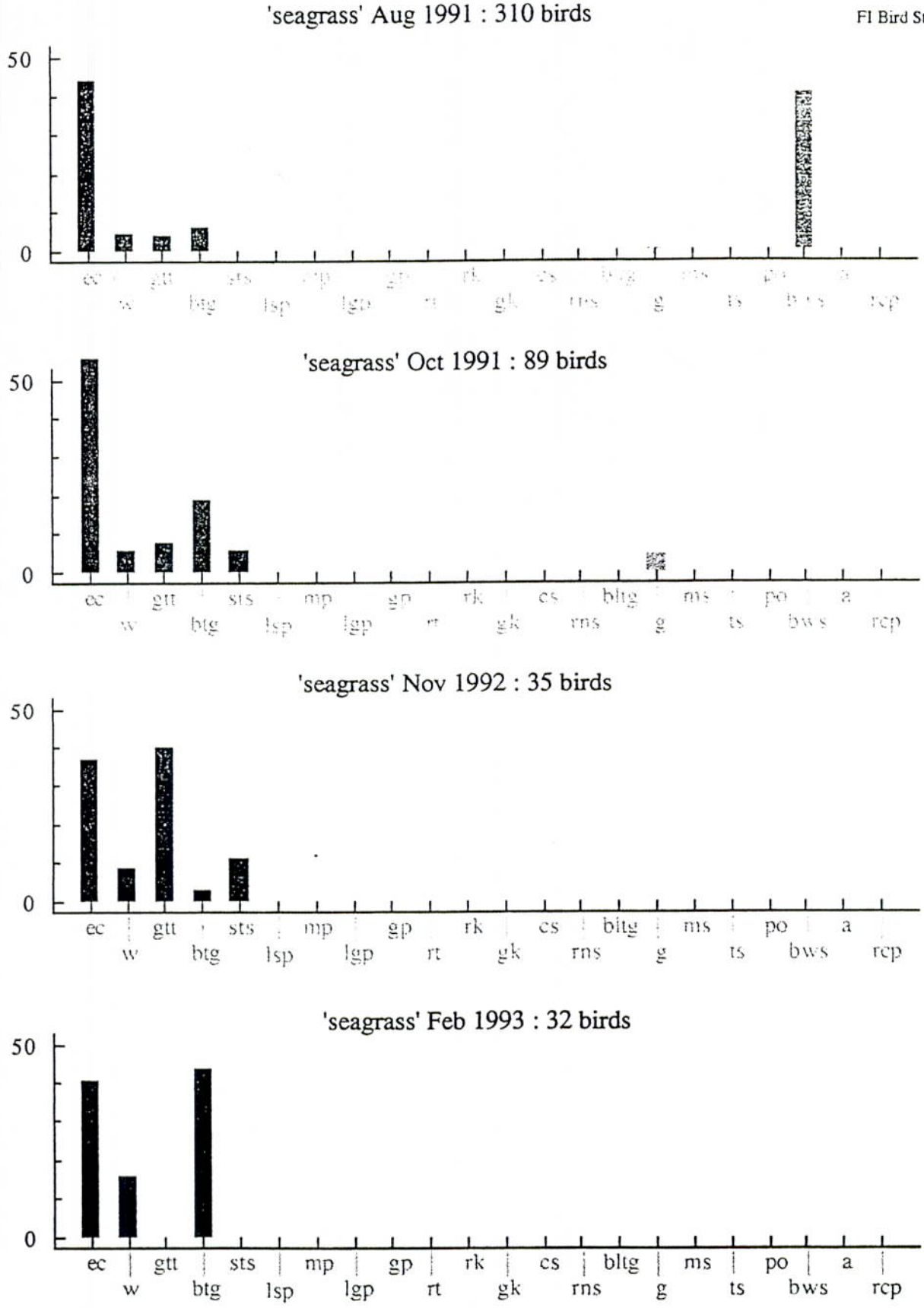


Figure 7. Percentage contribution of species of wader to scan counts taken in the SEAGrass zone in four months between August 1991 and February 1993. The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species. For a key to the species initials see Figure 5 or 10.

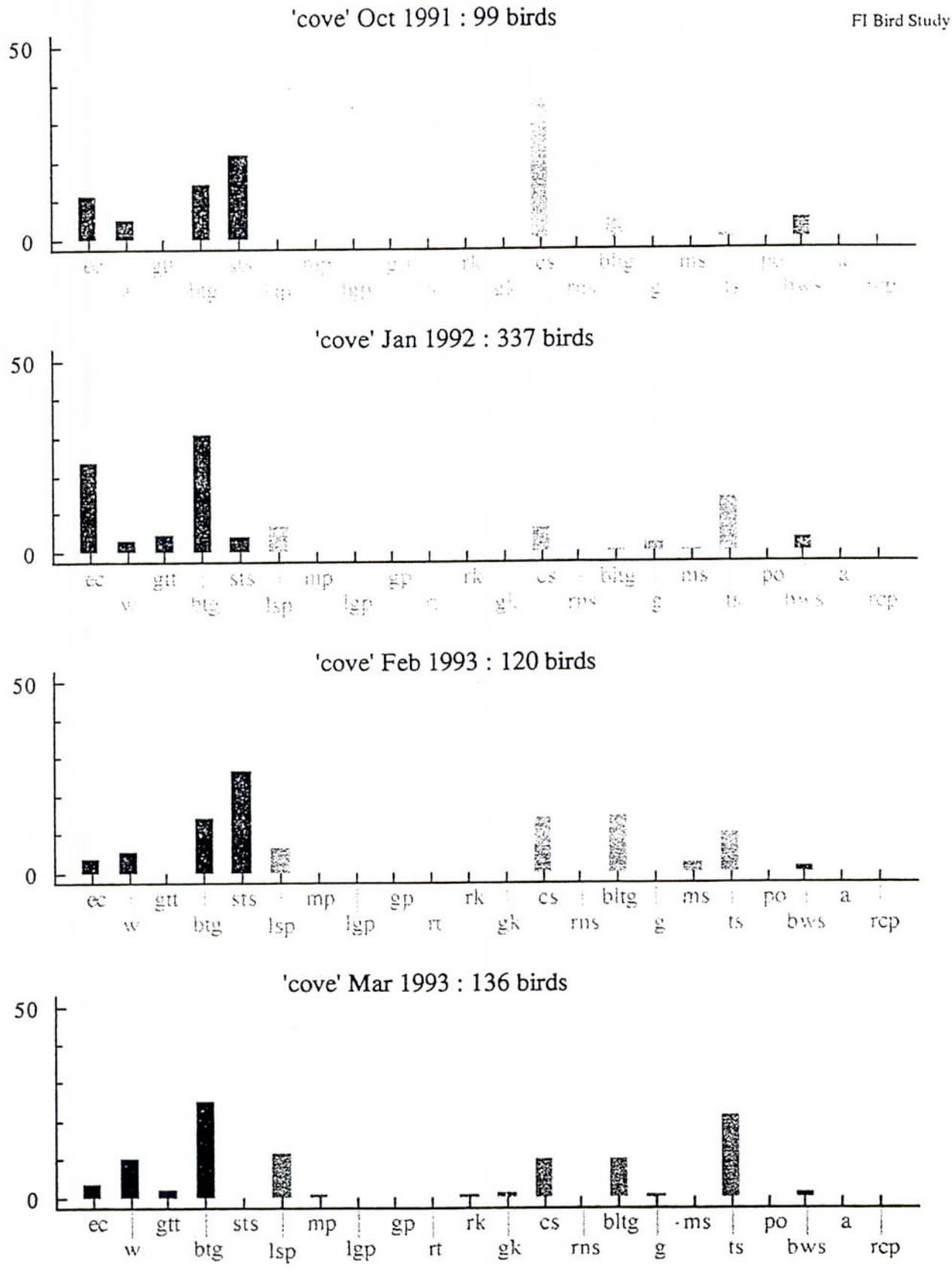


Figure 8. Percentage contribution of species of wader to scan counts taken in the COVE zone in four months between October 1991 and March 1993. The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species. For a key to the species initials see Figure 10.

samples (January 1992 and February 1993) and for March 1993. It is less apparent for October 1991 (Figure 8).

Typical species of the zones MIX and COMB could not be well defined on the basis of the first study and they remain elusive (Appendices C and D). This is probably a reflection of the intermediate nature of the habitat and the less predictable use of these areas by particular species. The Bar-tailed Godwit is the most consistently seen species in these areas but at times good numbers of Eastern Curlew, Whimbrel, Grey-tailed Tattler, Sharp-tailed Sandpiper and Pied Oystercatcher, have also been recorded. The SAND zone is similarly ill defined but is less likely to have Eastern Curlews and Whimbrels.

Areas sampled away from Fisherman Islands have consistently shown differences to around Fisherman Islands. Ruddy Turnstone and Pied Oystercatchers are very typical of some areas around St Helena (Appendix A). Luggage Point has maintained its distinctive nature between the two study periods with high numbers of Great Knot, Red Knot (in spring), Curlew Sandpipers and very few if any Eastern Curlew, Whimbrel, Sharp-tailed Sandpiper and Grey-tailed Tattler (Figure 9) which are so typical of areas to the east and south of Fisherman Islands. High numbers of Red Knot have been recorded in spring in different years at the staging site in the boat Passage (Appendix C). There can be a variety of species at this site but seldom have many Eastern Curlew, Whimbrel or Grey-tailed Tattler been noted here, probably because they move on and off the feeding areas in a different manner to other species.

4.2.2 Changes related to construction

The foregoing assessment of the scan counts does not indicate there have been any large scale alterations to the feeding distribution or densities of birds on the eastern or southern side of Fisherman Islands. However, to the north a large area has now been reclaimed and changes in the shoreline are occurring rapidly. Parts of the area now being reclaimed were categorised in the initial bird study as COMB zone.

It has been difficult to gain much insight into how the birds are being affected by these changes because conditions are different from one site visit to the next. However, a thorough scan count made in March 1993 of the area being surrounded on two sides by bund walls indicated a mix of species quite different from what was typical of the area previously (Figure 10), although no proper comparison in the same season is possible. Red-necked Stint, Pied Oystercatcher and Curlew Sandpiper were the three most abundant species whereas previously, Sharp-tailed Sandpipers, Bar-tailed Godwits and Grey-tailed Tattlers predominated in October 1991. A little farther to the south (site E, Appendix A), these species are still the most numerous although the density of birds here was generally low (only 16 seen in the scan count).

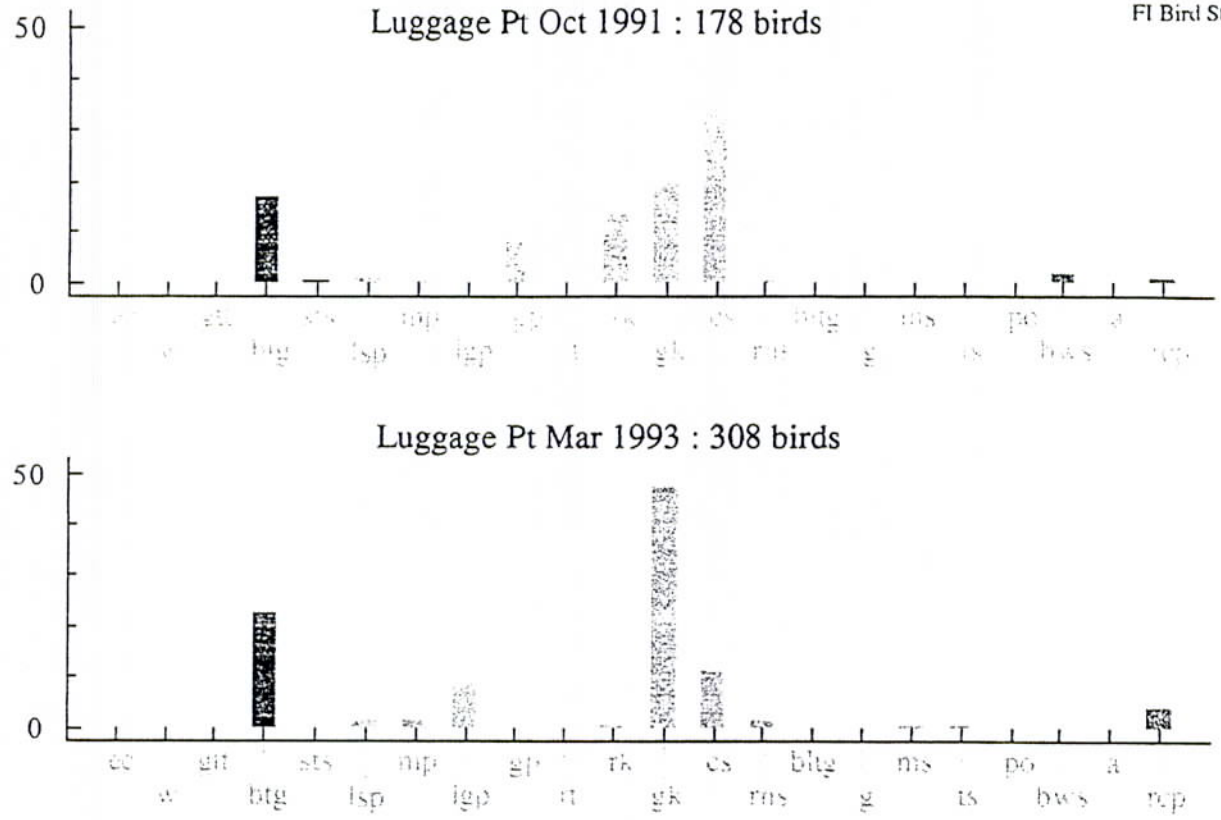


Figure 9. Percentage contribution of species of wader to scan counts taken in October 1991 and March 1993 at Luggage Point). Key to species initials are given in Figure 6.

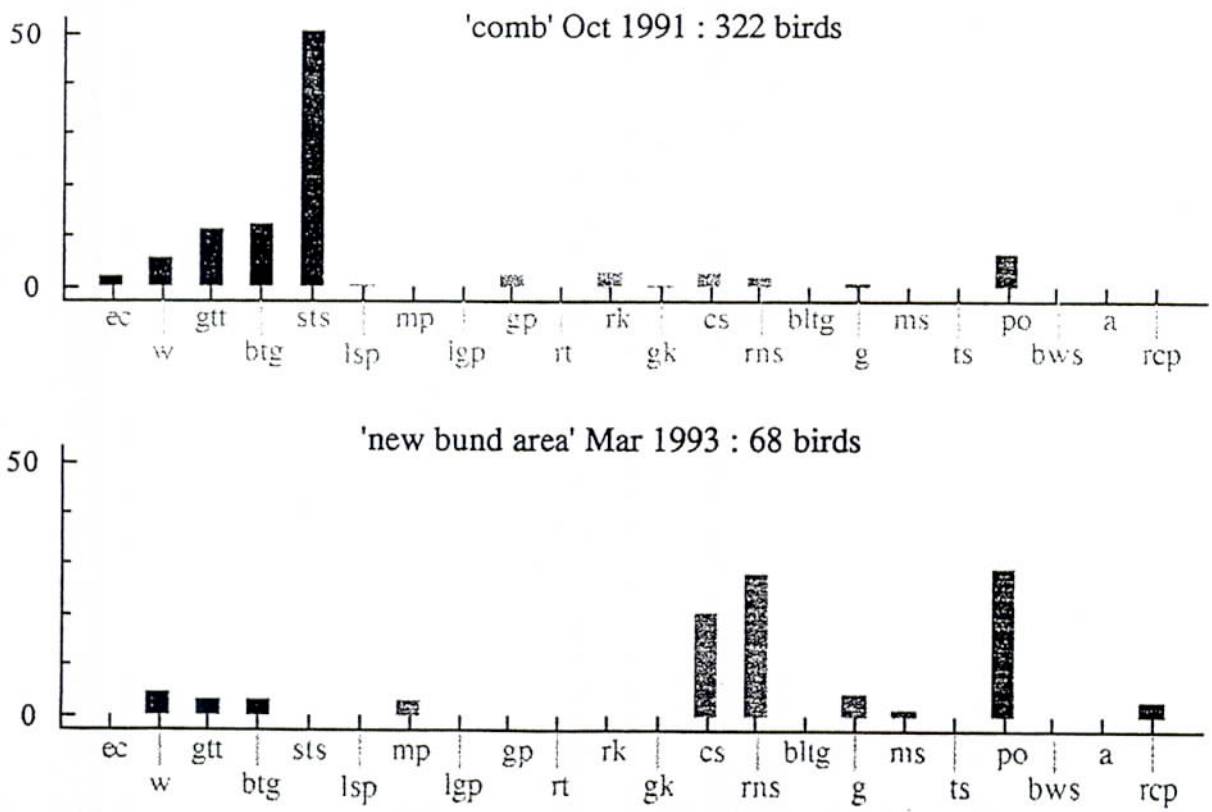


Figure 10. Percentage contribution of species of wader to scan counts taken in the COMB zone in October 1991, and in March 1993 between two new bund walls to the north of Fisherman Islands.Key to species initials are given in Figure 6.

The intertidal area that is being extended to the north of Fisherman Islands as a result of the construction program, is not being intensively utilised by birds at present. As noted above, conditions keep changing and no definite useage pattern by birds will be established until the reclamation finishes and conditions stabilise.

5 Feeding observations

Feeding observations were begun and a small study area established just out from the south eastern corner of Fisherman Islands. The substrate here can be easily categorised and delineated into broad expanses of a muddy type with uniform cover of seagrass (not SEAG which is deeper), and a sandier type with very little seagrass. The number and activity of birds on the two substrates can be readily observed in the one general area. Unfortunately, the weather disrupted some of the observations and the data are not yet sufficient to be conclusive. I will therefore refer to some other work conducted by David Stewart in 1989 as a student project at the Queensland University of Technology.

Even over the short period that observations were made in the confined study area, it was apparent that species were selecting different substrate types with a high proportion (60%) of the birds in the seagrass area being Grey-tailed Tattler and 16% Bar-tailed Godwit, compared with 35% of the birds on the firmer, bare substrate being Lesser Golden Plover and 26% Large Sand Plover. Similar types of microhabitat preference shown by species were shown to be significant in the local distribution patterns of Bar-tailed Godwits, Great Knot, Curlew Sandpipers and Red-necked Stint in the study by Stewart at Thorneside and Luggage Point. Whereas the former species tended to forage in substrate covered with water, the latter three are more likely to forage on moist mud..

Not only was the preferred substrate shown to be different for different species but the foraging techniques and prey consumed also differed. That is, a microhabitat distinction based simply on substrate type is not the only explanation for the observed foraging distribution of waders. Nevertheless, some of the observed changes in the mix of species occurring at the northern end of Fisherman Islands could be initially interpreted in terms of preference for a certain substrate type that is being favoured by the construction program. Much of the feeding area is newly created, althouth there has also been some local replacement of areas of seagrass with bare areas of sandy mud. The advent of increased numbers of Curlew Sandpipers and Red-necked Stint in the area conforms with previous evidence that both species are partial to this type of substrate.

The impact of commercial worm digging on the extent of different substrate types around Fisherman Islands may have a more extensive, long term influence on the local distribution of waders than the changes being caused by the port development.

6 Banding and leg-flagging program

The banding program on waders run through the QWSG continues to utilise the Fisherman Islands roost as a principal banding site and many valuable data on site fidelity of birds, longevity records and movements are accruing though the continued use of the site. The details of catches of birds made at Fisherman Islands since the beginning of 1992 are given in Table 1. Appendix G gives records of all locally banded birds, recaptured at any of the sites used for banding in Moreton Bay. Many of these birds were caught at least once at Fisherman Islands.

A Curlew Sandpiper was recaptured in February this year at Fisherman Islands that was banded in Taiwan. These are the types of records which are helping to build up information concerning the international movement patterns of many of the migratory waders.

Table 2 is a record of leg flag sightings of birds banded at Fisherman Islands. Most of the waders now being banded are also given a green leg flag on the upper right leg so they can be identified from a distance as being banded in the Moreton Bay region. In addition, there is a program running of banding the resident Pied Oystercatchers with colour bands that are unique to the individual banding sites throughout Moreton Bay.

Table 1. The number of birds banded and recaptured by QWSG on each occasion cannon netting day at Fisherman Islands during 1992 and 1993. The number of recaptures are given in brackets. All other values include both first captures and recaptures. Many birds have been banded from Fisherman Islands prior to 1992 and Appendix G gives details of all recaptures of locally banded birds from all sites used in Moreton Bay. These data include records of birds banded at Fisherman Islands as early as mid 1989.

Day -->	8	7	5	7	1	19	10	20
Month -->	2	3	4	6	8	10	1	3
Year -->	'92	'92	'92	'92	'92	'92	'93	'93
Pied Oystercatcher			3	16 (2)				
Large Sand Plover		1						
Mongolian Plover							4	
Grey Plover								3
Sharp-tailed Sandpiper						19		
Red Knot							1	8
Curlew Sandpiper	1					1	20 (2)	1
Red-necked Stint			3		5	4	29	
Great Knot							19 (2)	172 (20)
Bar-tailed Godwit	7	13 (2)						9 (2)
Whimbrel	1							
Gull-billed Tern	1							
Little Tern	2	1						
Total	12	15 (2)	6	16 (2)	5	24	73 (4)	193 (22)

Table 2. Sightings of colour banded waders recorded by QWSG of birds seen at Fisherman Islands or banded at Fisherman Islands. Abbreviations used for birds are: BTG (Bar-tailed Godwit); GK (Great Knot); RK (Red Knot); PO (Pied Oystercatcher). Abbreviations used for observers are: GA (Greg Anderson); CC (Chris Corben); JD (Jill Dening); PD (Peter Driscoll); SH (Sandra Harding); RH (Rod Hobson); BJ (Bob James); MA (Marjorie Andrews); JH (Joyce Harding); JT (Jeremy Thompson); SP (Sheila Petch); PW (Paul Walbridge).

Sp.	Location	Date	Flag/band colour, origin	Ob	Comment
BTG	Fisherman Is	17.1.92	1-green flg, Moreton Bay	PD	Banded at Fisherman Is
BTG	Ariake Sea, Japan	28.4.92	1-green flg, Moreton Bay	JT	Banded Fisherman Islands Oct. '91. Two other colour banded BTG - one a male with orange leg flag (Victoria) and one a female with a white leg flag (N.Z.).
BTG	30 km nth of Christchurch	29.4.92	1-green flag, Morton Bay	SP	2nd yr bird banded year before?
PO	Raby Bay,	1.8.92	1-yellow band, F. Is	SH	Sighted at roost.
PO	Wynnum	8.8.92	1-yellow band, Fisherman Is	CC	A flock of 62 PO were sighted, of which 2 were colour banded.
BTG	Luggage Point	24.8.92	1-green flg, Moreton Bay	JD	32 BLTG and 5 other BTG were sighted
BTG	Fisherman Is	10.11.92	2-green flg, Moreton Bay	PD	Sighted at roost. A total of 2740 waders were at roost, of which 895 were BTG.
BTG	Fisherman Is	8.1.93	4-green flg, Moreton Bay	PD	Pobably banded same location
GK	Fisherman Is	8.1.93	1-green flg, Moreton Bay	PD	Probably banded same location
PO	Fisherman Is	8.1.93	5-orange bands, St Helena 2-yellow bands, Fisherman Is	PD	
PO	Fisherman Is	10.1.93	1-yellow band, F. Islands	JT	
GK	Fisherman Is	21.1.93	2-green flg, Moreton Bay	PD	banded at Fisherman Is or Nudgee
PO	Fisherman Is	4.2.93	2-orange band, St Helena	PD	
PO	Manly boat Harb.	6.2.93	1-yellow band, Fisherman Is	PW, RH	
BTG	Donnybrook	20.2.93	1-green flag, Moreton Bay	JN, JT	Banded Fisherman Is, Nudgee, Amity or Moreton Is
BTG	Fisherman Is	9.3.93	1-green flg, Moreton Bay	PD	Probably banded same location
GK	Toorbul	13.3.93	1-green flg, Moreton Bay	BJ	Banded at Fisherman Is or Nudgee
BTG	Toorbul	14.3.93	1-green flag, Moreton Bay	BJ	Banded Fisherman Is, Nudgee, Amity or Moreton Is
GK	Luggage Pt	23.3.93	1-green flg, Moreton Bay	PD	Banded Fisherman Is or Nudgee
RK	Fisherman Is	24.3.93	1-green flg, Moreton Bay	PD	Banded Fisherman Is or Nudgee
GK	Woody Point	28.3.93	1-green flg, Moreton Bay	GA	Banded at Fisherman Is or Nudgee
GK	Fisherman Is	28.6.93	3-green flg, Moreton Bay	PD	Banded Fisherman Is or Nudgee
RK	Fisherman Is	28.6.93	5-green flg, Moreton Bay	PD	Banded Fisherman Is or Nudgee
BTG	Fisherman Is	28.6.93	2-green flg, Moreton Bay	PD	Banded Fisherman Is or Nudgee

7 Management issues

If changes to intertidal zones due to the construction program are confined to the northern section of Fisherman Islands where there appears to be limited replacement of one substrate type with another, and perhaps an eventual increase in the total area of intertidal substrate, then feeding bird populations are unlikely to be seriously affected by the port development. However, it is important to realise that the present low level of impact on the birdlife is likely to be conditional upon a number of conditions being maintained on and around Fisherman Islands.

Firstly, I am assured that the impact of the reclamation program will not have wide scale repercussions in the intertidal zone to the south and east of Fisherman Islands.

Of critical importance is the maintenance of the roost sites which greatly facilitate the use of the area by birds. The main wader roost is particularly important and is used by thousands of birds in addition to those that are feeding in the immediate vicinity of Fisherman Islands.

As noted earlier the nature of the main roost site is continually changing. Providing there are at least two large areas of gently sloping, sandy shoreline rising above the high tide line, birds should persist in roosting in the area. There is a need to maintain such conditions as the reclamation program proceeds and to ultimately provide for roosting birds over the long term. It is also preferable that at least two such sites be provided close to one another to allow birds to move between sites when they are disturbed by people or predators. The roost sites could be located to the north or east of the newly reclaimed area and provision of these sites should be considered now before the options for their creation become limited. The activity and numbers of birds on the main roost site should be carefully monitored until changes in the area cease.

The usefulness to birdlife of the claypan roost site in the south east of Fisherman Islands has probably been compromised by the road works that now lie on its western boundary. Freshwater runoff and tidal waters strongly influence the claypan and its consequent use by birds for feeding and roosting. At times when surface water has been deepest and most extensive, the majority of birds were noted roosting back from where the road is now situated. This option is no longer available and it is likely that, at times, birds will be forced to roost very close to the new road. The proposed drain (see below) may help to discourage people from walking out onto this area but appropriate signage here and even at the main roost site could be an appropriate way to educate people and to discourage them disturbing the birdlife.

The other critical site is behind the cove, an area which provides roosting sites on embankments and in trees for the abundant and diverse collection of waterbirds that feed out from here at low tide. The port development is to cut across the back of the cove but the possibility of re-establishing suitable bird habitat along a major north-south drain in this

area is likely to offer a solution to the problem. Features of the drain that would facilitate its use by birdlife are given below.

Appropriate signs could serve to limit disturbance of birds by people while helping to educate the public. The signs could inform people about the birdlife, their migration habits, their need for undisturbed periods of rest and the importance of local roost sites and feeding areas. People would be requested to keep well back from roosting flocks or groups of birds. Signs could be located beside the roadway overlooking the claypan roost, alongside the drain behind the cove, or wherever else significant concentrations of roosting birds are close to public access.

Drain construction along the eastern side of the Island.

A major drain is being planned for the eastern boundary of the island. It would form a boundary between port development to the west, and mangroves, the cove and claypan roost sites to the east. If the drain was suitably designed and constructed it would serve as a buffer between existing natural habitat and the port facility. Furthermore, it could be revegetated in such a way to cater for the needs of waterbirds over high tide and thereby help to maintain the high density of birds that currently feed over low tide in the cove and farther to the south. Suitable revegetation and design could also encourage birds to the area by providing another type of wetland habitat. Patches of freshwater swamp and reeds that are still left on Fisherman Island attract groups of egrets, ibis and ducks. These areas are all being taken over and filled but shallow, vegetated ponds along the length of the drain could compensate for their loss and attract birds as an adjunct to the intertidal habitat.

The drain itself should be at least 3 m wide with sloping sides of less than 50° (the gentler the slope the better) and surfaced (bottom and sides) with grasses or other natural substrates including small rocks, wood, sand, bare earth or mud. If this is not possible for the entire length, there should be substantial sections that are not simply made of concrete. The drain should be terraced to include shallow ponds (no more than 20 cm) with gently sloping margins. These terraced sections can be as long as is feasible but should be a minimum of 20 m. Having fewer terraces with a greater drop between each is probably easier to build and manage than many terraces but the hydrological conditions and chances of water stagnation need to be considered. Persistent good water quality will be necessary to attract birds and it is preferable to have the ponds dry up rather than become stagnant or heavily polluted.

The walls of the drain need to be at least 3m across the top and suitable for revegetating. It would be preferable to have the eastern wall wider than the western wall. The western wall functions more as a barrier than as bird habitat. It will be necessary to plant out the western edge and sections of the eastern edge with tall trees. An understorey would be preferable as well on the western side of the drain but is less desirable on the eastern edge where

waterbirds and waders will need open ground between or within clumps of trees to move around. Taller sedges and reeds could be established in patches within the drain and on the slopes but at least 20% of the area (apart from the base of the drain) should be clear ground or low grasses.

It may be necessary to maintain restricted access (walking or small machines) to the eastern edge of the drain for maintenance of the vegetation using a few small bridges and access tracks. Weed growth may threaten the persistence of some of the desired habitat features but careful consideration of the species chosen for planting, the creation of the right conditions for their growth and some maintenance of the area over the long term should allow establishment of particular habitat features. Many of the waterbirds use both open ground and tall trees for roosting and both are necessary.

The far side of the eastern wall should abut areas of claypan or mangroves at the base of a gentle slope covered with a similar mix of vegetation as described above for the top of the wall. The western wall should rise to a height (1 m or so) above the neighbouring pavement of the port facility and could be much higher than the eastern wall. The western wall should slope down towards the pavement and be revegetated in a similar fashion to the top of the wall. Dense heath shrubs could be used here and serve as an effective barrier and attract other types of birdlife such as honeyeaters.

Given the constraints outlined above and those determined by engineering requirements and costs, a landscape architect and/or a horticulturalist could be commissioned to develop a plan of revegetation which I would be pleased to review.

Appendix B.

The percentage contribution of species of waders to the total scan counts of waders recorded during low tide surveys around Fisherman Island in November 1992 (Spring), February & early March 1993 (Summer), late March 1993 (Autumn), and June 1993 (Winter). The locations where counts were taken are indicated with capital letters in accordance with Driscoll (1992) and are shown in Figure 1. Four new locations were sampled, two around St Helena Island (S1 & S2) on the northern and eastern sides of the island respectively, one on the mudflat in the small inlet in the western side of the boat passage (Z2) and one between the new bunds walls to the north of Fisherman Island (Z1). The last row gives the site totals from which the percentages are calculated. The last column gives the totals counts for each species.

Species	Spring					Summer												Autumn												Winter							Tot
Sites->	J	A	P	E	F	G	A	B	Y	M	L	S1	S2	V	R	Q	E	I	F	Y	L	M	A	J	R	E	Z1	Z2	B	K	Y	M	B	J	R	E	
Pied Oystercatcher			28.6			7.6				1.8		85.5	16.7	2			66.7		60	70	32.1	11.1					50	29.4			47.7							210
Black-winged Stilt															1.7									1.7	1.5			6.2		17.6		9.1	20.7	53.1	57.5	100	164
Red-necked Avocet																																			7.5		12
Large Sand Plover							1.6	6.5							6.7			1.6						3.3	11.8			9.5									49
Mongolian Plover							1.6			1.8				2.9				1.6						3.3	0.7		2.9						12.5				28
Red-capped Plover																		4.2						6.7			2.9										19
Lesser Golden Plover						1.5	2.4	11.7	6.5	18.2			25	2				8.8				11.1	13.1	10					10.3				24.1		0.6			100
Grey Plover			1.8																																		1
Ruddy Turnstone														6.9																							7
Sharp-tailed Sandpiper	26.1	33.7	7.1	12.5	11.4	1.5	34.7	15.6	16.1	10.9			25	2.9	26.7																							260
Red Knot	48.1																	0.6							0.7												141
Curlew Sandpiper	4.2	1												3.9	14.2			11						3.3	10.3		20.6	31.2									104
Red-necked Stint																		1.6									27.9										24
Great Knot	15	0.5																47.1							1.5												191
Bar-tailed Godwit	4.9	21.2	23.2	6.2	2.9	7.6	12.1	26	29	23.6	43.8	1.2		12.7	14.2		18.2	22.7	13.3	30	21.4	11.1	15.2	45	25	3.6	2.9	6.2	16.4	14.7	4.5	9.1	27.6	11.5	13.8		422
Black-tailed Godwit		1													15							5.6	10.1	11.7	10.3			12.5					3.4	14.6	3.1			75
Eastern Curlew	1	6.7	1.8	37.5	37.1	15.2	1.6	6.5	16.1	14.5	40.6	4.8	25	1	3.3	20		26.7				2.8			3.7			18.8	1.7	55.9	11.4	54.5	13.8	4.2	14.4		169
Whimbrel	0.3	6.2	3.6		8.6	25.8	6.5	3.9	16.1	16.4	15.6	8.4	8.3	15.7	5.8	80	9.1			10.7	19.4	12.1	3.3	10.3	14.3	4.4	18.8	11.2	11.8	4.5	27.3	10.3	4.2	1.9			184
Grey-tailed Tattler		29.3	30.4	43.8	40	40.9	37.9	27.3	9.7	10.9				50			6.1			25	33.3	47.5		2.2	28.6	2.9		41.4		22.7				1.2			395
Greenshank	0.3	0.5	3.6				0.8	2.6												10.7	5.6	2	6.7	0.7	3.6	4.4	6.2	6		9.1							35
Marsh Sandpiper									6.5	1.8					2.5			0.3					5			1.5		2.6									14
Terek Sandpiper							0.8								10			0.3						21.3				0.9									44
Totals	287	208	56	16	35	66	124	77	31	55	32	83	12	102	120	5	33	308	15	20	28	36	99	60	136	28	68	16	116	34	44	11	29	96	160	2	2648

Appendix A.

Scan counts of all species recorded during low tide surveys around Fisherman Island in November 1992 (Spring), February & early March 1993 (Summer), late March 1993(Autumn), and June 1993 (Winter). The locations where counts were taken are indicated with capital letters in accordance with Driscoll (1992) and are shown in Figure 1. Four new locations were sampled, two around St Helena Island (S1 & S2) on the northern and eastern sides of the island respectively, one on the mudflat in the small inlet in the western side of the boat passage (Z2) and one between the new bunds walls to the north of Fisherman Island (Z1). The sampling effort for each count is not standardised and the data are most appropriate as the basis of other tables of selected species showing the percentage contribution of species to totals for each count.

Species	Spring					Summer											Autumn												Winter							Tot
Sites->	J	A	P	E	F	G	A	B	Y	M	L	S1	S2	V	R	Q	E	I	F	Y	L	M	A	J	R	E	Z1	Z2	B	K	Y	M	B	J	R	E	
Little Pied Cormorant				3															2	2	7								2		22				15			53
Pied Cormorant									1										5												6				9			21
Australian Pelican	2																	1	10										2		4				2			21
White-faced Heron	1	1	2	2	7	12		3	4	3	2					2			22	5	5		3		2			1		23	18	9	11	3	21	1	163
Striated Heron																									1			1	1				1					4
Great Egret					1	1													19	1			1			1				1							25
Little Egret														1							1										1					1	7
Royal Spoonbill												1												1	1					22			2				27
Sacred Ibis			1		2			1					7											15				17		29	13	11	26	31	10		163
Osprey																			1																		1
Brahminy Kite																														1							1
Whistling Kite																														1							1
Chestnut Teal		51											2		1										10	3	66			13		32	49	12	31	6	276
Grey Teal														2																							2
Pied Oystercatcher			16			5				1		71	2	2			22		9	14	9	4				14	20				21						210
Black-winged Stilt															2									1	2			1		6		1	6	51	92	2	164
Red-necked Avocet																																			12		12
Large Sand Plover							2	5							8			5						2	16				11								49
Mongolian Plover							2			1				3				5						2	1		2							12			28
Red-capped Plover																		13						4			2										19
Lesser Golden Plover						1	3	9	2	10			3	2				27				4	13	6					12				7		1		100
Grey Plover			1																																		1
Ruddy Turnstone														7																							7
Sharp-tailed Sandpiper	75	70	4	2	4	1	43	12	5	6			3	3	32																						260
Red Knot	138																	2							1												141
Curlew Sandpiper	12	2												4	17			34						2	14		14	5									104
Red-necked Stint																		5									19										24
Great Knot	43	1																145							2												191
Bar-tailed Godwit	14	44	13	1	1	5	15	20	9	13	14	1		13	17		6	70	2	6	6	4	15	27	34	1	2	1	19	5	2	1	8	11	22		422
Black-tailed Godwit		2													18							2	10	7	14			2					1	14	5		75
Eastern Curlew	3	14	1	6	13	10	2	5	5	8	13	4	3	1	4	1			4			1			5			3	2	19	5	6	4	4	23		169
Whimbrel	1	13	2		3	17	8	3	5	9	5	7	1	16	7	4	3				3	7	12	2	14	4	3	3	13	4	2	3	3	4	3		184
Grey-tailed Tattler		61	17	7	14	27	47	21	3	6				51			2			7	12	47			3	8	2		48		10				2		395
Greenshank	1	1	2				1	2												3	2	2	4	1	1	3	1	7		4							35
Marsh Sandpiper									2	1					3			1					3			1		3									14
Terek Sandpiper							1								12			1							29				1									44
Gull-billed Tern																			2						1					3			1		11		18
Caspian Tern												3							1	2	14									1	11			20				52
Silver Gull	1			1	1	1		1	1	8		20		1			1	5	3		3		2	3		1	22			3	7	4	17	126				232
Little Tern	4		2	1	1										2						1		3														14
Crested Tern					1							172																										176
Collared Kingfisher																								1					1	6		2	11	4	5	1	31
Sacred Kingfisher																																	2				2
Totals	295	260	61	23	48	80	124	82	37	66	34	279	21	106	123	7	34	314	80	30	59	36	108	80	151	33	156	35	122	138	128	69	152	318	238	11	3938

Appendix B.

The percentage contribution of species of waders to the total scan counts of waders recorded during low tide surveys around Fisherman Island in November 1992 (Spring), February & early March 1993 (Summer), late March 1993 (Autumn), and June 1993 (Winter). The locations where counts were taken are indicated with capital letters in accordance with Driscoll (1992) and are shown in Figure 1. Four new locations were sampled, two around St Helena Island (S1 & S2) on the northern and eastern sides of the island respectively, one on the mudflat in the small inlet in the western side of the boat passage (Z2) and one between the new bunds walls to the north of Fisherman Island (Z1). The last row gives the site totals from which the percentages are calculated. The last column gives the totals counts for each species.

Species	Spring					Summer											Autumn												Winter							Tot
Sites->	J	A	P	E	F	G	A	B	Y	M	L	S1	S2	V	R	Q	E	I	F	Y	L	M	A	J	R	E	Z1	Z2	B	K	Y	M	B	J	R	E	
Pied Oystercatcher			28.6			7.6				1.8		85.5	16.7	2			66.7		60	70	32.1	11.1					50	29.4			47.7							210
Black-winged Stilt															1.7									1.7	1.5			6.2		17.6		9.1	20.7	53.1	57.5	100	164
Red-necked Avocet																																			7.5		12
Large Sand Plover							1.6	6.5							6.7			1.6						3.3	11.8			9.5									49
Mongolian Plover							1.6			1.8				2.9				1.6						3.3	0.7		2.9						12.5				28
Red-capped Plover																		4.2						6.7			2.9										19
Lesser Golden Plover						1.5	2.4	11.7	6.5	18.2			25	2				8.8				11.1	13.1	10					10.3				24.1		0.6			100
Grey Plover			1.8																																		1
Ruddy Turnstone														6.9																							7
Sharp-tailed Sandpiper	26.1	33.7	7.1	12.5	11.4	1.5	34.7	15.6	16.1	10.9			25	2.9	26.7																							260
Red Knot	48.1																	0.6							0.7													141
Curlew Sandpiper	4.2	1												3.9	14.2			11						3.3	10.3		20.6	31.2										104
Red-necked Stint																		1.6									27.9											24
Great Knot	15	0.5																47.1							1.5													191
Bar-tailed Godwit	4.9	21.2	23.2	6.2	2.9	7.6	12.1	26	29	23.6	43.8	1.2		12.7	14.2		18.2	22.7	13.3	30	21.4	11.1	15.2	45	25	3.6	2.9	6.2	16.4	14.7	4.5	9.1	27.6	11.5	13.8			422
Black-tailed Godwit		1													15							5.6	10.1	11.7	10.3			12.5					3.4	14.6	3.1			75
Eastern Curlew	1	6.7	1.8	37.5	37.1	15.2	1.6	6.5	16.1	14.5	40.6	4.8	25	1	3.3	20			26.7			2.8			3.7			18.8	1.7	55.9	11.4	54.5	13.8	4.2	14.4			169
Whimbrel	0.3	6.2	3.6		8.6	25.8	6.5	3.9	16.1	16.4	15.6	8.4	8.3	15.7	5.8	80	9.1			10.7	19.4	12.1	3.3	10.3	14.3	4.4	18.8	11.2	11.8	4.5	27.3	10.3	4.2	1.9			184
Grey-tailed Tattler		29.3	30.4	43.8	40	40.9	37.9	27.3	9.7	10.9				50			6.1			25	33.3	47.5		2.2	28.6	2.9		41.4		22.7				1.2			395
Greenshank	0.3	0.5	3.6				0.8	2.6												10.7	5.6	2	6.7	0.7	3.6	4.4	6.2	6		9.1							35
Marsh Sandpiper									6.5	1.8					2.5			0.3						5			1.5		2.6									14
Terek Sandpiper							0.8								10			0.3							21.3				0.9									44
Totals	287	208	56	16	35	66	124	77	31	55	32	83	12	102	120	5	33	308	15	20	28	36	99	60	136	28	68	16	116	34	44	11	29	96	160	2	2648

Appendix C.

Scan counts of species recorded during low tide surveys around Fisherman Island during the first surveys (Driscoll 1992) in August 1991, October 1991 and January 1992, and during the recent surveys in November 1992 February & early March 1993, late March 1993 and June 1993. The table includes only those scan counts that could be categorised into certain habitats as discussed in Driscoll (1992) and further discussed in this report. Also, counts from the same "habitat" and time have been combined. The sampling effort for each count is not standardised and the data are most appropriate as the basis of other tables of selected species showing the percentage contribution of species to totals for each count. The two totals in the last columns are for each of the two main survey periods, Driscoll (1992) and the present report.

Species	Habitat->	"main"							"seagrass"							"cove"						"mix"			"staging"					Luggage Pt		Month Totals							Tot1	Tot2
	Month->	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Oct	Jan	Feb	Mar	Jun		Oct	Jan	Mar	Aug	Oct	Nov	Mar	Jun	Oct	Mar	Aug	Oct	Jan	Nov	Feb	Mar	Jun		
	Year->	'91	'91	'92	'92	'93	'93	'93	'91	'91	'92	'92	'93	'93	'93	'91	'92	'93	'93	'93		'91	'92	'93	'91	'91	'92	'93	'93	'91	'93	'91	'91	'92	'92	'93	'93	'93		
Little Pied Cormorant		5		5			4	22			1			2									1	7	9				15			14		7			13	37	21	50
Pied Cormorant						1		6		1	1			5															9				1	1		1	5	15	2	21
Australian Pelican							2	4	2	1	4			10									11			2	2		2		1	2	3	15	2		13	6	20	21
White-faced Heron		59	24	32	3	22	8	38	90	36	10	7	2	22	23		11		2	21		13	6	5	6		1		3			155	73	59	11	24	37	85	287	157
Striated Heron			1				1	1											1														1				2	1	1	3
Great Egret						1	2		22	2	17	1		19	1		1						2									22	2	20	1	1	21	1	44	24
Little Egret				2				4	3							2	1							1									3	2	3			1	4	8	5
Royal Spoonbill			6					2	109	3					22	2	26		1				4					1				109	11	30			2	24	150	26
Sacred Ibis		81	12		1	1		50	263	22		2			29		1			10		44	6		17			15	31	11		361	89	7	3	1	15	120	457	139
Osprey		1												1																		1					1		1	1
Brahminy Kite									4						1																	4						1	4	1
Whistling Kite															1																							1		1
Chestnut Teal		32	16		51			81	128						13			1	10	31				17					12	24		177	40		51	1	10	137	217	199
Grey Teal																																								
Pied Oystercatcher		19	13	23	16	6	18	21						9										9	1							20	13	23	16	6	36	21	56	79
Black-winged Stilt			3					7	126						6	5	12	2	2	92		1			40	1		1	51	4		166	14	12		2	3	156	192	161
Red-necked Avocet																				12																		12		12
Large Sand Plover			18	5		7	11										23	8	16						1	8		2		2	5	1	28	28		15	34		57	49
Mongolian Plover			2	1		3													1						8			2	12	1	5	8	3	1		3	8	12	12	24
Red-capped Plover																										2		4		2	13		4			17		4	17
Lesser Golden Plover		12	6	23		25	29	7												1		3						6			27	12	9	23		25	62	8	44	95
Grey Plover			16		1																	6				9				15			46		1				46	1
Ruddy Turnstone			4																														4						4	
Sharp-tailed Sandpiper			185	47	74	67				5		4				22	14	32				10				11	75			1			234	61	153	99			295	252
Red Knot			3																1							29	138			25	2		57		138		3		57	141
Curlew Sandpiper			8	5	2											36	20	17	14				25			26	12	2		61	34		131	50	14	17	50		181	81
Red-necked Stint				6																										1	5		1	6			5		7	5
Great Knot			9	1	1														2							2	43			36	145		47	1	44		147		48	191
Bar-tailed Godwit		19	123	57	57	62	44	11	19	17		1	14	2	5	14	104	17	34	22		13	84	6	23	51	14	27	11	30	70	61	248	245	72	93	183	49	554	397
Black-tailed Godwit			2	9	2		12	1								5	1	18	14	5						8		7	14				15	10	2	18	33	20	25	73
Eastern Curlew		64	47	58	15	30	3	15	136	51	3	13	13	4	19	11	79	4	5	23		14	15		16	2	3		4			216	125	155	31	47	12	61	496	151
Whimbrel		16	44	48	15	42	32	8	15	5		3	5		4	5	11	7	14	3		7	10	3	1	6	1	2	4			32	67	69	19	54	51	19	168	143
Grey-tailed Tattler		20	232	154	78	104	107	10	13	7		14					15		3	2		12	70	7		6						33	257	239	92	104	117	12	529	325
Greenshank		4	16	5	3	3	11	4	1	4							8		1			2	11	3			1	4				5	22	24	4	3	19	4	51	30
Marsh Sandpiper						3	3										2	3										3		1				2		6	7		2	13
Terek Sandpiper			7	1		1	1									1	48	12	29				2			5			1			13	51		13	31		64	44
Gull-billed Tern								1		2				2	3		2		1	11			1									2	3			3	15	5	18
Caspian Tern		2		1			2	11	3	1				1	1									14	2				20			7	1	1			17	32	9	49
Silver Gull		15	13	3		11	2	28	5	3	7	1		3	3		3						7	3	1	2	1	3	126	1	5	21	19	20	2	11	16	157	60	186
Little Tern			16	12	2		3					1					1	2					7	1		3	4						19	20	7	2	4		39	13
Crested Tern		1		4				2	4			1			1																	5		4	1			3	9	4
Collared Kingfisher		9	1				1	13	10						6	2				5					2			1	4			21	3				2	28	24	30
Sacred Kingfisher								2																														2		2
Totals		359	827	502	321	389	296	349	953	160	43	48	34	80	138	105	383	123	151	238		125	262	59	144	173	295	80	318	214	314	456	1604	1190	664	546	980	1043	4250	3233

Appendix D.

The percentage contribution of species of waders to scan counts of waders recorded around Fisherman Island during the first low tide surveys (Driscoll 1992) in August 1991, October 1991 and January 1992, and during the recent surveys in November 1992 February & early March 1993, late March 1993 and June 1993. The table includes only those scan counts that could be categorised into certain habitats as discussed in Driscoll (1992) and further discussed in this report. Also, counts from the same "habitat" and time have been combined. The two last columns are for each of the two main survey periods, Driscoll (1992) and the present report. The last row gives the site totals for waders from which the percentages are calculated.

Species	Habitat->	"main"							"seagrass"							"cove"					"mix"			"staging"					Luggage Pt		Month Totals							% 1	% 2
	Month->	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Oct	Jan	Feb	Mar	Jun	Oct	Jan	Mar	Aug	Oct	Nov	Mar	Jun	Oct	Mar	Aug	Oct	Jan	Nov	Feb	Mar	Jun		
	Year->	'91	'91	'92	'92	'93	'93	'93	'91	'91	'92	'92	'93	'93	'93	'91	'92	'93	'93	'93	'91	'92	'93	'91	'91	'92	'93	'93	'91	'93	'91	'91	'92	'92	'93	'93	'93		
Pied Oystercatcher		12.3	1.8	5.2	6.1	1.7	6.6	25						60									32.1	1.1							3.6	1	2.3	2.7	1.2	4.4	5.6	1.9	3.5
Black-winged Stilt			0.4					8.3	40.6						17.6	5.1	3.6	1.7	1.5	57.5	1.5			44.4	0.6		1.7	53.1	2.2		30	1	1.2		0.4	0.4	41.7	6.6	7.1
Red-necked Avocet																				7.5																	3.2		0.5
Large Sand Plover			2.4	1.1			2	4.1									6.8	6.7	11.8					1.1	4.8		3.3		1.1	1.6	0.2	2.1	2.8		3	4.2		2	2.1
Mongolian Plover			0.3	0.2		0.8													0.7					8.9			3.3	12.5	0.6	1.6	1.4	0.2	0.1		0.6	1	3.2	0.4	1
Red-capped Plover																									1.2		6.7		1.1	4.2		0.3				2.1		0.1	0.7
Lesser Golden Plover		7.8	0.8	5.2		7.1	10.7	8.3												0.6	4.4						10			8.8	2.2	0.7	2.3		5	7.6	2.1	1.5	4.2
Grey Plover			2.2		0.4																8.8				5.4				8.4			3.4		0.2				1.6	
Ruddy Turnstone			0.5																													0.3						0.1	
Sharp-tailed Sandpiper			25.1	10.6	28	19				5.6		11.4				22.2	4.2	26.7			14.7				6.6	26.1			0.6			17.5	6.1	26.1	19.6			10.2	11
Red Knot			0.4																0.7						17.5	48.1			14	0.6		4.3		23.5		0.4		2	6.2
Curlew Sandpiper			1.1	1.1	0.8											36.4	5.9	14.2	10.3			11.5			15.7	4.2	3.3		34.3	11		9.8	5	2.4	3.4	6.1		6.3	3.5
Red-necked Stint				1.4																									0.6	1.6		0.1	0.6			0.6		0.2	0.2
Great Knot			1.2	0.2	0.4														1.5						1.2	15			20.2	47.1		3.5	0.1	7.5		18		1.7	8.4
Bar-tailed Godwit		12.3	16.7	12.9	21.6	17.6	16.2	13.1	6.1	19.1		2.9	43.8	13.3	14.7	14.1	30.9	14.2	25	13.8	19.1	38.7	21.4	25.6	30.7	4.9	45	11.5	16.9	22.7	11	18.5	24.5	12.3	18.4	22.4	13.1	19.2	17.4
Black-tailed Godwit			0.3	2	0.8		4.4	1.2								5.1	0.3	15	10.3	3.1					4.8		11.7	14.6				1.1	1	0.3	3.6	4	5.3	0.9	3.2
Eastern Curlew		41.6	6.4	13.1	5.7	8.5	1.1	17.9	43.9	57.3	100	37.1	40.6	26.7	55.9	11.1	23.4	3.3	3.7	14.4	20.6	6.9		17.8	1.2	1		4.2			39	9.3	15.5	5.3	9.3	1.5	16.3	17.2	6.6
Whimbrel		10.4	6	10.8	5.7	11.9	11.8	9.5	4.8	5.6		8.6	15.6		11.8	5.1	3.3	5.8	10.3	1.9	10.3	4.6	10.7	1.1	3.6	0.3	3.3	4.2			5.8	5	6.9	3.2	10.7	6.2	5.1	5.8	6.3
Grey-tailed Tattler		13	31.4	34.8	29.5	29.5	39.5	11.9	4.2	7.9		40					4.5		2.2	1.2	17.6	32.3	25		3.6						6	19.2	23.9	15.7	20.6	14.3	3.2	18.3	14.2
Greenshank		2.6	2.2	1.1	1.1	0.8	4.1	4.8	0.3	4.5							2.4		0.7		2.9	5.1	10.7			0.3	6.7				0.9	1.6	2.4	0.7	0.6	2.3	1.1	1.8	1.3
Marsh Sandpiper						0.8	1.1										0.6	2.5									5			0.3			0.2		1.2	0.9		0.1	0.6
Terek Sandpiper			0.9	0.2		0.3	0.4									1	14.2	10	21.3			0.9			3					0.3		1	5.1		2.6	3.8		2.2	1.9
Totals		154	738	443	264	353	271	84	310	89	3	35	32	15	34	99	337	120	136	160	68	217	28	90	166	287	60	96	178	308	554	1338	1000	586	505	818	374	2892	2283

Appendix E - High tide roost counts at Fisherman Island main roost (BSIS) and claypan (FICP)

August 1991 to June 1993 - Species initials head columns. Totals and subtotals given for sites. Totals given for wader species.

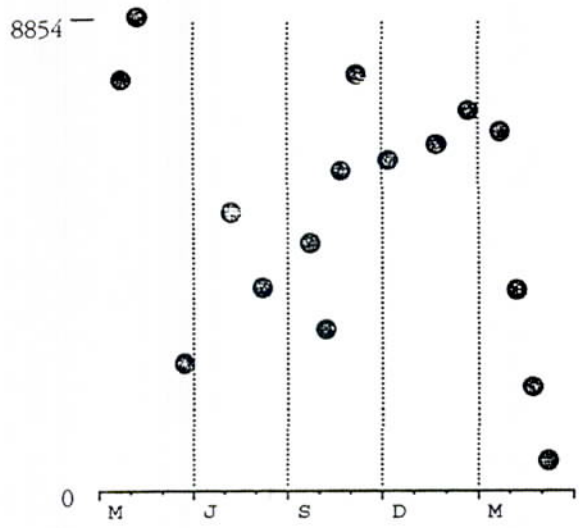
site	date	po	ml	gp	lgp	mp	dbp	lsp	rcp	bws	rns	rt	ec	w	gtt	g	ms	ts	bltg	btg	rk	gk	sts	rns	cs	Tot.	Spp	ap	d	pc	lbc	lpc	wfh	ge	sh	rs	ct	sg	wwt	gbt	cpt	cmt	lt	crt
BSI	13/8/9	79				5				123	22									167					142	538	6											24		2	31	3		73
BSI	12/10/	64		98		50		5	10	19	30	23	473	28	3					1480	150	2600	46	5	201	5284	17	11										47			12		113	110
BSI	24/10/	21		12	9	12		16		19	52	16	8	3	25			5	350	575	5	1050	8	192	32	2410	19										62		8	12		80	40
BSI	16/1/9	22		46		35		95			95	4		10				5		423		545		5		1285	11	34								5	135	95		74	27	14	280
BSI	17/1/9	11		82		248		176	5		130		8						146	704		392		40	21	1963	12	18			19					23	610	20		90		65	209
BSI	10/11/	12		60		280		51		13	105		1							895	410	271	1	140	501	2740	13	6	2	2		1		2			220		5	39		310	174
BSI	8/1/93	113		47		672		166		13	84	10				1		1	213	740	3	2490		475	2288	7306	15	47							3		345	365		45	4	613	16
BSI	21/1/9	76		36	3	250		170	2		46	15			50			3	298	592	1	2007	1	218	1780	5548	17	10		2	4	3					60	301		15		250	55
BSI	9/2/93	216		64		528		95	10	1	28	48		3	24			2	159	584		1476		66	1835	5139	16	69		40	2						497			46		857	380
BSI	24/3/9	93		3		87	11	171	4	4	73	10	6	1	289	1		14	80	160	5	460		15	23	1510	20	60							2		30	516	215	3	124		154	159
BSI	22/4/9	210							2	10	108	1		105					91	65	5	26		70	101	794	12	20			1			1			180	798	186	16	10		68	13
BSI	9/6/93	153	1		11	10		40		32	115					5		2		90		1		80	21	561	13	37	1	10	210	32	5	10	1		382	155		14	19			
BSI	28/7/9	130								1	36				220			2	14	270	132	607			1	1413	10	61	1		301			4			180	126		112	2			
		1200	1	448	23	2177	11	975	33	235	924	127	496	150	611	7		34	1351	6745	711	11925	55	1306	6946	36491		373	4	54	537	36	5	17	6		800	4810	1181	100	519	34	2327	150
FIC	26/8/9									110			212										12			334	3																	
FIC	24/10/									6			300	30		4				15			42		55	452	7																
FIC	17/1/9				6					38			190	50		5	15		60	131			20	25	30	569	11	75						5							5			25
FIC	21/1/9									7			203	115		5				130			158			618	8																	
FIC	9/2/93												152	60						200			70			482	4						4										
FIC	24/3/9				5								44			1			2	370		20	1		22	465	8																
FIC	28/6/9												80	40												120	2									125							
					10					161			1181	295		15	15		62	846		20	301	25	107	3038		75					4	5		125				5			25
		1200	1	448	33	2177	11	975	33	396	924	127	1677	445	611	22	15	34	1413	7591	711	11945	356	1331	7053	39529		448	4	54	537	36	9	22	6	125	800	4810	1181	100	524	34	2327	153

Key to species initials:

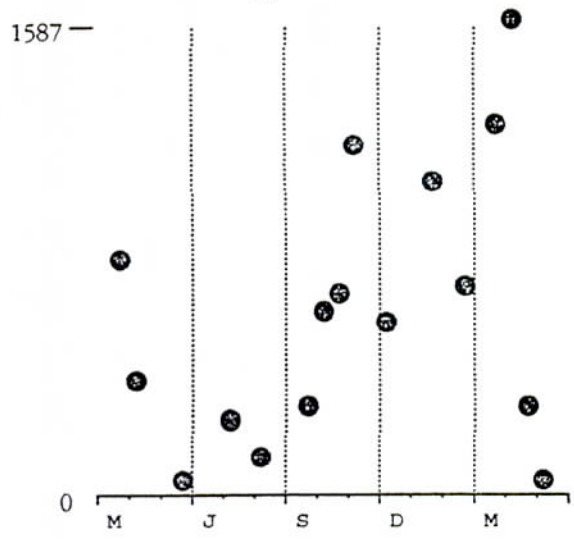
po	Pied Oystercatcher
ml	Masked Lapwing
gp	Grey Plover
lgp	Lesser Golden Plover
mp	Mongolian Plover
dbp	Double-banded Plover
lsp	Large Sand Plover
rcp	Red-capped Plover
bws	Black-winged Stilt
rns	Red-necked Stint
rt	Ruddy Turnstone
ec	Eastern Curlew
w	Whimbrel
gtt	Grey-tailed Tattler
g	Greenshank
ms	Marsh Sandpiper
ts	Terek Sandpiper
bltg	Black-tailed Godwit
btg	Bar-tailed Godwit
rk	Red Knot
gk	Great Knot
sts	Sharp-tailed Sandpiper
rns	Red-necked Stint
cs	Curlew Sandpiper
ap	Australian Pelican
d	Darter
pc	Pied Cormorant
lbc	Little Black Cormorant
lpc	Little Pied Cormorant
wfh	White-faced Heron
ge	Great Egret
sh	Striated Heron
rs	Royal Spoonbill
ct	Chestnut Teal
sg	Silver Gull
wwt	White-winged Tern
gbt	Gull-billed Tern
cpt	Caspian Tern
cmt	Common Tern
lt	Little Tern
crt	Crested Tern

Appendix F. High tide roost counts of selected species from 5 sites combined for the period March 1992 to May 1993 (seasons shown by vertical lines). The sites are Amity Spit, Luggage Pt, Lytton, Manly Harbour & Cleveland/Raby Bay (not Fisherman Island). Values range from 0 to the max count.

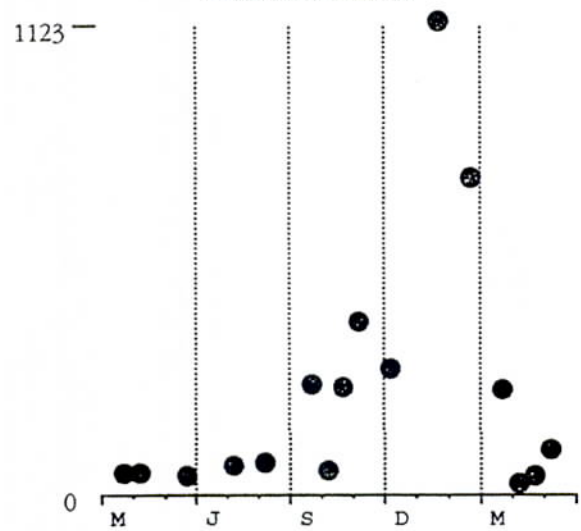
Total migratory waders



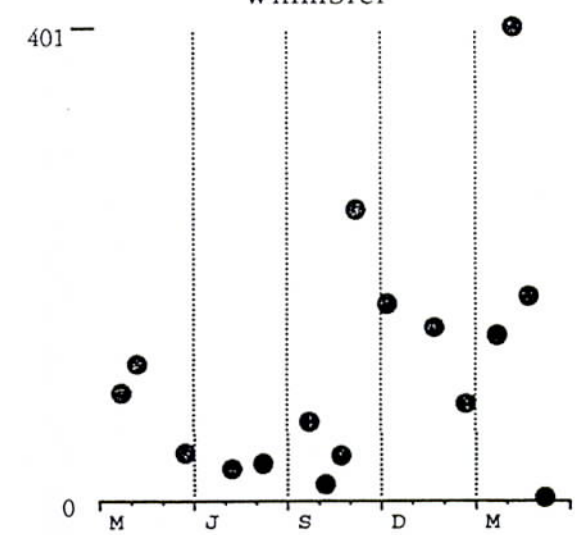
Mongolian Plover



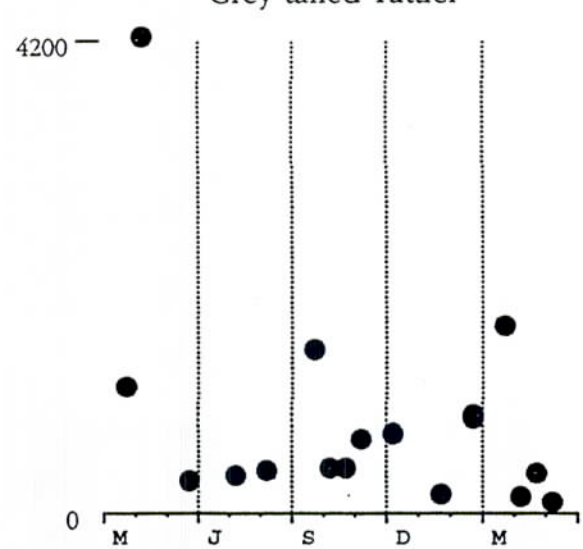
Eastern Curlew



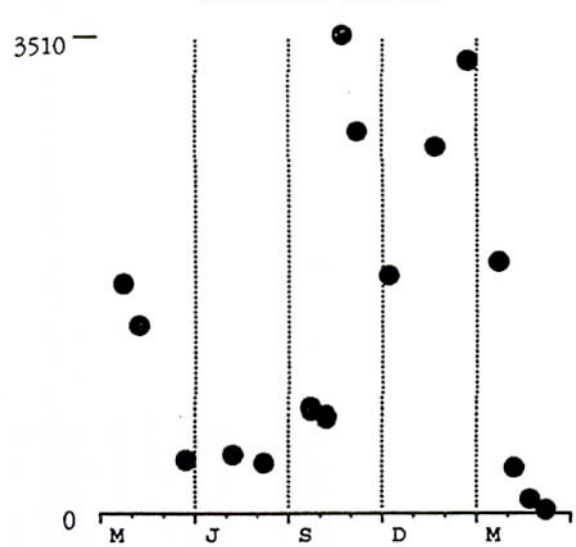
Whimbrel



Grey-tailed Tattler

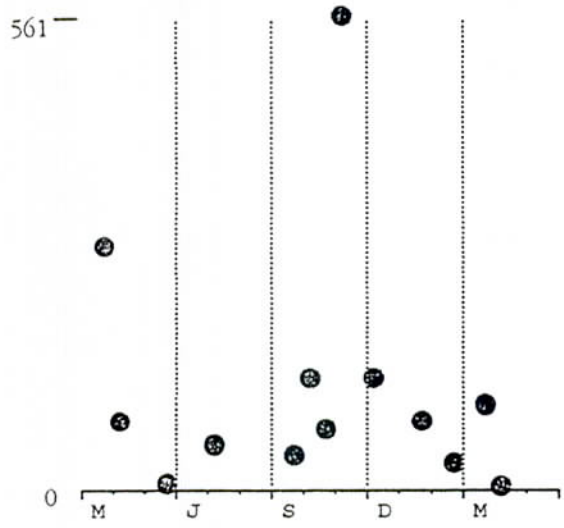


Bar-tailed Godwit

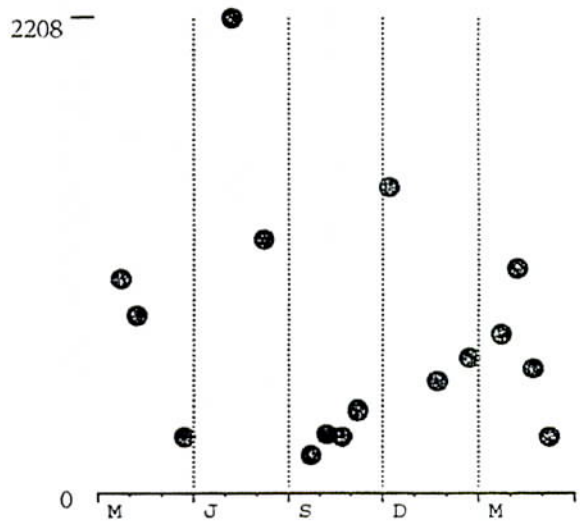


Appendix F ctnd. High tide roost counts of selected species from 5 sites combined for the period March 1992 to May 1993 (seasons shown by vertical lines). The sites are Amity Spit, Luggage Pt, Lytton, Manly Harbour & Cleveland/Raby Bay (not Fisherman Island). Values range from 0 to the max count.

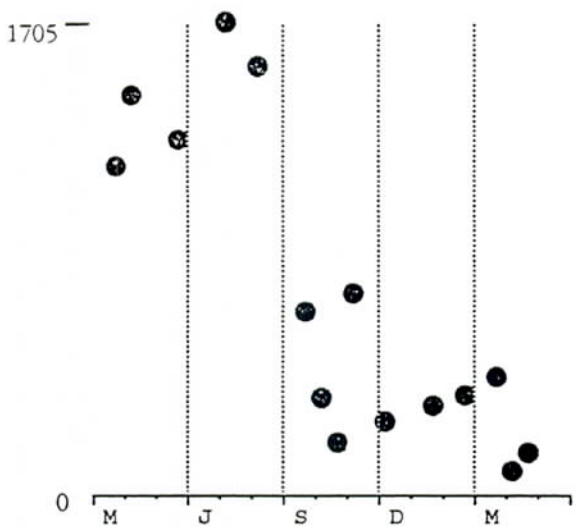
Great Knot



Red-necked Stint



Curlew Sandpiper



Appendix G

Recapture details for Pied Oystercatcher

Band		Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
100	97513		2	675.0	QLD	-27 24 18	153 25 57			AM	6/7/89	
		R	2+	790		-27 21 56	153 10 29	33	259	BI	7/6/92	1067
101	02267		1	640	QLD	-27 24 18	153 25 57			AM	3/5/92	
		R	1	660		-27 20 15	153 26 10	14	307	MI	30/10/92	180
100	97550		2+	845	QLD	-27 21 56	153 10 29			BI	5/4/92	
		R	3+	840		-27 21 56	153 10 29			BI	7/6/92	63
101	02282		3+	800	QLD	-27 21 56	153 10 29			BI	7/6/92	
		R	3+	760		-27 23 00	153 13 50	17	38	SH	12/10/92	127

Recapture details for Bar-tailed Godwit

Band		Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
071	75888		1+	272.0	QLD	-27 24 18	153 25 57			AM	7/7/89	
		R	3+	260		-27 24 18	153 25 57			AM	23/10/92	1204
071	75890		1+	267.0	QLD	-27 24 18	153 25 57			AM	7/7/89	
		R	3+	255		-27 24 18	153 25 57			AM	23/10/92	1204
072	41194		1+	260	QLD	-27 24 18	153 25 57			AM	23/10/92	
		R		270		-27 24 18	153 25 57			AM	10/4/93	169
072	41465		3+	225	QLD	-27 24 18	153 25 57			AM	23/10/92	
		R		320		-27 20 15	153 26 10	14	307	MI	21/2/93	121
072	41480		3+	240	QLD	-27 24 18	153 25 57			AM	23/10/92	
		R		260		-27 24 18	153 25 57			AM	10/4/93	169
072	06306		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	2+			-27 21 56	153 10 29			BI	3/3/91	471
072	06311		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	4+	325		-27 21 56	153 10 29			BI	20/3/93	1219
072	06320		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	2+	428		-27 21 56	153 10 29			BI	7/3/92	841
072	06325		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	1+	367.0		-27 21 56	153 10 29			BI	19/1/91	428
072	06350		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	4+	340		-27 20 20	153 05 20	17	321	NB	2/2/93	1173
072	06377		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	2+			-27 21 56	153 10 29			BI	3/3/91	471
072	06384		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	3+	289.0		-27 21 56	153 10 29			BI	13/10/91	695
072	06388		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	3+	288.0		-27 21 56	153 10 29			BI	13/10/91	695
072	06392		1+		QLD	-27 21 56	153 10 29			BI	17/11/89	
		R	4+	460		-27 21 56	153 10 29			BI	20/3/93	1219
072	06393		1	227.0	QLD	-27 21 56	153 10 29			BI	21/10/90	
		R	1+	336		-27 21 56	153 10 29			BI	7/3/92	503

Recapture details for Bar-tailed Godwit

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
072 06407		2+		QLD	-27 21 56	153 10 29			BI	19/1/91	
	R	2+	234.0		-27 21 56	153 10 29			BI	13/10/91	267
072 06408		2+	325.0	QLD	-27 21 56	153 10 29			BI	19/1/91	
	R	4+	348		-27 20 20	153 05 20	17	321	NB	2/2/93	745
072 06412		2+	323.0	QLD	-27 21 56	153 10 29			BI	19/1/91	
	R	4+	363		-27 20 20	153 05 20	17	321	NB	2/2/93	745
072 06419		2+	303.0	QLD	-27 21 56	153 10 29			BI	19/1/91	
	R	4+	315		-27 20 20	153 05 20	17	321	NB	18/7/92	546
072 06479		2+	319.0	QLD	-27 21 56	153 10 29			BI	13/10/91	
	R	3+			-27 20 20	153 05 20	17	321	NB	2/2/93	478
072 11844		2+	294.0	QLD	-27 21 56	153 10 29			BI	13/10/91	
	R	3+	350		-27 20 20	153 05 20	17	321	NB	2/2/93	478
072 06502		2		QLD	-27 20 15	153 26 10			MI	15/8/92	
	R		298		-27 24 18	153 25 57	14	126	AM	10/4/93	238
072 06537		2		QLD	-27 20 15	153 26 10			MI	15/8/92	
	R		300		-27 24 18	153 25 57	14	126	AM	10/4/93	238
072 06572		3+		QLD	-27 20 15	153 26 10			MI	15/8/92	
	R		258		-27 24 18	153 25 57	14	126	AM	10/4/93	238
072 06582		2+		QLD	-27 20 15	153 26 10			MI	15/8/92	
	R		380		-27 20 15	153 26 10			MI	21/2/93	190
072 06601		1	275	QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	2	225		-27 20 20	153 05 20			NB	3/5/93	289
072 06606		2+	260	QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	3+	320		-27 20 20	153 05 20			NB	2/2/93	199
072 06613		2+	335	QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	3+	345		-27 20 20	153 05 20			NB	2/2/93	199
072 06621		1	320	QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	2	285		-27 20 20	153 05 20			NB	3/5/93	289
072 06626		2+	290	QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	3+	255		-27 20 20	153 05 20			NB	3/5/93	289
072 06638		1+		QLD	-27 20 20	153 05 20			NB	18/7/92	
	R	1+			-27 20 20	153 05 20			NB	19/7/92	1
072 41493		3+		QLD	-27 20 20	153 05 20			NB	26/10/92	
	R		205		-27 20 20	153 05 20			NB	3/5/93	189
072 41494		3+	295	QLD	-27 20 20	153 05 20			NB	26/10/92	
	R		340		-27 20 20	153 05 20			NB	2/2/93	99
072 41540			445	QLD	-27 20 20	153 05 20			NB	2/2/93	
	T				-27 20 20	153 05 20			NB	2/2/93	0

Recapture details for Curlew Sandpiper

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days

Recapture details for Curlew Sandpiper

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
)41 65640		1+		QLD	-27 20 20	153 05 20			NB	26/10/92	
	R	2+	47		-27 21 56	153 10 29	17	140	BI	10/1/93	76

Recapture details for Red Knot

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
)51 56715		1+	106.0	QLD	-27 21 56	153 10 29			BI	21/10/90	
	R	2+			-27 22 00	153 10 30	15	1	X1	19/10/92	729
)51 56769		2+	98	QLD	-27 21 56	153 10 29			BI	20/3/93	
	R		96		-27 20 20	153 05 20	17	321	NB	3/5/93	44
)51 56772		2+	110	QLD	-27 21 56	153 10 29			BI	20/3/93	
	R		104		-27 20 20	153 05 20	17	321	NB	3/5/93	44
)51 56773		2+	100	QLD	-27 21 56	153 10 29			BI	20/3/93	
	R		82		-27 20 20	153 05 20	17	321	NB	3/5/93	44
)51 56774		2+	115	QLD	-27 21 56	153 10 29			BI	20/3/93	
	R		105		-27 20 20	153 05 20	17	321	NB	3/5/93	44

Recapture details for Great Knot

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
)61 92025		1+	161.0	QLD	-27 21 56	153 10 29			BI	21/10/90	
	R	3+	230		-27 21 56	153 10 29			BI	20/3/93	881
)61 92046		2+	220.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	225		-27 21 56	153 10 29			BI	20/3/93	748
061 92056		2+	214.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	180		-27 21 56	153 10 29			BI	20/3/93	748
)61 92060		2+	236.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	195		-27 21 56	153 10 29			BI	20/3/93	748
061 92061		2+	190.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	3+	180		-27 20 20	153 05 20	17	321	NB	18/7/92	503
)61 92069		2+	156.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	161		-27 21 56	153 10 29			BI	10/1/93	679
061 92072		2+	178.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	205		-27 21 56	153 10 29			BI	20/3/93	748
061 92076		2+	152.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	195		-27 21 56	153 10 29			BI	20/3/93	748
061 92077		2+	194.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	200		-27 21 56	153 10 29			BI	20/3/93	748
061 92093		2+	206.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	205		-27 21 56	153 10 29			BI	20/3/93	748
061 92098		2+	194.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	208		-27 21 56	153 10 29			BI	20/3/93	748
061 92101		2+	210.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
	R	4+	220		-27 21 56	153 10 29			BI	20/3/93	748

Recapture details for Great Knot

Appendix G

Band		Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days
061	92104		2+	194.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
		R	4+	200		-27 21 56	153 10 29			BI	20/3/93	748
061	92106		2+	184.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
		R	4+	200		-27 21 56	153 10 29			BI	20/3/93	748
061	92109		2+	198.0	QLD	-27 21 56	153 10 29			BI	3/3/91	
		R	4+	165		-27 21 56	153 10 29			BI	10/1/93	679
061	87286		1+	164.0	QLD	-27 21 56	153 10 29			BI	13/10/91	
		R	2+	205		-27 21 56	153 10 29			BI	20/3/93	524
061	87299		1+	164.0	QLD	-27 21 56	153 10 29			BI	13/10/91	
		R	2+	175		-27 20 20	153 05 20	17	321	NB	18/7/92	279
061	92132		1+	154.0	QLD	-27 21 56	153 10 29			BI	13/10/91	
		R	2+	215		-27 21 56	153 10 29			BI	20/3/93	524
062	09506		2+	170	QLD	-27 21 56	153 10 29			BI	10/1/93	
		R		155		-27 21 56	153 10 29			BI	20/3/93	69
062	09513		2+	169	QLD	-27 21 56	153 10 29			BI	10/1/93	
		R		215		-27 21 56	153 10 29			BI	20/3/93	69
062	09515		2	146	QLD	-27 21 56	153 10 29			BI	10/1/93	
		R		134		-27 20 20	153 05 20	17	321	NB	3/5/93	113
061	94499			140	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		130		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94516			155	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		135		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94524			135	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		140		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94535			143	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		135		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94536			177	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		145		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94546			125	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		130		-27 20 20	153 05 20	17	321	NB	3/5/93	44
061	94564			135	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		135		-27 20 20	153 05 20	17	321	NB	3/5/93	44
062	09533			155	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		135		-27 20 20	153 05 20	17	321	NB	3/5/93	44
062	09536			130	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		130		-27 20 20	153 05 20	17	321	NB	3/5/93	44
062	09540			150	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		142		-27 20 20	153 05 20	17	321	NB	3/5/93	44
062	09543			145	QLD	-27 21 56	153 10 29			BI	20/3/93	
		R		130		-27 20 20	153 05 20	17	321	NB	3/5/93	44

Recapture details for Great Knot

Appendix G

	Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days	
)62	09548			155	QLD	-27 21 56	153 10 29			BI	20/3/93		3
		R		152		-27 20 20	153 05 20	17	321	NB	3/5/93	44	
)62	09550			135	QLD	-27 21 56	153 10 29			BI	20/3/93		3
		R		130		-27 20 20	153 05 20	17	321	NB	3/5/93	44	
)62	09564			160	QLD	-27 21 56	153 10 29			BI	20/3/93		3
		R		144		-27 20 20	153 05 20	17	321	NB	3/5/93	44	
)62	09580			150	QLD	-27 21 56	153 10 29			BI	20/3/93		3
		R		136		-27 20 20	153 05 20	17	321	NB	3/5/93	44	
)61	94406		2+	160	QLD	-27 20 20	153 05 20			NB	18/7/92		3
		R	3+	190		-27 21 56	153 10 29	17	140	BI	20/3/93	245	
)61	94426		2+		QLD	-27 20 20	153 05 20			NB	18/7/92		3
		R	3+	225		-27 21 56	153 10 29	17	140	BI	20/3/93	245	
061	94431		1		QLD	-27 20 20	153 05 20			NB	18/7/92		3
		R	2	135		-27 20 20	153 05 20			NB	3/5/93	289	
061	94460		1		QLD	-27 20 20	153 05 20			NB	18/7/92		4
		R	2	154		-27 20 20	153 05 20			NB	3/5/93	289	
061	94462		1		QLD	-27 20 20	153 05 20			NB	18/7/92		4
		R	2	137		-27 20 20	153 05 20			NB	3/5/93	289	
061	94468		2+		QLD	-27 20 20	153 05 20			NB	18/7/92		4
		R	3+	225		-27 21 56	153 10 29	17	140	BI	20/3/93	245	
061	94469		1		QLD	-27 20 20	153 05 20			NB	18/7/92		4
		R	2	195		-27 21 56	153 10 29	17	140	BI	20/3/93	245	
061	94474		1		QLD	-27 20 20	153 05 20			NB	18/7/92		4
		R	2	165		-27 20 20	153 05 20			NB	26/10/92	100	

Band	Rec.	Age	Weight	State	Latitude	Longitude	Dist.	Direct.	Location	Date	Days