Bird Populations of Fisherman Islands: Continued Monitoring and Three Year Assessment of Changes

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Contents

Appendices

1993-94

List of Tables

List of Figures

1 Introduction

The report covers the period of monitoring of bird populations between November 1993 and September 1994. It is the third of a series of reports on bird populations of the environs of Fisherman Islands. The first focused on documenting the birdlife and bird habitats and the second on monitoring changes. This report gives details of a continuation of the monitoring programme and summarises data collected since the beginning of fieldwork in 1991. Attention is also given to design criteria for the rehabilitation and establishment of wetland sites for use by birds.

As in the past, considerable change has taken place over the last 12 months with completion of the foundations for the eastern access road into the Port, levelling of large amounts of sand fill and the completion of bunding of large areas of intertidal and subtidal wetlands at the northern extremity of the Port. The area used most intensively in the past as a high tide roost site has dried up and a large freshwater pond of over 50 ha behind a section of the new access road was inadvertently created. This artificial pond is now being filled. The implications of these changes to birdlife have been considerable and have yet to be fully manifested. There is a strong case for continued monitoring of the whole area due to this constant process of change.

The fieldwork involved low tide scan counts of feeding birds and high tide roost counts. All incidental observations were also recorded and cannon netting was conducted on two occasions. Many high tide roost counts made by the Queensland Wader Study Group at other locations have been utilised to establish a framework of comparison of areas within the central region of Moreton Bay. As with the last report, there has been a free flow of information between QWSG and the Port Corporation.

2 Methods

Fieldwork was undertaken in November and early December, in mid February, in April, July, August and September. In addition, one day was spent on low tide scan counts in March and other visits were made to count at high tide roosts throughout the year to coincide as far as possible with dates set down for QWSG counts throughout Moreton Bay.

The study area was the same as that outlined in Driscoll (1992, 1993) with the exception that the Wynnum area and Green Island were not visited. Claypans on Fisherman Islands and the surrounding intertidal mudflats and seagrass beds were sampled as well as the roost sites identified in the previous studies. The southern shoreline of the Boat Passage was sampled on several occasions and a single visit was made to Luggage Point at low tide. Rough counts were made of the birds using the large pond that developed to the north east of the new road overpass. It was difficult to assess birdlife on this pond because of its size and the amount of debris that often concealed the birds. Observations were generally made here on the days when high tide roost counts were being made.

The technique of sampling feeding birds at low tide (scan counts) was the same as used previously. 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 varying size depending upon the situation. Sites were mostly approached by canoe or dinghy but also from the land. Observations were made within 90 minutes of low tide. Other notes regarding this technique are given in the earlier reports.

Only a subset of the full range of low tide sites that were sampled in 1992 at Fisherman Islands were sampled over the last 10 months. These were chosen to represent a good coverage of the variation in the bird community that has been recorded previously. Labelling of these sites has been consistent for all three reports.

A total of 55 low tide scan counts were made throughout the recent period of fieldwork but some of these were repeated observations made from different angles onto the same general area or from the same habitat zone as defined in earlier reports and have been combined to give a total of 36 sets of data. As for previous reports, data from scan counts were subjected to classification analyses using counts of waders only. Details of the analysis technique were given in Driscoll (1992).

Cannon netting was conducted at Fisherman Islands on 2 occasions over the survey period, on 4th December 1993 and 8th May 1994 but the site has become less suitable for cannon netting. Banding is conducted by QWSG in accordance with permits, guidelines and procedures given by the Australian Bird Banding Scheme and Qld National Parks and Wildlife Service.

QWSG data used in this report includes part or all of what has been collected from high tide roosts since November 1993 at Lytton (2 sites), Luggage Point (1 site), Manly (up to 4 sites but 1 principal site), Cabbage Tree Creek mouth (1 site), Raby Bay (1 site), St Helena Island (4 sites), Amity Point (1 site) and Moreton Island (2 sites). Where there is more than one site at any of these places the data have been summed for each count. Also, data collected since August 1991 at the first three of these locations (those closest to Fisherman Islands) have also been assessed as part of this report in conjunction with information from Fisherman Islands.

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.

3 Scan counts at low tide

3.1 Recent sampling

The location of scan counts are shown in Figure 1 and the results are given in detail in Appendix A. There were a total of 5,272 counts of 42 species, half of which were wader species and are the subject of a classification analysis presented in the section on waders.

3.1.1 Non wader species

The 2,075 counts of the other 21 species included a large proportion of White-faced Heron, Australian White Ibis (Sacred Ibis), Chestnut Teal and Silver Gull. The other non wader species included four species of terns, two kingfishers, two ducks, three cormorants, three egrets, the Darter, the Australian Pelican, the Striated Heron and the Royal Spoonbill.

That is, as has already been shown in the earlier reports, the intertidal areas that are so well used by waders are also utilised by a range of other species. In particular, the spoonbills, herons and egrets make good use of areas with greater depth that are less accessible to the smaller species of wader. Other species, such as the cormorants and gulls primarily loaf on the mudflats over low tide. Distinctive features of this assortment of species is the Little Terns that often feed from the air close to the shore on an incoming tide and the high numbers of Great Egret, White-faced Heron, Australian White Ibis, Royal Spoonbill and Chestnut Teal.

All of these species rely upon Fisherman Islands to provide high tide roosting areas and there must be continuity of this facility if the birds are going to continue in such high numbers on the intertidal feeding areas. A suitably designed open drain down the eastern side of Fisherman Islands was advocated in the last report to provide habitat for these birds over high tide. It is paramount that there be this provision, and in accordance with appropriate design features for the birdlife. A standard engineered drain will be of no use whatsoever.

As in previous years, incidental records of flocks of over 40 Royal Spoonbill, 100 Australian White Ibis, 50 Great Egret and 35 White-faced Heron and were made on the intertidal area in and beyond the COVE area during the most recent period of sampling.

3.1.2 Waders

The scan counts of waders were converted to percentage values of the count totals (Appendix B) and subjected to a classification analysis to determine whether these observations were consistent with the patterns of intertidal habitat use as determined in the previous studies. Counts having fewer than a total of ten records were not used. Nor were the species whose totals were less than five. A dendrogram showing the 9 principal groupings of scan counts is given in Figure 2.

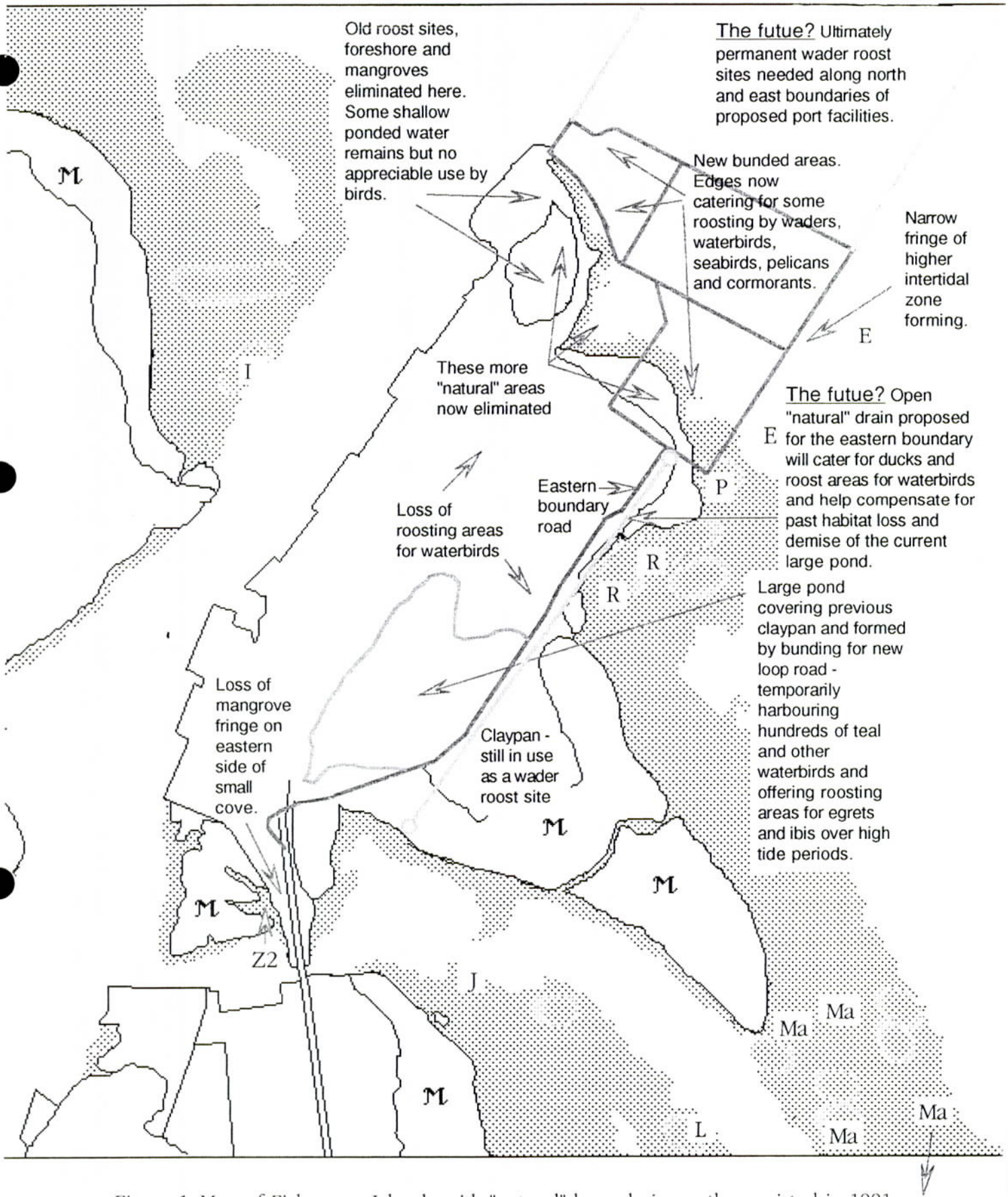


Figure 1. Map of Fisherman Islands with "natural" boundaries as they existed in 1991 and new bund wall and road boundaries superimposed. Notes indicate some of the main habitat changes that have occurred and capital letters show locations of current scan count positions (see text and Appendix A). The large "M" indicates mangroves and the shaded areas intertidal zones.

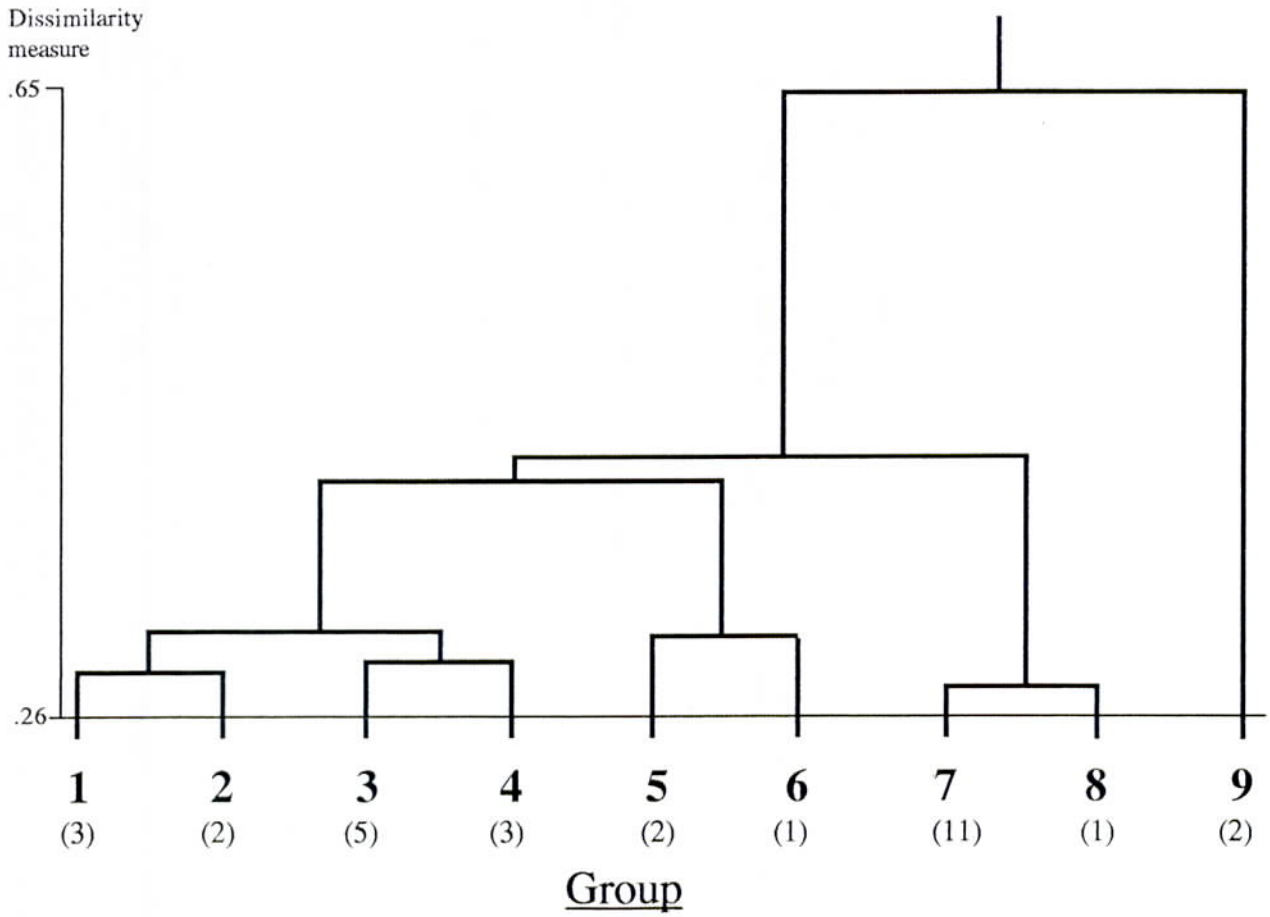


Figure 2. Dendrogram showing the result of a classification of scan counts undertaken during the recent period of fieldwork (Dec. 1993 to Sept 1994). Appendix B gives details of the 30 scan counts being classified (site Z2 in the winter months not included due to scarcity of birds). The groups are simply labelled from 1 to 9 and the number of members of each group is given in brackets (30 in total). A description of the group membership and characteristics is given in the text. The classification was undertaken using Gower's General Similarity Index to calculate a dissimilarity matrix betweeen counts which were then grouped using flexible sorting (beta value of -0.25). Choice of the cutoff of the number of groups was taken upon visual inspection of the dendrogram. Interpretation of a larger number of groups would have been impractical. The clustering had a cophenetic correlation coefficient of 0.62.

All of the counts made in the MAIN zone ("Ma" in Figure 1 and see Driscoll 1992, 1993) have in fact grouped closely together in Groups 3 and 4 (Figure 2) and the difference between these two groups is seasonal with counts made in July, August and September (Group 4) separating from those made in the summer and autumn months (Group 3). The difference being the much lower density of migratory waders in winter, especially in relation to the resident Black-winged Stilt which tends to increase in numbers around Moreton Bay during the drier, winter months.

One other count, made near the new bund wall (site E), grouped with the MAIN site counts in Group 3. The other 5 counts from site E occur in Group 1 (February and April counts) and Group 7 (2 counts from winter) and Group 5 (December). However, apart from the suggestion of some seasonal influence on the composition of these groups there is little apparent basis for their composition.

Other features of the classification are simpler to interpret and include the single member group of the count made at Luggage Point (Group 8) which offers some confirmation of the earlier indications that the wader community of Luggage Point varies from that of areas to the east of Fisherman Islands where the substrate is much muddier and with seagrass.

The winter counts from the COVE (site R in Figure 1) also occur together in a subgroup of (Group 11) but the three other counts from here made earlier in the year are variously placed with counts from site J, E and P (see Figure 1). This suggests that the distinctive features of the COVE area may not be as strong as they were when the area was first investigated beginning in 1991. However, it should be remembered that the sites that this area is variously aligned with are subject to changing physical conditions (near the bund wall) or subject to movements of dispersing flocks of waders (site J, STAG or "staging" area).

The direct impact of reclamation work at the northern end of Fisherman Islands has meant changes in bird use and distribution. These are described in the section on roost counts. However, this analysis of recent scan counts does not indicate that there has been any dramatic departure from the pattern of intertidal habitat utilisation by birds in other areas around Fisherman Islands. A better assessment of long term temporal changes is available through the analysis of counts from three of the major habitat zones over the three years of sampling as given below.

3.2 Long term assessment of changes

Appendix C tabulates counts from the "MAIN" zone, the "COVE" and "STAG", as defined in earlier reports, for the three year period since August 1991. The record is not entirely satisfactory in that in each year there has not been the same degree of sampling during particular seasons but the data do give a picture over the long term. For non-wader species

nothing unusual is apparent in that numbers and the occurrence of particular species appear to show some consistency from year to year given that there are seasonal effects such as the absence in winter months of Little Tern and the apparent build up at this time of year in the abundances of other species such as the White-faced Heron and Chestnut Teal alluded to earlier.

The overall percentage contribution of waders to scan counts from the three habitat zones is illustrated in Appendix F. However, a far more thorough analysis has been undertaken of these data based upon the details tabulated in Appendix D. A classification of scan counts based upon the percentage contribution of species to scan counts resulted in the dendrogram shown in Figure 3. The characteristic species composition of each of the derived groups from the classification is shown in Figure 4.

Groups 1, 2 and 3 are all counts taken in July, August or September of this year or in August 1991 or June 1993. The two anomalies to this major, clear seasonal division in the data are for a September sample from the staging site that was not in any of these Groups and a January sample from the staging site which was. In September, migratory waders were returning but numbers had not built up enough to show a clear distinction from the winter counts except in the case of the sample from the staging site where a high number of Sharp-tailed Sandpipers were recorded. The high numbers of Black-winged Stilts recorded at the same site in January helped to give rise to the second anomalous grouping.

The species contribution to data for Groups 1, 2 and 3 (Figure 4) clearly shows the features of the winter assemblage of waders where diversity is lower and where resident waders (Pied Oystercatchers and Black-winged Stilts), and a high proportion of over wintering Eastern Curlew tend to dominate the counts. However, different habitat zones tend to differ in species composition, even in winter and the MAIN zone (all of group 1 in different years in winter) shows a more even distribution of different species of wader in winter and is characterised by higher numbers of Pied Oystercatchers than in other zones where Black-winged Stilts are more common.

What is also interesting about the collection of winter counts is that Group 2 is made up of the three counts from the cove in 1994 (July, August, September), whereas the two cove counts for other years in winter are in Group 3 with two counts from the staging area in July and August this year. This discrepancy is not great but is suggestive that the characteristics of the cove area may be changing subtly (see also Section above).

Among the other five Groups, two contain the majority of the counts and two are Groups with only one scan count each, i.e. May this year in the main zone (Group 5) and November 1992 in the staging area (Group 8). Both are the result of a large temporary build up and appearance of migrating birds (Figure 4). In the former case, high numbers of Grey-tailed Tattlers and in the latter, high numbers of Red Knot. These species are two that most

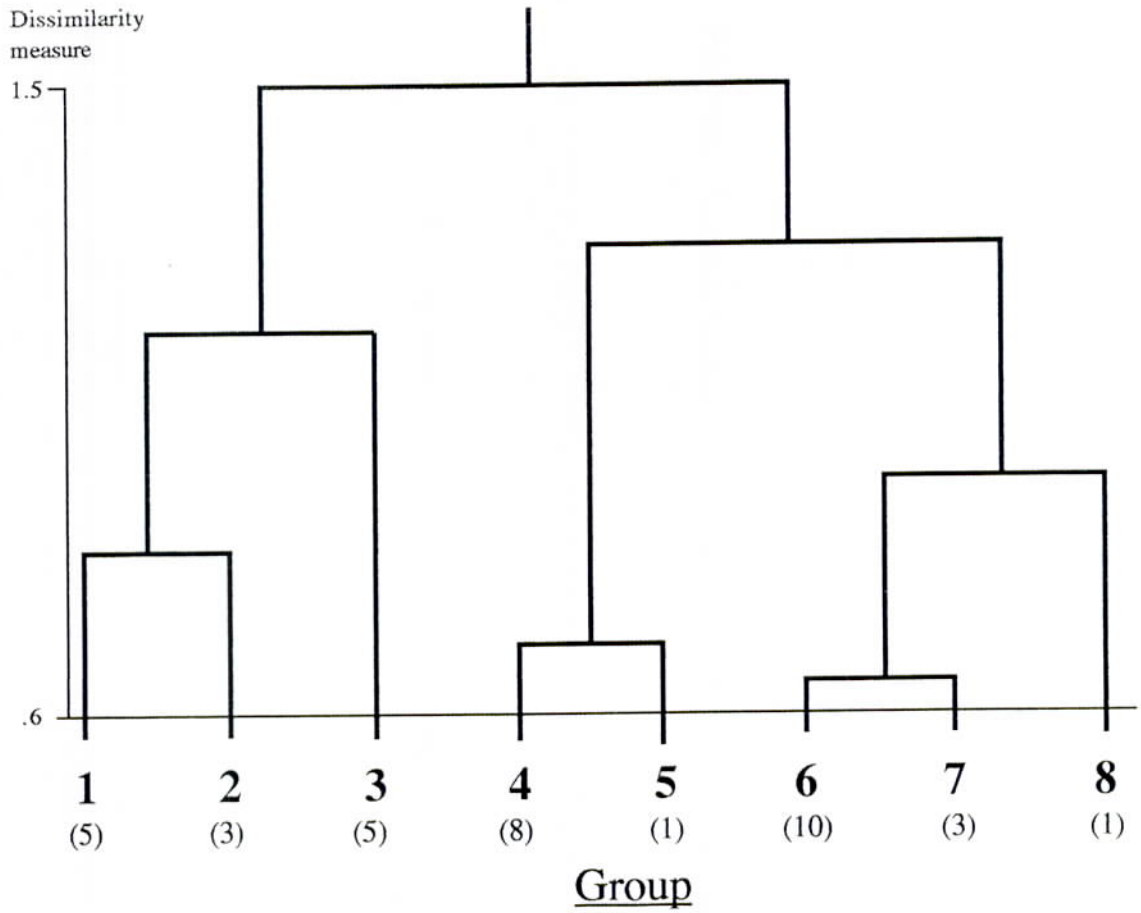


Figure 3. Dendrogram showing the result of a classification of scan counts undertaken over the period between August 1991 and September 1994 on three of the main habitat zones of intertidal feeding area around Fisherman Islands. Appendix D gives details of the 36 scan counts being classified. The groups are simply labelled from 1 to 8 and the number of members of each group is given in brackets (36 in total). A description of the group membership and characteristics is given in the text and Figure 4 gives details of species contribution to mean percentage values for each group. The classification was undertaken usingWhittaker's relative distance measure to calculate a dissimilarity matrix betweeen counts which were then grouped using flexible sorting (beta value of -0.25). Choice of the cutoff of the number of groups was taken upon visual inspection of the dendrogram. Interpretation of a larger number of groups would have been impractical. The clustering had a cophenetic correlation coefficient of 0.51.

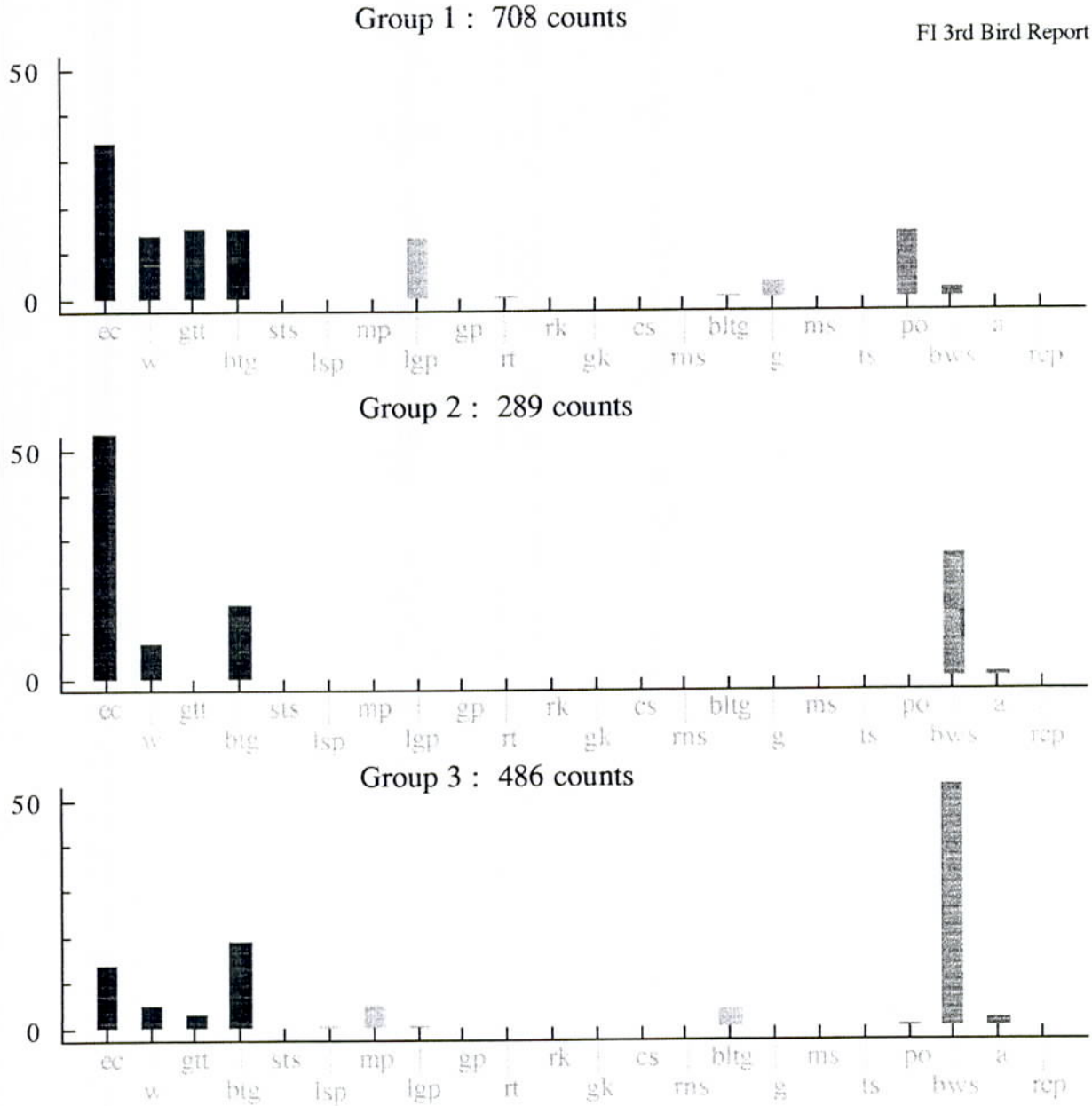


Figure 4. Percentage contribution of species of wader to scan counts for each of the classification groups using a selection of counts since 1991 (see Figure 3 and Appendix D). The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 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		

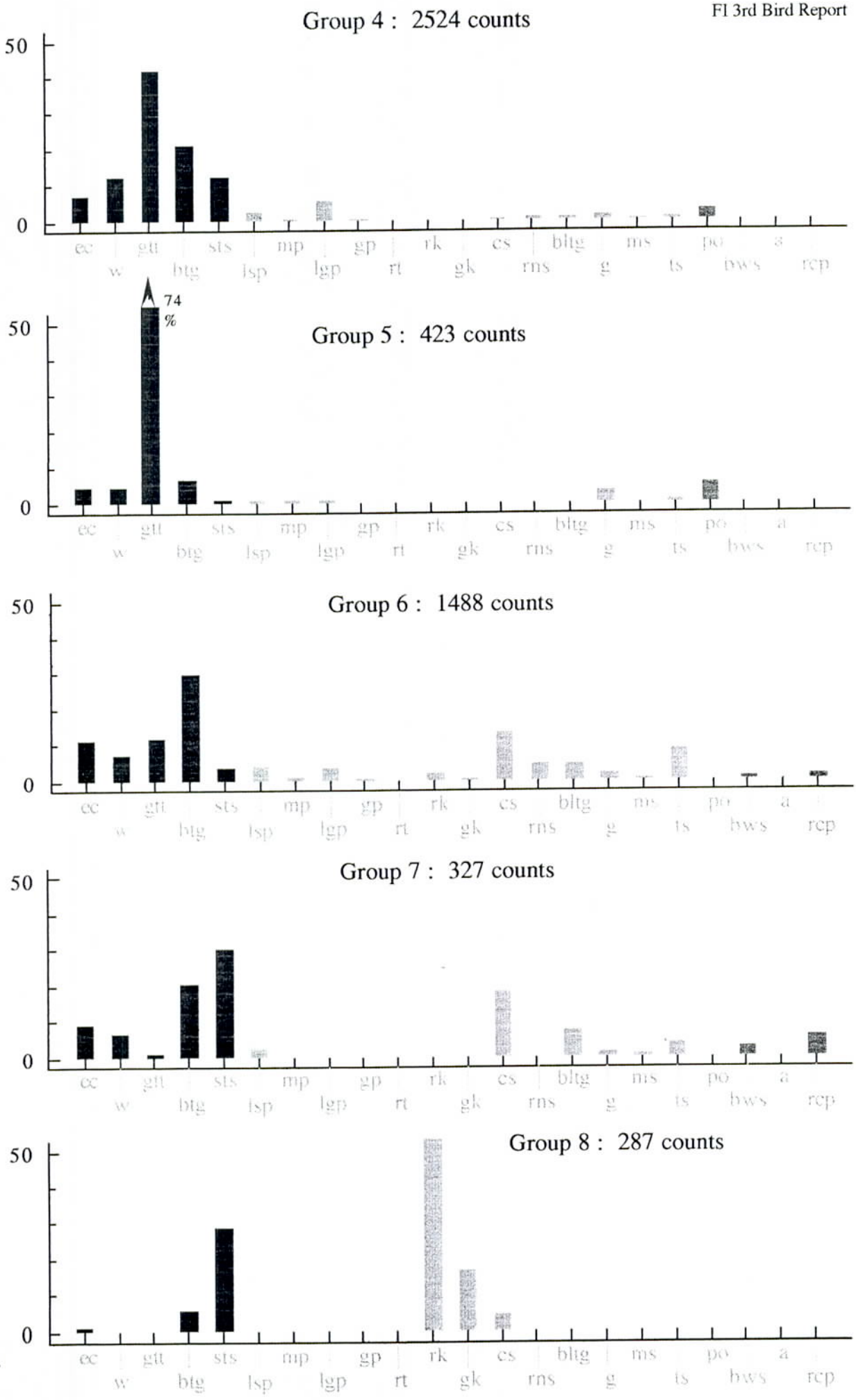

Group 4 : 2524 counts
50
0
ec
w
gtt
btg
sts
lsp
mp
lgp
gp
rt
rk
gk
cs
rns
bltg
g
ms
ts
po
bws
a
rcp
74
%
Group 5 : 423 counts
Group 6 : 1488 counts
Group 7 : 327 counts
Group 8 : 287 counts

Fig. 4. ctnd.

characterise Moreton Bay as a stopover site for waders en route during migration. Grey-tailed Tattlers show a late autumn build up in numbers throughout Moreton Bay and Red Knot exhibit a dramatic rise and fall in numbers in Moreton Bay during the southward migration. Red Knot mostly move onto Victoria or New Zealand.

Group 7 consists of only three scan counts; a cove count from October 1991, a cove count from February 1993 and a staging site count from September (1994). High counts of Sharp-tailed Sandpipers with Curlew Sandpipers and Bar-tailed Godwits characterise this group but it not a typical configuration of birds. It has probably resulted from temporary flocking and movement of birds, particularly in the period of southward migration.

The remaining two large groups, Group 4 with eight members and Group 6 with ten members, are a result of the second main split in the data (the first being seasonal). With just one exception Group 4 is scan counts in the main zone at times of year other than winter in all years. Group 6 is a mixture of counts from the staging area and the cove in non-winter months. Again the distinctive features of the cove are not paramount but nevertheless evident in some of the sub grouping of members of Group 6. The species makeup of Groups 4 and 6 are illustrated in Figure 4 and Group 6 does exhibit a higher proportion of Curlew Sandpiper and Terek Sandpiper which has been identified as a characteristic of the cove area in the earlier reports.

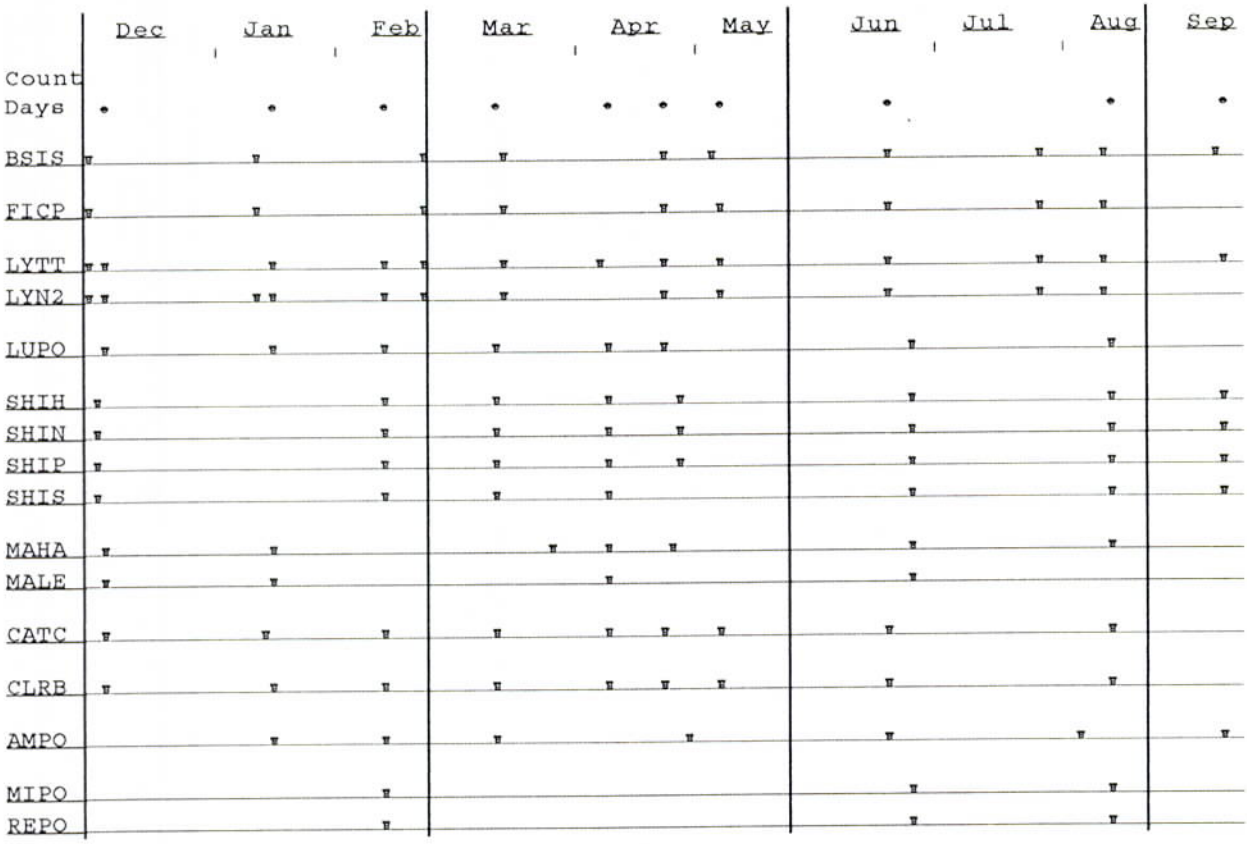
The data show that at least on the main intertidal habitat zone no major change in species composition of wading birds has occurred over the three year period. Nevertheless, some species such as Great Knot, Red Knot, Curlew Sandpiper and Sharp-tailed Sandpiper were generally recorded less frequently during the most recent sampling period than in previous years (Appendix E). There are certainly changes where there has been direct impact of the port development and changes at the roost sites (see below). There is also a vague suggestion from the data that conditions may not have remained the same in the cove and ongoing sampling would be useful in this regard.

4 Roost counts

4.1 Recent sampling

Summary totals since December 1993 of roost counts for sites around central Moreton Bay are shown in Table 2. In the case of the main roost on Fisherman Islands the values are graphed in Figure 5. The timing of these counts and the way certain subsites are grouped for purposes of analysis are shown in Table 1. Sites include Amity Spit (AMPO), Fisherman Islands main roost (BSIS), Cabbage Tree Creek mouth (CATC), Raby Bay (CLRB), Fisherman Islands claypan roost (FICP), Luggage Point (LUPO), Lytton (LYTT and LYN2), Manly boat harbour (MAHA), Mirapool and Reader's Point on Moreton Island (MIPO) and St Helena Island (SHIH).

Table 1. Timing of high tide roost counts of birds since December 1993, at a selection of sites being monitored by QWSG in the central region of Moreton Bay, including the sites at Fisherman Islands. The most recent counts were in early September 1994. A definition of site codes follows the body of the table. The site codes begin each line and the "official" count days for the State as listed in QWSG newsletter are indicated in the top line of the table. Sites are often grouped, as indicated in the table, because of their proximity to one another.



Code	Name	approx. Latitude	approx. Longitude	Group
BSIS	Bishop Island	27 22 24	153 10 45	A
FICP	Fisherman Is. claypan	27 23 35	153 10 30	B
LYTT	Lytton	27 25 0	153 10 0	C
LYN2	Lytton Claypan No. 2	27 24 45	153 09 30	C
LUPO	Luggage Point	27 22 30	153 09 0	D
SHIH	St Helena Is homestead	27 23 01	153 14 03	E
SHIN	St Helena Is north	27 22 49	153 14 0	E
SHIP	St Helena Is pier	27 23 26	153 13 45	E
SHIS	St Helena Is south east	27 23 35	153 14 18	E
MAHA	Manly Harbour	27 27 00	153 11 00	F
MALE	Manly Lota Esplanade	27 28 00	153 11 00	F
CATC	Cabbage Tree Creek mouth	27 20 10	153 05 20	G
CLRB	Cleveland/Raby Bay	27 31	153 16 30	H
AMPO	Amity Point Nth Stradbroke Island	27 24 30	153 26 0	I
MIPO	Mirapool Moreton Island	27 20 15	153 26 10	J
REPO	Reeders Point Moreton Island	27 21 50	153 25 40	J

Table 2. Total numbers of species and birds counted at high tide roost sites around Fisherman Island and in a broader area of central Moreton Bay between December 1993 and September 1994. (see Table 1 for names and locations of sites). Not all counts for September 1994 were available at the time of preparation of this table.

Site code	Date (yr mth dy)	Migratory wader spp	Migratory waders	Resident wader spp	Resident waders	Non wader species	Non waders
AMPO	940115	3	66	0	0	7	290
AMPO	940212	2	1120	2	55	3	107
AMPO	940312	6	2882	2	51	7	147
AMPO	940430	4	1023	4	90	13	166
AMPO	940618	2	153	4	171	10	194
AMPO	940806	3	211	5	107	10	207
AMPO	940911	2	15	4	24	8	123
BSIS	931201	12	3779	1	34	10	1144
BSIS	940111	11	3862	1	70	7	799
BSIS	940223	13	1900	4	222	9	1184
BSIS	940314	12	2457	3	293	6	1397
BSIS	940423	12	578	3	569	14	1187
BSIS	940506	5	236	3	374	8	580
BSIS	940618	7	960	4	499	5	716
BSIS	940726	6	894	4	1070	11	1745
BSIS	940811	5	644	3	820	11	1400
BSIS	940909	8	459	3	652	10	542
CATC	931204	9	1845	2	42	10	218
CATC	940113	1	440	1	38	3	91
CATC	940212	7	660	2	20	6	74
CATC	940313	6	950	0	0	8	225
CATC	940409	8	362	2	8	8	111
CATC	940424	7	279	4	52	9	68
CATC	940508	9	227	4	57	11	161
CATC	940618	8	677	5	261	8	185
CATC	940813	6	1025	3	132	6	51
CLRB	931204	10	2937	3	63	9	278
CLRB	940115	11	2801	3	115	6	205
CLRB	940213	7	1684	3	214	8	100
CLRB	940312	7	1531	3	198	4	89
CLRB	940409	8	962	3	186	9	116
CLRB	940423	9	912	4	121	8	81
CLRB	940507	7	365	3	130	9	90
CLRB	940618	5	193	5	106	6	131
CLRB	940813	8	453	5	107	10	106
FICP	931201	4	501	0	0	1	1
FICP	940111	9	483	1	7	1	20
FICP	940223	9	585	2	78	5	24
FICP	940314	9	813	0	0	7	36
FICP	940423	8	254	2	156	4	23

Table 2 ctnd over page

Site code	Date (yr mth dy)	Migratory wader spp	Migratory waders	Resident wader spp	Resident waders	Non wader species	Non waders
FICP	940508	3	162	1	31	1	6
FICP	940618	4	217	3	102	4	81
FICP	940726	5	276	4	37	3	9
FICP	940811	6	365	5	58	3	19
LUPO	931204	11	1228	2	56	3	12
LUPO	940116	13	1222	4	50	12	106
LUPO	940212	10	448	3	98	15	135
LUPO	940312	11	1138	1	193	13	42
LUPO	940409	6	164	3	72	14	226
LUPO	940424	11	282	3	63	12	146
LUPO	940625	6	2884	6	566	16	192
LUPO	940813	6	426	5	179	12	89
LYN2	940111	6	538	0	0	2	18
LYTT	931201	9	1131	0	0	3	13
LYTT	931204	7	555	1	2	1	1
LYTT	940115	8	810	1	12	2	16
LYTT	940213	10	1186	2	15	5	9
LYTT	940223	7	685	2	4	4	24
LYTT	940314	5	398	1	13	1	4
LYTT	940408	10	703	2	278	8	40
LYTT	940423	8	556	2	80	7	126
LYTT	940508	4	344	2	494	8	71
LYTT	940618	2	25	5	179	10	68
LYTT	940726	5	177	3	228	5	20
LYTT	940811	3	58	1	98	3	12
LYTT	940910	10	897	3	151	8	44
MAHA	931204	14	1977	3	34	8	222
MAHA	940116	14	1849	3	72	9	317
MAHA	940327	10	1063	5	89	4	216
MAHA	940409	11	1096	5	104	11	208
MAHA	940425	11	1042	6	131	7	424
MAHA	940625	8	312	6	194	7	126
MAHA	940814	9	451	6	142	6	259
MIPO	940212	7	3375	1	145	4	920
MIPO	940625	8	2124	3	92	6	651
MIPO	940813	5	2503	2	116	7	1409
SHIH	931203	10	740	4	198	9	95
SHIH	940212	11	653	3	50	8	98
SHIH	940313	10	447	3	72	15	371
SHIH	940409	8	245	3	164	12	188
SHIH	940428	5	105	3	43	5	59
SHIH	940625	6	118	4	109	9	83
SHIH	940813	7	263	5	67	8	106
SHIH	940911	12	1248	4	140	9	111

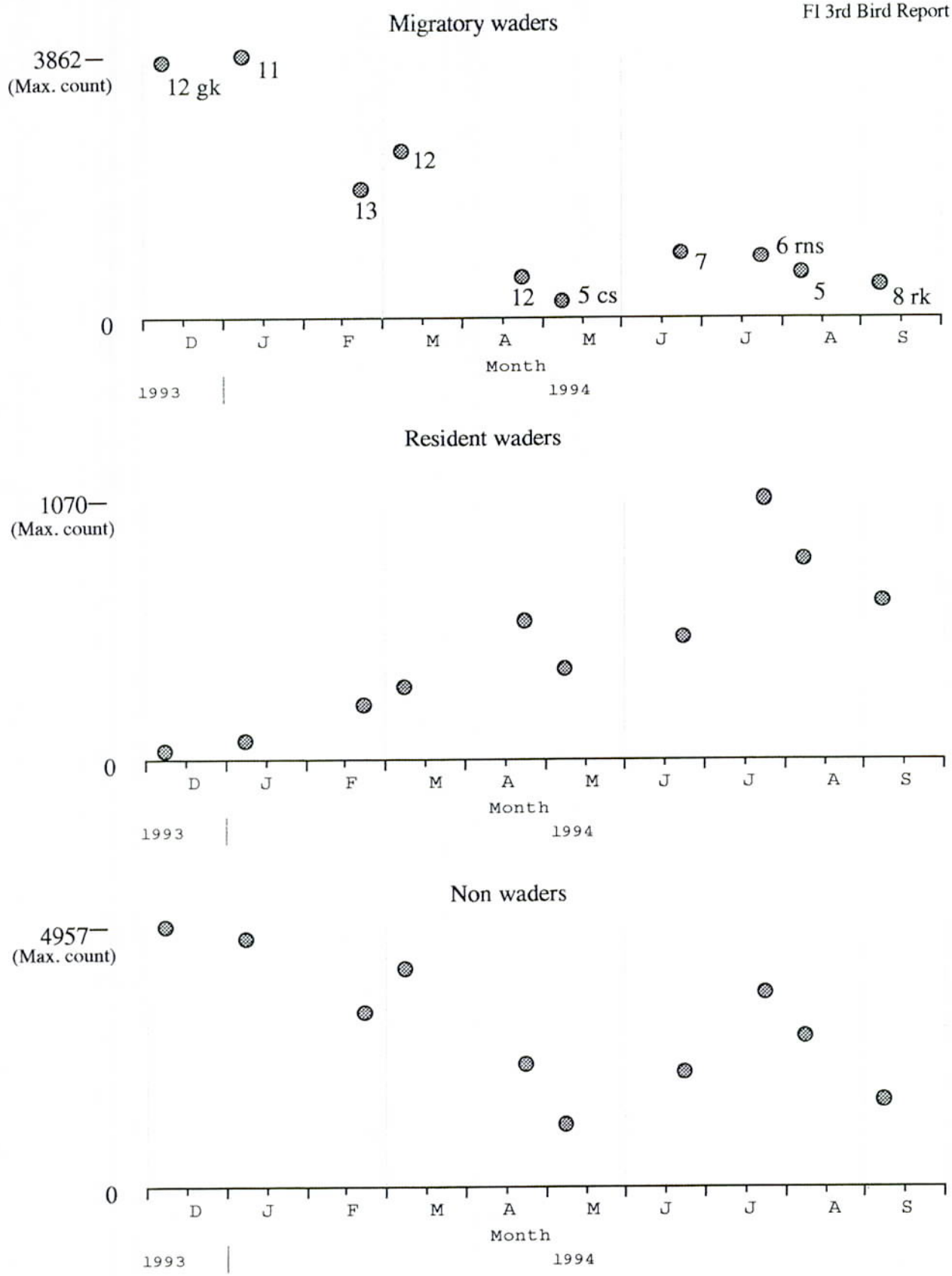


Figure 5. Total counts of birds at the main Fisherman Islands roost (northern area) taken throughout the most recent survey from December 1994 to September 1994. Numbers beside the points on the top graph indicate the number of species represented in the count. If a species represented over half of the total birds for a particular count its initials are given (migraory species only, top graph). Key to the initials are: rk - Red Knot, gk - Great Knot, cs - Curlew Sandpiper, rns - Red-necked Stint .

4.1.1 Non wader species

High numbers of seabirds and waterbirds have been counted at the wader roost sites on Fisherman Islands and, in the case of waterbirds, on a temporary impoundment. One thousand birds, other than waders, including ten or more species have regularly been recorded on the main roost at Fisherman Islands which is consistently higher than at the other sites in the central Moreton Bay region (Table 2, Figure 5).

Full details of counts of seabirds on Fisherman Islands is given in Appendix H. Numbers are highest throughout summer when there is an abundance of Little Terns that is unmatched elsewhere in Moreton Bay. Between 200 and 700 were counted regularly at the roost over the summer months. This has been the case in past years as well. The eastern Australian subspecies of the Little Tern is considered vulnerable (Garnett 1992), but due to the co-occurrence of the non-breeding east Asian subspecies and the difficulty of differentiating between the two it is not possible to know how significant the numbers at Fisherman Islands are in terms of the Australian subspecies. It has breed in the past in south east Queensland and if suitable provision existed for breeding at Fisherman Islands there may be some chance of breeding.

The numbers of Caspian Tern, White-winged Tern and Crested Tern are also especially high at Fisherman Islands at the right time of the year, and exceed or equal the numbers recorded at other locations (Appendix H). The higher numbers in summer of terns and gulls is not apparent from the graph of temporal changes in the number of non-wader species in Figure 5. These totals also include cormorants whose numbers had a dramatic increase during winter this year. A large collection of Little Black Cormorants, numbering over 1200 birds on one occasion, were roosting on the mangrove debris created along the southern edge of the newly bunded area to the north east of the complex. The very high numbers of waterbirds, avocets and cormorants around Fisherman Islands this year during winter may well have been linked to drought conditions over much of inland Queensland. Unusual influxes of a number of these species have been noted in other parts of Moreton Bay and south east Queensland.

4.1.2 Waders

Figure 5 indicates that the total number of migratory waders using the main roost at Fisherman Islands behaved predicably with the seasonal fall in numbers in autumn. In December and January, Great Knot outnumbered other migratory species at the main roost but counts of Mongolian and Large Sandplovers, Curlew Sandpiper and Red-necked Stint were also high (Appendix G). The number of Bar-tailed Godwit were lower than in previous years and Black-tailed Godwit were less consistently present at the site.

As late as December, Red Knot were still on the site but as in previous years continued migrating and were relatively scarce later in summer. Late northward migration of Grey-tailed Tattlers was also a feature of the counts and these birds were making use of temporary situations as construction proceeded. As the remaining mangroves were cleared off what was once Bishop Islands, the Grey-tailed Tattlers moved to a small sandy spit bordering the river channel in April and May to join flocks of Mongolian Plovers. However, this latter area now seems unsuitable for roosting with further earthworks in progress. These and other changes are mentioned in a later section.

The number of Bar-tailed Godwits on the claypan roost at Fisherman Islands showed more consistency than the number using the main roost and the significance of this site should not be understated. It also held several hundred Eastern Curlew through the summer and sporadic high numbers of other species (Appendix G). It is one of the most significant sites for Eastern Curlew on the mainland shores.

Nearly 4000 migratory waders was the highest count for a single count on Fisherman Islands (BSIS in Table 2, Figure 5) and was the maximum for any site during the period. However, few counts were taken from Moreton Island (MIPO) which in the past has returned higher values. The species mix tends to differ between sites and Moreton and Fisherman Islands are particularly dissimilar in this respect. A longer term perspective is needed to compare areas and this is attempted in the next Section using fewer sites for comparison.

In comparison to other areas, Fisherman Islands also holds high numbers of resident waders (Black-winged Stilts, Red-necked Avocets, Pied Oystercatchers) and reasonable numbers of the smaller resident species (Red-capped Plovers and Red-Kneed Dotterels) (Table 2, Appendix G). The overall numbers of resident waders rose over the winter months, primarily with the influx of an exceptionally large number of Red-necked Avocets (Appendix G, Figure 5).

4.2 Long term assessment of numbers

The three other main areas of roosting for migratory shorebirds closest to Fisherman Islands are at Lytton, Luggage Point and Manly boat harbour. Counts for these sites and counts for the combined values for the main roost and the claypan roost at Fisherman Islands from late 1991 to the present are shown in Figure 6.

In general, there have been consistent differences between sites over the years and seasonal changes in numbers have been repeated from one year to the next. This is not surprising giving that individual birds tend to return to the same feeding area and roost site. Providing local conditions don't change appreciably, the numbers should reflect population trends. For example, Luggage Point has been host to unusually high numbers of Red-necked Stint

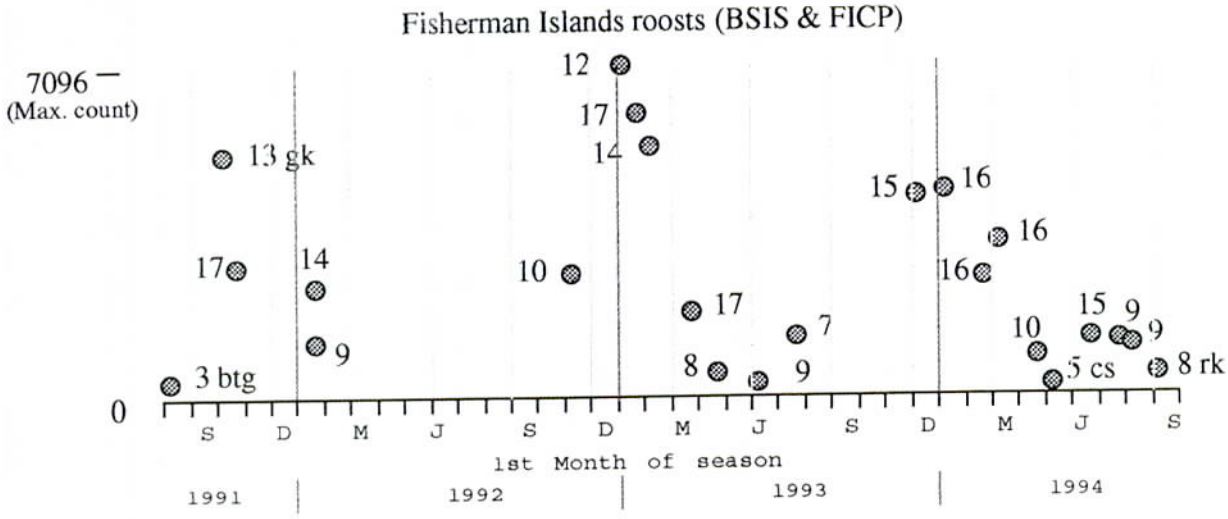
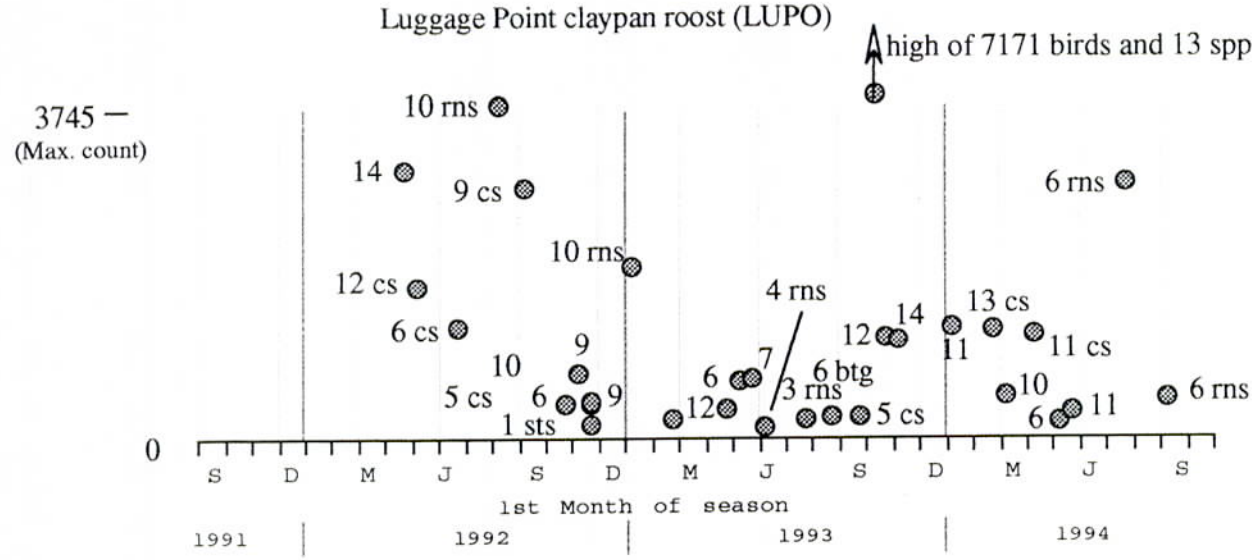


Figure 6. Total high tide roost counts of migratory waders at four main roosting areas between Luggage Point and Manly between late 1991 and September 1994. Counts have been made as part of the QWSG monitoring programme as well as fieldwork at Fisherman Islands. Data have sometimes been combined from neighbouring areas when they were collected on the same day, as indicated by the site codes in the titles. Numbers beside the points indicate the number of species represented in the count. If a species represented over half of the total birds for a particular count its initials are given as per the key below.

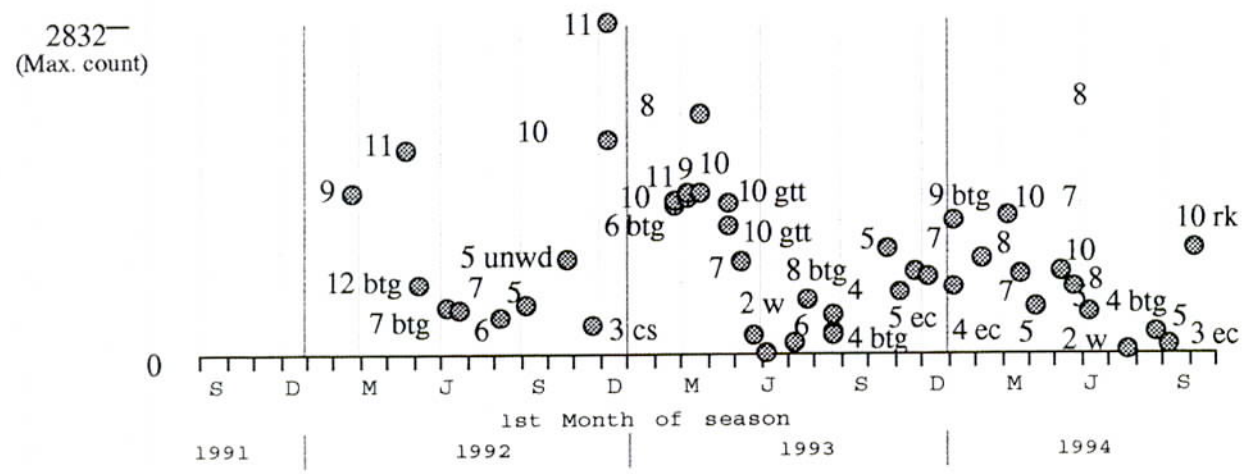
The species represented are as follows:

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		

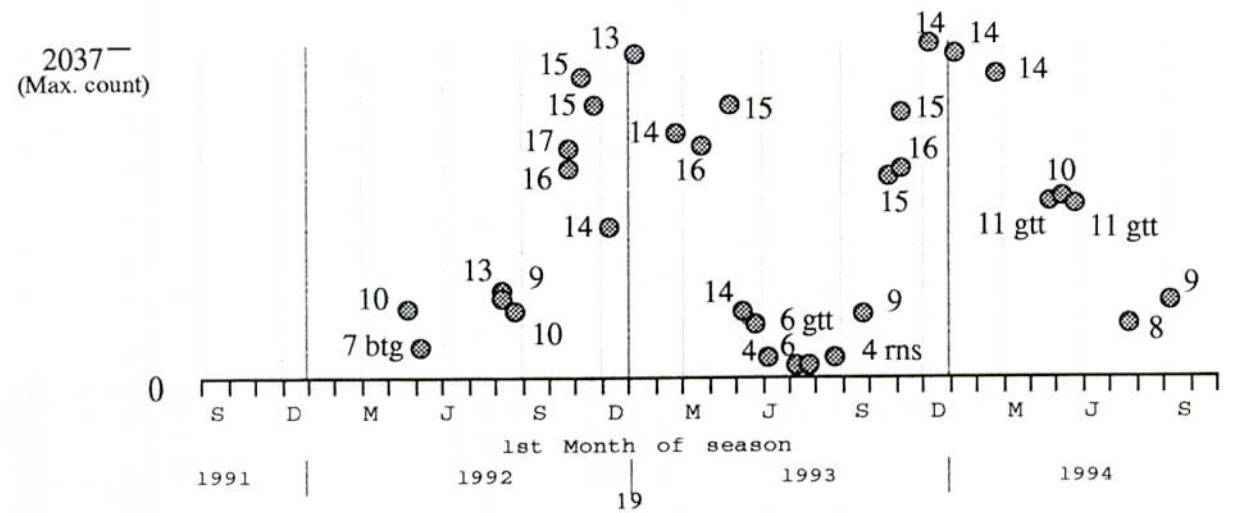
Luggage Point claypan roost (LUPO)



Lytton roosts (LYTT & LYN2)



Manly roosts (MAHA & others)



in winter for two years running and what we thought were anomalous counts in the first year may reflect a real influx of non-breeding birds onto this site in winter.

The highest total counts of migratory waders for Fisherman Islands were made in early 1993. Maximum counts last summer were between one and three thousand less than the highest in 1993. There is not as great a difference between last summer and the summer of 1992 and it is not possible to be conclusive about the variation between the years because the numbers could be considered to be within a range of normal fluctuation, especially considering the degree of variation there can be, even from one day to the next during the period of migration.

However, as mentioned earlier fewer Bar-tailed Godwits were roosting on the main roost this year and this difference has been consistent. Also, the nature of the roost site has changed, particularly over the last 4 months, and it has culminated in the abandonment of the edges of the main lagoon as a roost site. This area was once the foreshore region between Fisherman Islands and Bishop Island.

Also of note is the low September count this year at Fisherman Islands when I had expected an influx of many more Red Knot and Great Knot. Such an influx has been noted for these and other species as would be expected at sites such as Lytton (Figure 6 and Appendix I and St Helena Appendix I). Unfortunately, data for other sites in September had not been sent in at the time of compilation of this report but I am aware that dramatic increases were recorded elsewhere such as at Cabbage Tree Creek. It is premature to make anything of the low count at Fisherman Islands in September but it does coincide with what seems to be total abandonment of the old roosting area due possibly to both drying out of that lagoon and/or poor water quality. The situation needs further monitoring.

5 Changes to roost and feeding sites

There are numerous ongoing changes occurring on Fisherman Islands that have implications for the way birds are using the site. Birds have persisted in the general area but often in the sense that they have maintained their use of a particular site for as long as possible and then taken up any new opportunities such as roosting on dredge spoil or in dead mangroves. It is hard to predict future responses by birds to further changes except to say that they are likely to utilise whatever space is suitable in terms of location and substrate. Only continued monitoring will allow assessment of these changes. Some of the past changes are outlined below.

5.1 Main roost

The change in conditions at the main roost site on Fisherman Islands coincides with generally fewer Bar-tailed Godwits roosting there. Overall, the numbers were less last

summer than in previous years and during the winter months no Bar-tailed Godwits were counted on the site. Coincidentally, more Bar-tailed Godwits were using the claypan roost on Fisherman Islands. There has apparently been a switch in site preference away from the main roosting area to neighbouring sites including the closest one, the Fisherman Islands claypan.

5.2 Bunded area and mangroves

The last report included details of a feeding area that had been created between incomplete bund walls at the northern end of Fisherman Islands (see Figure 1). This area has since been fully bunded and flooded and no longer functions as a feeding area. As a result of a die-off of fish in the impounded waters the area briefly attracted many Darters, Cormorants and birds of prey. Over winter, around 200 Grey-tailed Tattlers have been roosting over high tide on the sides of the outer bund wall. Similarly, Pied Oystercatchers now almost exclusively roost on the mud that has been pumped into the north western side of the impoundment. More teal and Red-necked Avocets are using this area since the main roost area became less attractive for migratory waders.

Over the winter months auxiliary fieldwork was undertaken around St Helena to ascertain whether the buildup of Pied Oystercatchers at Fisherman Islands was made up of birds that had previously roosted on St Helena Island. There was a change in the pattern of roosting and very few Pied Oystercatchers were using the traditional roost site on St Helena Island. However, most recent observations indicate that numbers of Pied Oystercatchers on St Helena Island have risen again, since September 1994.

The mangroves that were to the back of the newly bunded area have since been cleared and in the interim, the debris and shallow substrate has attracted small groups of Sharp-tailed Sandpipers and Red-necked Stints. Over winter, the mangrove debris has been the roost site of a very large concentration of Little Black Cormorants (see section on roost counts).

Feeding activity to the east of the newly bunded area is not appreciably different from what has been apparent since the first report. Typically in this area in deeper water are White-faced Herons, Eastern Curlews, Great Egrets and in shallower conditions there is a low density of Bar-tailed Godwits, Grey-tailed Tattlers and occasionally Greenshank or Whimbrel

Another small site that has been the focal point of roosting activity has been the remnant patch of mangroves that once lay to the inside of Bishop Island. Over summer, Grey-tailed Tattlers, Sharp-tailed Sandpipers and sometimes Terek Sandpipers were evident here together with Black-winged Stilts and teal. With the intense earthworks nearby, this area has changed over time and remains with few of its original features. Nearby, a sandspit that

Table 3. Details of birdlife noted on a 50 ha area (approx.) that filled with water through the early stages of the fieldwork (Dec. '93 to Jan. '94 and earlier). The area became a significant waterbird habitat as the table below illustrates. The data are approximate and often only give an indication of what species were present. Due to time constraints and the difficulty of looking out over such a large area filled with low, dying mangroves, many individual birds and some species would have been overlooked on each occasion.

By February 1994 water (probably freshwater runoff) covered about 75% of the area and was trapped behind the newly built wall carrying the access road (see Figure 1). The area started off as important for waders (see earler reports) but, as the water deepened, waders became confined to the northern edges and many ducks, Black Swans and a range of waterbirds came to feed in the area and in many instances, breed. Black Swan bred in the lagoon with at least 6 clutches being observed with up to 5 cygnets per clutch. Medium sized flocks of waders occurred in the shallower waters on the northern and eastern sides of the pond. Other species were using the fringe of the pond, primarily the reed bed beside the railway line, and the northern edge. They included the Clamorous Reed Warbler, Bar-Shouldered Dove, Torresian Crow, Feral Pigeon, House Sparrow and Common Starling. Also, large flocks of Fairy Martins and Welcome Swallows often fed above the water, and birds of prey were seen (Brown Goshawk, Black-shouldered Kite, Whistling Kite, White-breasted Sea-eagle).

Species Date ->	Dec. 93	24/2/94	23/4/94	8/5/94	18/6/94	26/7/94	11/8/94	9/9/94
Little Black Cormorant			5	7		6		
Little Pied Cormorant			4				1	1
Australian Pelican			13	9	15	24	17	61
White-faced Heron			5	5	1	5		1
Great Egret			5	6	9		18	25
Intermediate Egret					1	1	2	
Little Egret			6	8	1		1	
Dusky Moorhen						1		
Purple Swamphen			1		4	2	2	1
Yellow-billed Spoonbill				1				
Royal Spoonbill	43	16	34	145	145	87	81	132
Glossy Ibis					2	3		
Sacred Ibis			17		50	22		8
Australasian Grebe					1	4	3	5
Black Swan			12	10	23	35	37	17
Australasian Shoveler				6	11			2
Pink-eared Duck					2		4	3
Pacific Black Duck			3		11	7	4	
Chestnut Teal			77	20	14	375	367	384
Grey Teal			46	44	96	362	227	107
Unidentified teal		30	100				141	1321
Red-necked Avocet							41	168
Black-winged Stilt	++	++	51		45	82	58	257
Red-capped Plover								1
Red-kneed Dotterel			12				1	23
Sharp-tailed Sandpip.		10	13					30
Marsh Sandpiper	++	20					1	5
Red-necked Stint								90
Bar-tailed Godwit	++							
Eastern Curlew	++							
Whimbrel			2					
Common Greenshank							1	
Curlew Sandpiper	++	30						52
Gull-billed Tern			3					
Silver Gull			1					320

temporarily pointed back and out into Brisbane River catered for roosting Grey-tailed Tattlers, Mongolian Plover, Large Sandplover and Red-necked Stint. It has since been transfigured and is no longer used by many birds. This was the site of the successful cannon netting in May.

5.3 The temporary large pond

Another area that was identified originally as important was the trees and embankment at the back of the cove that was used by some waders and many waterbirds. To the east of the road here, trees are still intact and the Osprey nest is still being used. However, with the removal of many of the dead trees and the encroaching development there is now less bird activity in the vicinity. This loss was more than compensated for by temporary establishment of a large impoundment behind the new access road, the details of which are described below

Details of the rapid development of waterbird habitat in the form of a large pond behind the eastern loop road is given in Table 3 and Figure 1. Within a few short months of water becoming trapped in this area, a range of birds took up occupancy. Over winter the numbers increased, with peak numbers of over 1500 teal, 150 Royal Spoonbill, 40 Black Swan, 250 Black-winged Stilt, 170 Red-necked Avocet and 60 Australian Pelican. A handful of Australian Shovelers and Pink-eared Ducks were also there for an extended period of time. The high numbers of duck, teal and Black Swan were a new feature of the area whereas the other species using the pond have been noted in previous years on Fisherman Islands, but not always in such high numbers. This area is unlikely to persist for long and at the time of this report was being filled.

The large pond was of suitable depth and provided adequate roosting positions in the form of mangrove debris, small islands and gentle shorelines. Furthermore, it was located in the vicinity of the rich intertidal feeding areas surrounding Fisherman Islands and served as a complementary habitat for many of the waterbirds already in the area. Birdlife exhibited a quick and intensive response to the opportunity that was artificially created, albeit inadvertently. This example of habitat creation is a good illustration of the benefit to birdlife that would result from a suitably constructed open drain down the eastern side of the Port facility.

6 Banding and leg-flagging program

Over the last 12 months, netting and banding of birds at Fisherman Islands has been successful on one occasion. There was one unsuccessful attempt at netting. On a number of other occasions netting was contemplated but the area has become less conducive to a successful catch due to gradual silting up and drying of the lagoon area between what was once the expanse of water between Bishop and Fisherman Islands. More fine dredge material was gradually deposited here and the substrate became too soft to work on. As

noted earlier, this site has been virtually abandoned by the birds now in favour of the edges of the newly bunded lagoons where there is less space and fewer opportunities to net. Nevertheless, the benefits of past banding at the site are still accruing and below is a summary of the salient features of the banding for the last 12 months around Moreton Bay.

1. The successful netting at Fisherman Islands on 8/5/94 resulted in a catch of 108 birds, mostly Red-necked Stint and Mongolian Plover. This substantially raised the tally of captures in Moreton Bay for both these species. A guest from Qld DEH in Gladstone, Don Arnold, attended the netting.
2. A Ruddy Turnstone recaptured on St Helena Island was one of only 13 banded in New Zealand. The same bird was caught again in New Zealand one month later by the New Zealand Wader Study Group
3. Despite attempting to catch Pied Oystercatchers on a number of occasions, QWSG has only one record for the year which was of a bird found dead after it become trapped in an antenna stay. The colour banding programme on Pied Oystercatchers will continue and hopefully the birds will be less illusive over the coming year. In previous years we have had good results.
4. Red Knot recoveries include two from New Zealand that were banded by the New Zealand Wader Study Group.
5. Great Knot recoveries include three birds banded by QWSG which were recovered in Manila as dead birds. Two of these were banded at Fisherman Islands.
6. The Bar-tailed Godwit recoveries include a juvenile bird banded in Alaska and recaptured on Moreton Island the following year and another bird banded by QWSG and recaptured in Manukau Harbour, New Zealand by the NZ Wader Study Group
7. The have been many sightings of green leg flagged waders, banded in Moreton Bay and seen again locally or overseas, including several sightings in New Zealand and two recent sightings from Japan of a Great Knot and an Eastern Curlew. A number of orange leg-flagged birds (banded in Victoria) have been seen around the Moreton Bay foreshore, including two from Fisherman Islands

7 Management issues

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.

7.1 Wader roost site construction

Waders need both intertidal feeding habitat and high tide roost sites where they flock together to sleep and rest over the high tide. The wader roosts on Fisherman Island are vitally important to the conservation of high populations of waders in Moreton Bay. The Bay is now internationally recognised for its significance to migratory waders and is a

RAMSAR site. It is understood that the Brisbane Port Corporation is committed to the construction of long term roosting habitat for waders that now use the construction site and have in the past traditionally roosted on and around Fisherman Islands. The following design features are recommended for the construction of effective high tide wader roost sites.

A number of general principles have been advocated by Wayne Lawler (NSW National Parks and Wildlife Service) in a recent article in Ranger for construction of roosting areas for waders. The following list of principles largely comply with his set of guidelines but incorporate ideas gained from my knowledge of roosting sites in Queensland and opinions of other members of the Queensland Wader Study Group. A literature search was also undertaken and many relevant references are included in this report. Only some of this literature was available in local libraries and where possible was consulted.

None of these principles outlined below are so necessary that some compromise in design features might not still create a viable roost site. However, I believe that the greater the compliance with these principles the more likely will be the success of an artificial roost site. The actual site chosen needs to be considered in the context of these guidelines and more specific advice may be necessary just prior to construction

- No disturbance to roosting birds and protection from predators. However, totally isolating a roost site, even over the high tide period, may be impractical. Providing the disturbance is infrequent (few times a week) and does not preclude birds returning in the short term to the site, then viability of the roost is unlikely to be threatened. Minimal disturbance is gained through some type of barrier, ideally a water barrier of several metres. Alternatively, a fence could be used, or a wall, or low shrubs. Anything that might create a buffer zone which humans and dogs are unlikely to cross. A low island is ideal but there are many other possibilities.

- Visibility needs to be unimpeded for birds to feel secure from predation.

- Some species roost in the branches of mangroves and sometimes other trees (Whimbrel, Grey-tailed Tattler, Terek Sandpiper) and provision for these species needs to be considered.

- Adjacent to the shoreline. Ideally at the shoreline, with a "beach" rather than an abrupt edge

- At least 30 m diameter with a 100 m buffer zone. Larger areas are much preferred.

- Bare or with low (less than 20 cm high) sparse vegetation (isolated tussocks or bushes can be 30-50 cm), with at least 15 m, and preferably more than 30 m to nearest trees (ie vegetation over 2 m tall).

- At an elevation close to the maximum (king) high tide level, but not inundated by more than 5 cm of water on the highest tide. If inundation may occur, the site should be protected from waves over a few centimetres high. Higher areas of bare sand are also necessary for a full range of species to utilise the site. That is, species differ in their preference for various heights above the tide line and proximity to the shoreline.

- Topographic relief can provide shelter for small shorebirds from the wind, and offer a variety of habitat to attract different species and minimise inter specific competition. Also, some species may prefer specific substrate types such as coarse sand, shell and shingle substrates.

- Birds are most likely to respond to artificially created roost sites if birds are habituated to the area already

Some <u>important</u> <u>issues</u> that may need to be resolved:

- Public access to the site.

- Use of different substrates. It would not be necessary to use sandy substrate, especially if it is not locally available and is likely to be difficult to keep in place.

- Zonation in the use of the site by different species.

- The question of how much water should be retained on the site at low tide. More permanent, shallow water will attract other birds besides waders such as egrets, terns, ibis and ducks. A local intertidal feeding area may help encourage the use of the site as a roost at high tide. It may be possible to regulate the amount of tidal water by use a flood gate.

- The actual position of the site will be important from the point of view of prevailing weather conditions and proximity and access to the major feeding areas nearby.

- Waders may face competition for space on the roost site from seabirds and even waterbirds, and in particular Silver Gulls.

- Any loss of roosting area through changing hydrological conditions will necessitate quick and effective mitigation measures. Care may need to be taken not to change the local turbidity and water conditions to the detriment of fishes and other marine organisms.

- If public access is to be given than there must be adequate controls of people movement and the provision of bird blinds to shield access pathways

- Artificial roost sites are likely to require some periodic maintenance to remove mangrove seedlings (and possibly other unwanted plants) which will settle on the intertidal portions of the roost. This may only require maintenance pruning every two years or so.

NSW NPWS at Alstonville has been instrumental in the design and construction of a bird roost area in a new housing estate near Chickiba Creek at Ballina which appears to be working successfully. The roost is generally 300-500 mm above high water. Rainwater collects in shallow depressions and runs off through defined channels. Artificial roosts are also being developed in the Hunter River region and have been inadvertently created in many places, including Fisherman Islands and other sites in Moreton Bay.

7.2 Waterbird habitat construction

As noted earlier, the intensive and quick response by birdlife to the large temporary pond augurs well for plans to establish a permanent wetland reserve by way of a wide, open drain down the eastern edge of the complex. I re-iterate the features that are needed to make such habitat creation a success.

- Drain base 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.

- There should be shallow, vegetated ponds along the length of the drain. That is, the drain should be terraced to include ponds no more than 30 cm deep with gently sloping margins. These terraced sections can be as long as is feasible but should be a minimum of 20 m. Reasonable water quality should be attainable to attract birds and it is preferable to have the ponds dry up rather than become stagnant or polluted. Perhaps small Gates to drain the ponds could be built.

- 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. The western edge could be more thickly vegetated and sections of the eastern edge could be planted with clumps of tall trees. An understorey is not 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 could be built to a height of 1 m or so above the neighbouring pavement of the port facility and could be much higher than the eastern wall. This would help to form a barrier between activities within the port complex and the waterbird habitat. Dense heath shrubs used here could also serve to attract other types of birdlife such as honeyeaters.

- Tidal influence up from the end of the drain should be kept to a little as possible to maximise the benefit and area of freshwater habitat.

7.3 Interim habitat

The variety and extent of bird habitat on Fisherman Islands is decreasing, especially with the demise of the prime wader roosting area (old site between Fisherman and Bishop Islands) and the inevitable filling of the large artificial pond that has been significant over the past twelve months. The range of habitat options for birds is far fewer now than three years ago, despite the fact that new areas have been bunded and reclaimed. In future, the new areas are unlikely to offer the range of conditions that were once available to birdlife. In the long term, plans for an open drain and artificial roost sites will help compensate for habitat losses. However, over the medium term, consideration should be given to consistent provision of temporary habitat.

The pumping of dredge spoil within the bunded areas is providing shoreline roosting areas for birds but the way it is placed, and therefore its adequacy as a substrate for birds, needs to be monitored. Also, filling of the pond and final burying of the cleared mangroves at the back of the newly bunded area needs to be monitored.

It would be preferable for these changes not to occur too quickly, or without interim or long term provision of other bird habitat. Ideally, as construction proceeds prior to the establishment of the open drain and permanent roost sites, birds should be able to switch from one area to another within Fisherman Islands to meet their roosting requirements. This would facilitate continued efficient utilisation by these birds of the surrounding intertidal feeding areas. Otherwise, there may be an interim or even long term decline in the intensity of local bird activity.

8 Summary

• Low tide scan counts, high tide roost counts and general observations continued between December 1993 and September 1994 to conclude a period of three years of study on bird populations around Fisherman Islands.

• The Fisherman Islands area continues to be one of the most significant waterbird and wader sites in Moreton Bay. Many thousand waders and many hundred waterbirds feed or roost in the area and their continued presence will depend upon adequate long term protection and provision of suitable habitat.

• Use by birds of the surrounding low tide feeding areas has not changed appreciably over the three year period. There are exceptions in localised areas due to direct impact of the development and indications that conditions in at least one major feeding zone may be changing subtly. More monitoring is required to clarify this issue.

• There is a high diversity of waders using roost sites on Fisherman Islands and some species occur there in high numbers, including the Great Knot, Red Knot, Curlew Sandpiper, Bar-tailed Godwit and Eastern Curlew. The latter species primarily uses the claypan roost.

• The spring influx of Palaearctic migrant waders is by far the most significant seasonal pattern of bird usage. There is considerable species variation in the timing of migratory movements and changes in numbers. The intensity of studies conducted at Fisherman Islands on the low tide feeding areas has led to a good understanding of the seasonal variation in numbers of migratory waders and a better understanding of their migration behaviour.

• Banding of birds from Fisherman Islands over the last three years has resulted in a number of significant band returns from overseas which is helping to clarify broad scale migration patterns.

• There is an influx of waterbirds and resident waders in winter to Fisherman Islands which appears to be enhanced by drier conditions out west. Ideal local conditions in the form of a large temporary pond at Fisherman Islands last winter solicited an exceptional response by birds and illustrated the feasibility and usefulness of creating permanent artificial wetlands.

• Roosting of seabirds and cormorants is also an important aspect of bird activity on Fisherman Islands, including roosting of high numbers of Little Tern over summer.

• Co-ordination of the Fisherman Islands studies with general monitoring of high tide roost sites throughout Moreton Bay, conducted by the Queensland Wader Study Group, has enhanced the value of both programmes. Results from Fisherman Islands have been

interpreted in the broader context of seasonal and year to year changes in bird numbers in Moreton Bay.

• The main wader roost at Fisherman Islands has become unsuitable for birds over the last twelve months. Newly created neighbouring areas are catering for many birds but total numbers have declined.

9 Recommendations

• Monitoring of birdlife in the Fisherman Islands area should be continued because of the substantial habitat changes that are still occurring and the uncertainty of the final outcome of these changes.

• Data on bird numbers from Fisherman Islands should continue to be interpreted in the context of data from other sites in Moreton Bay being collected by QWSG.

• Plans for the establishment of an open drain down the eastern edge of the complex should be reviewed in the light of the favourable response shown by waterbirds to the large pond that was temporarily created on site. Every effort should be made to maximise the benefit of the drain for birdlife by using appropriate design features. Existing plans for the drain do not take full advantage of the opportunity available for the creation of bird habitat.

• Similarly, consideration should now be given to the design and location of areas that can serve as permanent roost sites for waders.

• Bunding and land reclamation should proceed in such a way as to avoid alienating birds from the area in the short and medium term. The type and sequence of changes that have occurred up until now have allowed for continued use of the area by birds but this is not necessarily going to be the case in the future as less of the site remains undeveloped. It may be necessary to plan to provide temporary habitat. Alternatively, provision of the more permanent wader and waterbird sites should undertaken in the near future.

• Appropriate signage and management procedures should be developed now to inform the public of the birdlife and to safeguard the birds against excessive disturbance. A critical site is the claypan wader roost. Such actions are likely to raise the public profile of the birds and, in the public view, reflect favourably on the Corporation.

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Appendix A.

Scan counts of all species recorded during low tide surveys around the Fisherman Islands in December 1993 and in 1994 in February, March (one sample only), late April - early May, July, August and September. The locations where counts were taken are indicated with capital letters in Figure 1, in accordance with Driscoll (1992) and with an additional area as noted in the last report, i.e. site Z2. 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	Dec. '93						Feb. ' 94						Mar. '94	Apr-May '94				July '94						Aug. '94					Sep. '94					Total
Sites->	R	P	E	Ma	L	J	Ma	R	E	P	Z2	J	Ma	Ma	J	E	R	Z2	R	E	Ma	J	I	J	Ma	Z2	R	E	Ma	J	Z2	R	E	
Little Black Cormorant																								55						1				56
Little Pied Cormorant														3		2					25			1	2				3	10			3	49
Pied Cormorant				7		5	2							20	3						19			4	50				17	5				132
Darter															1						2		1		1									5
Australian Pelican						4								1							4		3	3					4					19
White-faced Heron		1		9	1		24		4	5		1	5	58	16	4	26	2	25	7	21	23	9	20	43	1	5	8	24	17	1	16	13	389
Striated Heron		1					1						1	1			1		2		2				2									11
Great Egret		4	1							4						2			2						1		3					1	3	21
Intermediate Egret																											2							2
Little Egret	1											4			2		2		1		2								3	1		2		18
Royal Spoonbill	8	3		3	10								7	2	5		54	1	18		5			3			5	1		3	1	4		133
Australian White Ibis					1			1			1	1	10	19	19	10	6	4	6	1	45	11	1	13	86	9	1	11	23	28	13	24	24	368
Chestnut Teal								18					2				15		4	18	37	1	65	10	7		7	2	25	10		4		225
Grey Teal																			3	1			25											29
Unidentified Duck																							19											19
Pied Oystercatcher				2			2		13					22		5				2	20				18			2	5			2		93
Black-winged Stilt																		14	8			39	115	40	2	3	14	10		1		47	8	301
Red-necked Avocet																											2							2
Masked Lapwing																					1													1
Greater Sand Plover				1			12	7				1	4	5																				30
Lesser Sand Plover							2	3				3	1	4																				13
Red-capped Plover			14			3						2																		17			2	38
American Golden Plover				7			30		1			15	5	3							15				16				24					116
Grey Plover			1																				5											6
Ruddy Turnstone				1																					3									4
Sharp-tailed Sandpiper	4			6		3	10	11	1					2																34			1	72
Red Knot								1																										1
Curlew Sandpiper	2		21			27		13	2			11			1		30																	107
Red-necked Stint	10		3			5		16				15			3																			52
Bar-tailed Godwit	66	14	20	52	20	15	43	19	12	7	10	11	35	24	13	2	26		16	5	22	11	37	11	56		5	5	3	29		22	1	612
Black-tailed Godwit	26							3	1																									30
Eastern Curlew	41	10		15	3		22	12	3	5	2	4		17	5		33		49	1	46	7	4	11	73	2	40	3	26	12	2	61	6	515
Whimbrel	23	6	3	26		1	23	10	5	2	4	5	31	18	6	1	4	1	7	2	17	8	5	3	31	1	3	1	14	8	2	9	1	281
Grey-tailed Tattler	52		19	31		15	101	3	14	2		14	69	312	27	8	17			13	10	10			34			3	21	3			22	800
Common Greenshank	5		1	2		1	5	4	3		1	2	1	12							2				10				1	4			2	56
Terek Sandpiper	19		1			7	1	13	1		1	12	1	4	2	4	1																	67
Gull-billed Tern	2							2	1					4			20		18		4	10	1		9		8	1	3	4		12		99
Caspian Tern	1			1		2	5							12	2						5	25		5	8				5					71
Silver Gull			1			5	11	2	2		7	3		19	13	9					34	9	3	81	10				5	12			2	228
Little Tern	19					1	10	13				51		2																				96
Crested Tern				1										5							1								6					13
Collared Kingfisher																	2	2	5	1	12	13	2	13	10	4	9	1	7	3	3	4		91
Sacred Kingfisher																												1						1
Total	279	39	85	164	35	94	304	151	63	25	26	155	172	569	118	47	237	10	170	59	351	167	295	273	472	20	104	49	219	202	22	206	90	5272

Appendix B

The percentage contribution of species of waders to the total scan counts of waders recorded during low tide surveys around the Fisherman Islands in December 1993, and in 1994 in February, March (one sample only), late April - early May, July, August and September. The locations where counts were taken are indicated with capital letters in Figure 1, in accordance with Driscoll (1992) and with an additional area as noted in the last report, i.e. site Z2. The last row gives the site totals from which the percentages are calculated. The last column gives the overall percentage contribution and totals counts for each species.

Species	Dec. '93						Feb. ' 94						Mar. '94	Apr-May '94				July '94						Aug. '94					Sep. '94					Total	
Sites->	R	P	E	Ma	L	J	Ma	R	E	P	Z2	J	Ma	Ma	J	E	R	Z2	R	E	Ma	J	I	J	Ma	Z2	R	E	Ma	J	Z2	R	E	%	count
Pied Oystercatcher				1			1		23					5		25				6	15				7			8	5				4	3	93
Black-winged Stilt																		16	26			52	69	62	1	50	22	42		1		34	18	9	301
Red-necked Avocet																											3							+	2
Masked Lapwing																					1													+	1
Greater Sand Plover				1			5	6				1	3	1																				1	30
Lesser Sand Plover							1	3				3	1	1																				+	13
Red-capped Plover			17			4						2																	16			4	1	38
American Golden Plover				5			12		2			16	3	1							11				7				26					4	116
Grey Plover			1																				3											+	6
Ruddy Turnstone				1																					1									+	4
Sharp-tailed Sandpiper	2			4		4	4	10	2					0															31			2	2	72
Red Knot								1																										+	1
Curlew Sandpiper	1		25			35		11	4			12			2		27																	3	107
Red-necked Stint	4		4			6		14				16			5																			2	52
Bar-tailed Godwit	27	47	24	36	87	19	17	17	21	44	56	12	24	6	23	10	23		19	16	17	15	22	17	23		8	21	3	27		16	2	19	612
Black-tailed Godwit	10							3	2																									1	30
Eastern Curlew	17	33		10	13		9	10	5	31	11	4		4	9		30		57	3	35	9	2	17	30	33	63	13	28	11	50	44	13	16	515
Whimbrel	9	20	4	18		1	9	9	9	13	22	5	21	4	11	5	4	100	8	6	13	11	3	5	13	17	5	4	15	7	50	6	2	9	281
Grey-tailed Tattler	21		23	22		19	40	3	25	13		15	47	74	47	40	15			42	8	13			14			13	22	3			49	25	800
Common Greenshank	2		1	1		1	2	3	5		6	2	1	3							2				4				1	4			4	2	56
Terek Sandpiper	8		1			9	0	11	2		6	13	1	1	4	20	1																	2	67
Total	248	30	83	143	23	77	251	115	56	16	18	95	147	423	57	20	111	1	86	31	133	75	166	65	243	6	64	24	94	108	4	139	45		3197

Appendix C.

Scan counts of species recorded during low tide surveys around Fisherman Islands on three habitat zones at times between August 1991 and September 1994. The table includes only a selection of scan counts, i.e. those made in the three zones that are specified. Also, counts from the same habitat zone 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 three totals in the end columns are for each of the habitat zones. Parts of the table are taken from Driscoll (1993, App. C).

Species	Habitat->	"main"															"cove"												"staging"												Tot	Tot	Tot
	Month->	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Dec	Feb	Mar	May	Jul	Aug	Sep	Oct	Jan	Feb	Mar	Jun	Dec	Feb	May	Jul	Aug	Sep	Aug	Oct	Nov	Mar	Jan	Dec	Feb	May	Jul	Aug	Sep	main	cove	stag.
	Year->	'91	'91	'92	'92	'93	'93	'93	'93	'94	'94	'94	'94	'94	'94	'91	'92	'93	'93	'93	'93	'94	'94	'94	'94	'94	'91	'91	'92	'93	'93	'93	'94	'94	'94	'94	'94			
Little Black Cormorant																																				55	1			56
Little Pied Cormorant		5		5			4	22				3	25	2	3												9			15					1	10	69		35
Pied Cormorant						1		6	7	2		20	19	50	17															9	5		3		4	5	122		26
Darter													2	1																			1				3		1
Australian Pelican							2	4				1	4		4													2	2		2	4			3		15		13
White-faced Heron		59	24	32	3	22	8	38	9	24	5	58	21	43	24		11		2	21			26	25	5	16	6		1		3		1	16	23	20	17	370	106	87
Striated Heron			1				1	1		1	1	1	2	2					1				1	2													10	4	
Great Egret						1	2							1			1							2	3	1												4	7	
Intermediate Egret																									2													2	
Little Egret				2				4					2		3	2	1				1		2	1		2							4	2		1	11	9	7
Royal Spoonbill			6					2	3		7	2	5			2	26		1		8		54	18	5	4				1				5		3	3	25	118	12
Australian White Ibis		81	12		1	1		50			10	19	45	86	23		1				10		1	6	6	1	24	17			15	31		1	19	11	13	28	328	49	135
Osprey		1																																				1		
Chestnut Teal		32	16		51			81				2		37	7	25			1	10	31		18	15	4	7	4	17				12				1	10	10	251	90	50
Grey Teal																									3														3	
Pied Oystercatcher		19	13	23	16	6	18	21	2	2		22	20	18	5												1										185		1
Black-winged Stilt			3					7						2		5	12	2	2	92				14	14	47	40	1		1	51				39	40	1	12	188	173
Red-necked Avocet																				12					2													14	
Masked Lapwing													1																									1		
Greater Sand Plover			18	5		7	11		1	12	4	5					23	8	16			7					1	8		2			1				63	54	12
Lesser Sand Plover			2	1		3				2	1	4							1			3				8			2	12			3				13	4	25
Red-capped Plover																												2		4		3	2			17			28
Amer. Golden Plover		12	6	23		25	29	7	7	30	5	3	15	16	24					1										6			15				202	1	21
Grey Plover			16		1																							9										17		9
Ruddy Turnstone			4						1					3																								8		
Sharp-tailed Sandpiper			185	47	74	67			6	10		2				22	14	32			4	11						11	75			3					34	391	83	123
Red Knot			3																1			1						29	138									3	2	167
Curlew Sandpiper			8	5	2											36	20	17	14		2	13	30					26	12	2		27	11	1				15	132	79
Red-necked Stint				6																	10	16										5	15	3				6	26	23
Great Knot			9	1	1														2									2	43									11	2	45
Bar-tailed Godwit		19	123	57	57	62	44	11	52	43	35	24	22	56	3	14	104	17	34	22	66	19	26	16	5	22	23	51	14	27	11	15	11	13	11	11	29	608	345	216
Black-tailed Godwit			2	9	2		12	1								5	1	18	14	5	26	3						8		7	14							26	72	29
Eastern Curlew		64	47	58	15	30	3	15	15	22		17	46	73	26	11	79	4	5	23	41	12	33	49	40	61	16	2	3		4		4	5	7	11	12	431	358	64
Whimbrel		16	44	48	15	42	32	8	26	23	31	18	17	31	14	5	11	7	14	3	23	10	4	7	3	9	1	6	1	2	4	1	5	6	8	3	8	365	96	45
Grey-tailed Tattler		20	232	154	78	104	107	10	31	101	69	312	10	34	21		15		3	2	52	3	17					6				15	14	27	10			3	1283	92	75
Common Greenshank		4	16	5	3	3	11	4	2	5	1	12	2	10	1		8		1		5	4							1	4		1	2				4	79	18	12
Marsh Sandpiper						3	3										2	3												3								6	5	3
Terek Sandpiper			7	1		1	1			1	1	4				1	48	12	29		19	13	1					5				7	12	2				16	123	26
Gull-billed Tern								1				4	4	9	3		2		1	11	2	2	20	18	8	12									10		4	21	76	14
Caspian Tern		2		1			2	11	1	5		12	5	8	5						1						2			20	2		2	25	5			52	1	56
Silver Gull		15	13	3		11	2	28		11		19	34	10	5		3					2					1	2	1	3	126	5	3	13	9	81	12	151	5	256
Little Tern			16	12	2		3			10		2					1	2			19	13						3	4			1	51					45	35	59
Crested Tern		1		4				2	1			5	1		6																							20		
Collared Kingfisher		9	1				1	13					12	10	7	2				5			2	5	9	4	2			1	4				13	13	3	53	27	36
Sacred Kingfisher								2																													2		
Totals		359	827	502	321	389	296	349	164	304	172	569	351	472	219	105	383	123	151	238	279	151	237	170	104	206	144	173	295	80	318	94	155	118	167	273	202	5294	2147	2019

Appendix D.

The percentage contribution of species of waders to the total scan counts of waders recorded during low tide surveys around Fisherman Islands on three habitat zones at times between August 1991 and September 1994. The table includes only a selection of scan counts, i.e. those made in the three zones that are specified. Also, counts from the same habitat zone and time, have been combined. The last row gives the site totals from which the percentages are calculated. The three end columns give the overall percentage contribution for each species for each of the habitat zones. Parts of the table are taken from Driscoll (1993, App. D). A "+" indicates a value of between 0 and 0.5.

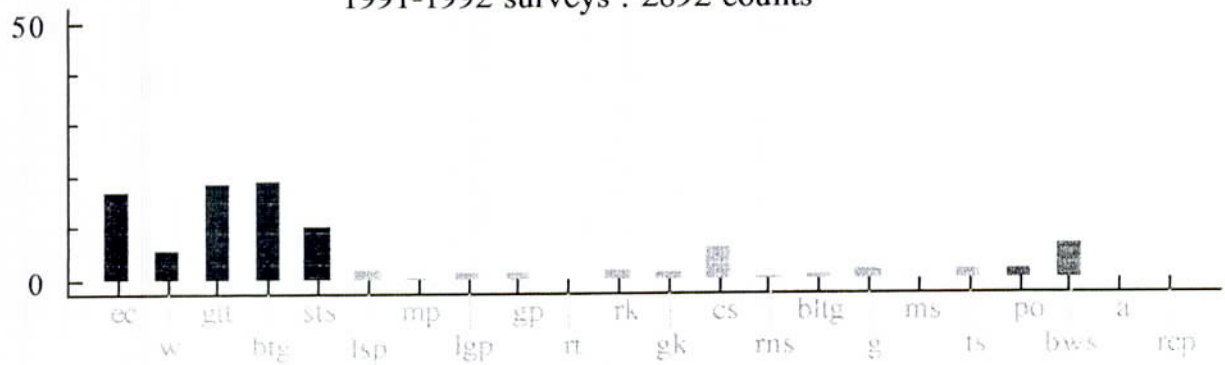
Species	Habitat->	"main"															"cove"												"staging"											Overall for:		
	Month->	Aug	Oct	Jan	Nov	Feb	Mar	Jun	Dec	Feb	Mar	May	Jul	Aug	Sep	Oct	Jan	Feb	Mar	Jun	Dec	Feb	May	Jul	Aug	Sep	Aug	Oct	Nov	Mar	Jan	Dec	Feb	May	Jul	Aug	Sep	main	cove	stag.
	Year->	'91	'91	'92	'92	'93	'93	'93	'93	'94	'94	'94	'94	'94	'94	'91	'92	'93	'93	'93	'93	'94	'94	'94	'94	'94	'91	'91	'92	'93	'93	'93	'94	'94	'94	'94	'94			
Pied Oystercatcher		12	2	5	6	2	7	25	1	1		5	15	7	5												1											5		+
Black-winged Stilt			+					8						1		5	4	2	2	58				16	22	34	44	1		2	53				52	62	1	+	12	15
Red-necked Avocet																				8					3													1		
Masked Lapwing													1																											
Greater Sand Plover			2	1		2	4		1	5	3	1					7	7	12			6					1	5		3			1				2	3	1
Lesser Sand Plover			+	0		1				1	1	1							1			3					9			3	13		3				+	0	2
Red-capped Plover																												1		7		4	2			16			2
Amer. Golden Plover		8	1	5		7	11	8	5	12	3	1	11	7	26					1										10			16				5	+	2
Grey Plover			2		+																							5										1		1
Ruddy Turnstone			1						1					1																								+		
Sharp-tailed Sandpiper			25	11	28	19			4	4		1				22	4	27			2	10						7	26			4					32	11	5	11
Red Knot			+																1			1						18	48									+	0	14
Curlew Sandpiper			1	1	1											36	6	14	10		1	11	27					16	4	3		35	12	2				+	8	7
Red-necked Stint				1																	4	14										7	16	5				+	2	2
Great Knot			1	+	0														2									1	15									+	0	4
Bar-tailed Godwit		12	17	13	22	18	16	13	36	17	24	6	17	23	3	14	31	14	25	14	27	17	23	19	8	16	26	31	5	45	12	20	12	23	15	17	27	16	21	18
Black-tailed Godwit			+	2	1		4	1								5	+	15	10	3	11	3						5		12	15							1	5	3
Eastern Curlew		42	6	13	6	9	1	18	11	9		4	35	30	28	11	23	3	4	14	17	10	30	57	63	44	18	1	1		4		4	9	9	17	11	12	22	5
Whimbrel		10	6	11	6	12	12	10	18	9	21	4	13	13	15	5	3	6	10	2	9	9	4	8	5	7	1	4	+	3	4	1	5	11	11	5	7	10	6	4
Grey-tailed Tattler		13	31	35	30	30	40	12	22	40	47	74	8	14	22		5		2	1	21	3	15					4				20	15	47	13		3	34	6	6
Common Greenshank		3	2	1	1	1	4	5	1	2	1	3	2	4	1		2		1		2	4							+	7		1	2				4	2	1	1
Marsh Sandpiper							1	1									1	3												5								+	0	+
Terek Sandpiper			1	+			+	0			+	1	1			1	14	10	21		8	11	1					3				9	13	4				+	8	2
Totals		154	738	443	264	353	271	84	143	251	147	423	133	243	94	99	337	120	136	160	248	115	111	86	64	139	90	166	287	60	96	77	95	57	75	65	108	3741	1615	1176

Appendix E

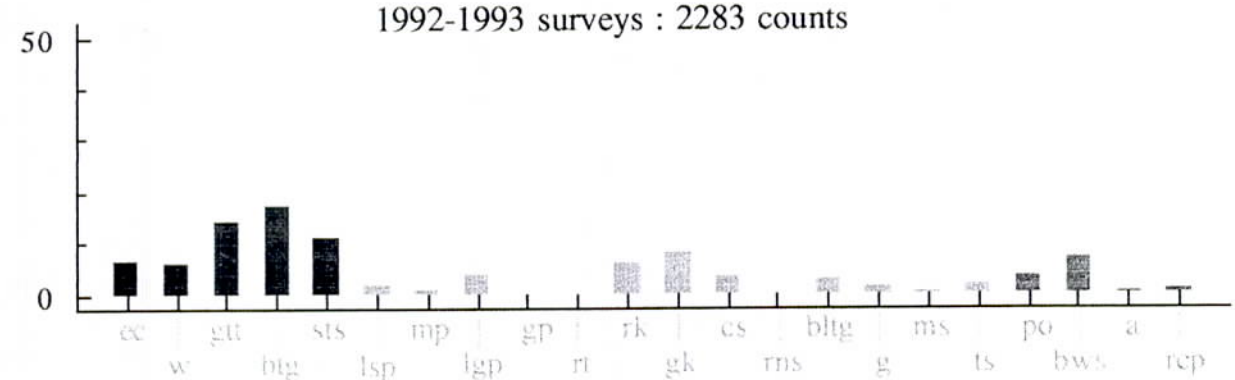
Percentage contribution of species of wader to scan counts taken for each of the three studies undertaken on intertidal areas near Fisherman Islands (Driscoll 1992, 1993 and the present study). The number of birds in the respective samples is given in the heading to the graphs.

The data are compiled from a different mix of habitat zones for each of the sampling periods and are simply a general guide to overall species composition of waders around Fisherman Islands. There is much seasonal and spatial variation in the wader community that is discussed in the various reports that is not shown here. The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species.

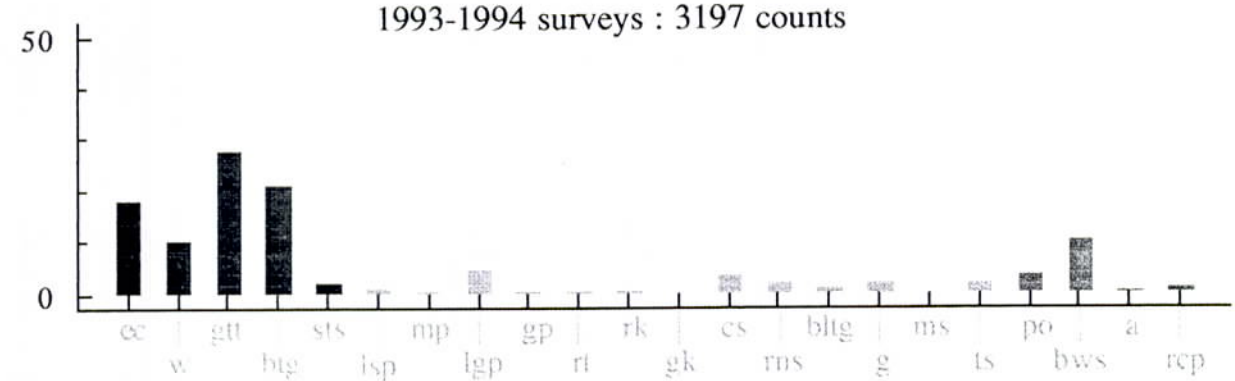
1991-1992 surveys : 2892 counts



1992-1993 surveys : 2283 counts



1993-1994 surveys : 3197 counts



The species represented are as follows:

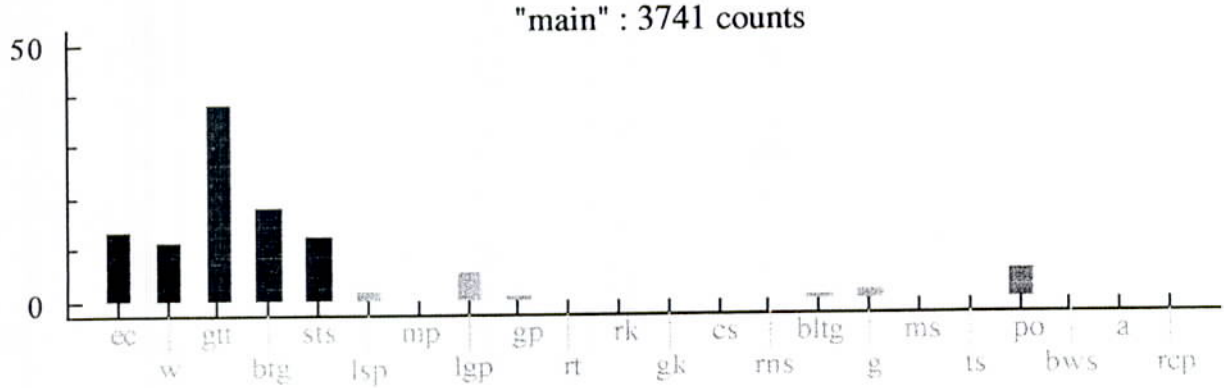
ec - Eastern Curlew
w - whimbrel
gtt - Grey-tailed Tattler
btg - Bar-tailed Godwit
sts - Sharp-tailed Sandpiper
lsp - Large Sand Plover
mp - Mongolian Plover
lgp - Lesser Golden Plover
gp - Grey Plover
rt - Ruddy Turnstone
rk - Red Knot
gk - Great Knot
cs - Curlew Sandpiper
rns - Red-necked Stint
bltg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

Appendix F

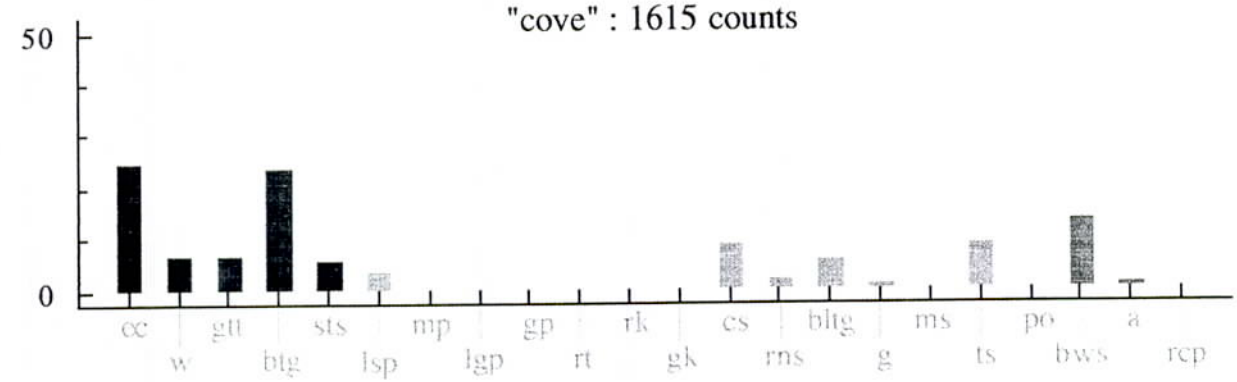
Percentage contribution of species of wader to scan counts taken for each of the three habitat zones near Fisherman Islands over the three years of sampling (Driscoll 1992, 1993 and the present study). The number of birds in the respective samples is given in the heading to the graphs.

The data are compiled from a different mix of times for each of the sampling periods and are simply a general guide to overall species composition of waders in these areas through time. There is much seasonal variation in the wader community that is discussed in the various reports that is not shown here. The species are grouped beginning with the 5 most common species seen overall, followed by other migratory waders and then the 4 resident species.

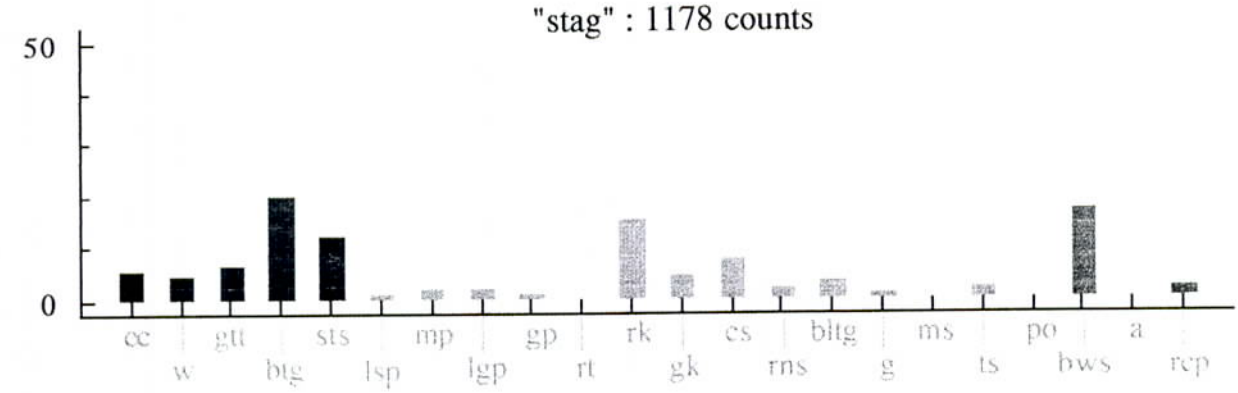
"main" : 3741 counts



"cove" : 1615 counts



"stag" : 1178 counts



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

Appendix G

Counts of wader species at high tide roost sites around Fisherman Islands and in the general central Moreton Bay region during the period December 1993 and September 1994. Not all the latest counts were available at time of preparation of these data. Keys to species (column headings) and site codes (rows) are given at the end of the table.

Site: date (yr mth dy)	betk	po	so	ml	gp	lgp	rkd	mp	dbp	lsp	rcp	bfp	bws	a	rt	ec	w	gtt	tsp	g	ms	ts	bltg	btg	rk	gk	sts	rns	cs
AMPO: 940115																	35		5					26					
AMPO: 940212		49		6													20							1100					
AMPO: 940312		49		2		7										132	120	120						2500					3
AMPO: 940430		52		4					12		22					141	82	600						200					
AMPO: 940618		45		10					78		38					145	8												
AMPO: 940806	2	35		2					55		13					209	1	1											
AMPO: 940911		12		1					1		10																	3	12
BSIS: 931201		34			12			400		150					7			3				2		24	340	2052	3	755	31
BSIS: 940111		70			7	6		386		199					2			300				10		819		1048		280	805
BSIS: 940223		215			21	9		400	1	90	3		3		1			1			3		45	202		805	13	220	90
BSIS: 940314		280			15			657	8	96	5				7	11		190					131	129		280	58	242	641
BSIS: 940423		218			9			85		1			190	161	2			110				17		1	19	34	10	146	144
BSIS: 940506		190						23		7			18	166	9													77	120
BSIS: 940618		198						135		10	2		54	245	4			35				1						300	475
BSIS: 940726		205			8			6			37		102	726		2		150										457	271
BSIS: 940811		226						54					15	579				265						5				250	70
BSIS: 940909		51						1					11	590	1			137						29	241		7	1	42
CATC: 931204		29									13					4	42	2		13				1002	340	163	2		277
CATC: 940113		38																						440		50			
CATC: 940212		18											2			9	97			7			1	475			1		70
CATC: 940313															10		29	29		4				448		430			
CATC: 940409						1		6	2		6				4		178	9		14				118		32			
CATC: 940424		2						16	4		5		41			3	48	7		7				78		120			
CATC: 940508		2				2		2	2		20		33		1	1	21	13						167	1	19			
CATC: 940618		48		4		2		3	6		23		180		1	1	61							24	43	542			
CATC: 940813		16				2					1		115			2	25							126	20	850			
CLRB: 931204		49				12		500			4		10		1	283	1			46				2000			20	5	69
CLRB: 940115		102						445		22	9		4		39	142	1	38		7				2038			6	56	7
CLRB: 940213		205						620		5	7		2		3	244	4			26				782					
CLRB: 940312		192	1					450		2			5			219				5				830				15	10

Site: date (yr mth dy)	betk	po	so	ml	gp	lgp	rkd	mp	dbp	lsp	rcp	bfp	bws	a	rt	ec	w	gtt	tsp	g	ms	ts	bltg	btg	rk	gk	sts	rms	cs
CLRB: 940409		175						400			2		9		24	76		44		40				108				252	18
CLRB: 940423		73		2				320			43		3		28	137	8	71				6		75				260	7
CLRB: 940507		96						1			19		15		22	84	1	212						44		1			
CLRB: 940618		21		4					21		33		27		46	9		95		10				33					
CLRB: 940813		37		1				30	25	10	10		34		48	26		300		3				12				24	
FICP: 931201																225	2			24				250					
FICP: 940111													7			125	33	35		17	3			220			17	3	30
FICP: 940223						4					2		76			201	135			16	5		30	152			35		7
FICP: 940314						73										100	36			27	2		25	355			90		105
FICP: 940423								1			2		154			76	7			1				105			10	29	25
FICP: 940508													31			85								40					37
FICP: 940618		2					2						98			112	10							94					1
FICP: 940726				1			3						28	5		165	13				3			82					13
FICP: 940811		2		1							3		40	12	9	137	6			1								78	134
LUPO: 931204						15					20			36		50	30			20	15		100	117		1	280	300	300
LUPO: 940116				3		1				1	12	4	31		2	46	33			33	7			17			127	150	802
LUPO: 940212				2		8					50		46			34	44			6	5		143	52			63	72	21
LUPO: 940312						11							193			33	5			27	17		116	104		90	84	51	600
LUPO: 940409				1							2		69			1	67			5	8			45			38		
LUPO: 940424						1	5				35		23			6	25			12	14		35	72	3	45	52		17
LUPO: 940625				13			4		25		200		276	48		2	12							86		2		2500	282
LUPO: 940813				2			5				23		76	73		11	8				8			77				273	49
LYN2: 940111																109	40			6	35			338					10
LYTT: 931201																126	205	71		23			2	620		21	45		18
LYTT: 931204											2					82	185	3		18				220			3	44	
LYTT: 940115													12			74	11	210		15				395			25	25	55
LYTT: 940213				1									14		3	81	16	420		10			64	554		3	5		30
LYTT: 940223				2									2			141	86			1			139	244		50			24
LYTT: 940314													13			48	108	46						176					20
LYTT: 940408				8									270		5	1	92	180		1	11			230		1	42		140
LYTT: 940423				5									75			43	32	230					8	83		2	62		96
LYTT: 940508				4									490			17	2							245					80
LYTT: 940618				6			18				7	10	138				22							3					
LYTT: 940726							15				1		212			52	60			7				42					16
LYTT: 940811													98			45				6									7
LYTT: 940910				9			2						140			39	88			16	20		54	160	450	3	24		43
MAHA: 931204		18		6		52		300		50	10				39	74	44	270				23		694	3	130	12	170	116
MAHA: 940116		64		4		36		320		40	4				101	39	55	118		9		10		555		210	17	254	85
MAHA: 940327		81	1	1				4	4		2				4	6	25	307				14		500		50		131	22

Site: date (yr mth dy)	betk	po	so	ml	gp	lgp	rkd	mp	dbp	lsp	rcp	bfp	bws	a	rt	ec	w	gtt	tsp	g	ms	ts	bltg	btg	rk	gk	sts	rns	cs
MAHA: 940409		83	1			38		45	2		14		4		29	19	48	583				37		110		18		100	69
MAHA: 940425		73	1	1				3	11		5		40		13	15	25	800		6		28		103		2		33	14
MAHA: 940625		40		2				23	37		18		64	33	15	25	22	100				12		85				30	
MAHA: 940814		29	1	5				28	41		11		55			57	15	110		3		13		180				35	10
MIPO: 940212		145						135		201					1	1119								1807		80		32	
MIPO: 940625	4	71									17				18	220	290	399						1160		19		15	3
MIPO: 940813		64												52	11	764		560						1128		40			
SHIH: 931203		151		13		25							2	32	16	79	247			16	15			87			96	3	156
SHIH: 940212		18		16	21								16		21	79	20			26	28			260		4	36	30	128
SHIH: 940313		9		21									42		54	25	33	3		23	26			119			29	2	133
SHIH: 940409		58		10									96		75	5	87	7		27				26		5	13		
SHIH: 940428		15		7									21		11	7	23	49						15					
SHIH: 940625		12		14	3	1	8						75			9	88			3				14					
SHIH: 940813		26		5	7	1	1						33	2	29	65	90	35						36					
SHIH: 940911		98		1	3	14	2			2			39		218	300	330	300		18	21			13			5		24
Totals	6	4091	5	200	106	321	65	5799	335	886	765	14	3972	2760	934	7054	3637	7568	5	605	246	173	893	25905	1460	7202	1330	7703	6884

Key to Species:

betk	Beach Thick-knee
po	Pied Oystercatcher
so	Sooty Oystercatcher
ml	Masked Lapwing
gp	Grey Plover
lgp	Lesser Golden Plover
rkd	Red-kneed Dotterel
mp	Mongolian Plover
dbp	Double-banded Plover
lsp	Large Sand Plover
rcp	Red-capped Plover
bfp	Black-fronted Plover
bws	Black-winged Stilt
a	Red-necked Avocet
rt	Ruddy Turnstone
ec	Eastern Curlew
w	Whimbrel
gtt	Grey-tailed Tattler
tsp	Tattler sp.
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

Key to Sites:

AMPO	Amity Point Nth Stradbroke Island
BSIS	Bishop Island
CATC	Cabbage Tree Creek mouth
CLRB	Cleveland/Raby Bay
FICP	Fisherman Is. claypan
LUPO	Luggage Point
LYN2	Lytton Claypan No. 2
LYTT	Lytton
MAHA	Manly Harbour
MALE	Manly Lota Esplanade
MIPO	Mirapool Moreton Island
REPO	Reeders Point Moreton Island
SHIH	St Helena Is homestead
SHIN	St Helena Is north
SHIP	St Helena Is pier
SHIS	St Helena Is south east

Appendix H

Counts of non-wader species at high tide roost sites around Fisherman Islands and in the general central Moreton Bay region during the period December 1993 and September 1994. Not all the latest counts were available at time of preparation of these data. Keys to species (column headings) and site codes (rows) are given at the end of the table. Also some of the species counted are not listed, including large numbers of Grey Teal seen over the winter months at Fisherman Islands (see text for more information).

Site: date (yr mth dy)	ap	d	pc	lbc	lpc	wfh	ge	le	ie	sh	si	sni	rs	bs	pbd	ct	md	o	bsk	bk	wk	wbse	sg	wwte	gbt	cpt	cmt	lt	crt	lct
AMPO: 940115			1	11														1			1		78			3			195	
AMPO: 940212																							34			13			60	
AMPO: 940312			1	2																	1	1	26			9			107	
AMPO: 940430	3		6	5	1	4		20			17										1		43		7	20			33	6
AMPO: 940618	12		5	15	7																	1	80		32	22			5	15
AMPO: 940806	6		7	7	70															1			18		20	11			20	47
AMPO: 940911	4		10	14	9																		12			12			23	39
BSIS: 931201	18		3	43			1																236	12	5	29		690	107	
BSIS: 940111	25																						242	5		28	2	314	183	
BSIS: 940223	25			5			2									26							465	94		92		390	85	
BSIS: 940314	70																						568	236		85		245	193	
BSIS: 940423	9	1	7	7			1	1	7		3		35										922	32	29	91		42		
BSIS: 940506	58														115	24							288	55		33	3	4		
BSIS: 940618	55				120	1										110							430							
BSIS: 940726	33	7	23	1249	80			1								104							147		84	12			5	
BSIS: 940811	21	4	2	849	187						5					80							155		1	21			75	
BSIS: 940909	25		41	2	40			1								30							337		27	18		21		
CATC: 931204	9		4				1				4										1		29		26	3		82	59	
CATC: 940113																							55			1			35	
CATC: 940212	7								1														34		2	13			17	
CATC: 940313	7			1					1												1		141			4		53	17	
CATC: 940409	5					1	1	5	1														91			4			3	
CATC: 940424	9		1			1					5										2		36		1	11			2	
CATC: 940508	26		2	1		3			2			2							1				119			2	2		1	
CATC: 940618	15					4	1	3	1			22							1				138							
CATC: 940813	20					1					13												6			5			6	
CLRB: 931204	3				2											2				1			48		10	8		170	34	
CLRB: 940115			2																				56		9	37		67	34	
CLRB: 940213	3				1											5							24			23		28	14	2
CLRB: 940312																							53			26			9	1
CLRB: 940409					2	1				1	1					3							59			34			13	2

Site: date (yr mth dy)	ap	d	pc	lbc	lpc	wfh	ge	le	ie	sh	si	sni	rs	bs	pbd	ct	md	o	bsk	bk	wk	wbse	sg	wwte	gbt	cpt	cmt	lt	crt	lct
CLRB: 940423	5			12				1	1														40			15		2	5	
CLRB: 940507				9	2						4					6	10						43			5			7	4
CLRB: 940618	16															5			1				77			4			28	
CLRB: 940813	17					1					21									1	1		20			24		12	7	2
FICP: 931201																									1					
FICP: 940111						20																								
FICP: 940223						15	1	3								4									1					
FICP: 940314				2		2					10			5		3									12	2				
FICP: 940423						10							6												3	4				
FICP: 940508															6															
FICP: 940618											1					2									61	17				
FICP: 940726						2					2														5					
FICP: 940811						7					4															8				
LUPO: 931204	1															10				1										
LUPO: 940116	18					4	1	1		2	11				5	5							1	50	1	7				
LUPO: 940212	18					9	2	2	5		22		2		1	53				1	1	1	2	14		2				
LUPO: 940312	2		1			2	2	4	5		1		1		2	14				1	1		6							
LUPO: 940409		2				6	1	2	2		42				35	64				1	2		1	58	7	3				
LUPO: 940424	5					3			4		32	1	1		24	62					2		3	8	1					
LUPO: 940625	1					5			2		34	2	1	2	43	70			1	1	1	2	21		4	2				
LUPO: 940813	1					5					36	1	9		21				1	1	1		9		1	3				2
LYN2: 940111	7					11																								
LYTT: 931201	10										2														1					
LYTT: 931204													1																	
LYTT: 940115													1													15				
LYTT: 940213	2							1								2		1								3				
LYTT: 940223	12															10									1	1				
LYTT: 940314																										4				
LYTT: 940408	2					4					2		19							1		1			4	7				
LYTT: 940423	31				1	28					5					17									5	39				
LYTT: 940508	13					2					1		20			8							13			10			4	
LYTT: 940618	4		1			2					9		7			25		1			2				14	3				
LYTT: 940726	5					2					2		8																3	
LYTT: 940811						1							8												3					
LYTT: 940910	8					14	2				5		6								1				2	6				
MAHA: 931204						2	1																146		3	11		45	12	2
MAHA: 940116	1					1					2												170		2	8		81	48	4
MAHA: 940327					10																		138			16			52	
MAHA: 940409	10				10		2			1								2					134		2	18		17	9	3
MAHA: 940425	28				6					1													357			17			13	2
MAHA: 940625					4	5					57												17		10	13			20	
MAHA: 940814							1																207		11	23			10	7
MIPO: 940212	12		588	16																									304	

Site: date (yr mth dy)	ap	d	pc	lbc	lpc	wfh	ge	le	ie	sh	si	sni	rs	bs	pbd	ct	md	o	bsk	bk	wk	wbse	sg	wwte	gbt	cpt	cmt	lt	crt	lct
MIPO: 940625	38		345		5	1																	204						58	
MIPO: 940813	24		957		4											11							8		40				365	
SHIH: 931203					15	3		2			1		11			13				1			46			3				
SHIH: 940212					11		1				8		7			30		2					9						30	
SHIH: 940313			4	97	10	7	2	1			6		12			76				3	3		19			1	64		66	
SHIH: 940409			5	1	3	7			1		14		11			58				1			2				60		25	
SHIH: 940428					9	3		2								35							10							
SHIH: 940625			11			6		1			29	6				2		1		1			26							
SHIH: 940813						7		1			53	2				22									8				5	8
SHIH: 940911			17			4	1	1			44					15		2											20	7
Totals	759	14	2044	2348	609	217	24	53	33	5	508	36	166	7	252	1006	10	10	5	16	22	6	6699	564	456	964	131	2263	2426	151

Key to species:

ap	Australian Pelican
d	Darter
pc	Pied Cormorant
lbc	Little Black Cormorant
lpc	Little Pied Cormorant
wfh	White-faced Heron
ge	Great Egret
le	Little Egret
ie	Intermediate Egret
sh	Striated Heron
si	Sacred Ibis
sni	Straw-necked Ibis
rs	Royal Spoonbill
bs	Black Swan
pbd	Pacific Black Duck
ct	Chestnut Teal
md	Maned Duck
o	Osprey
bsk	Black-shouldered Kit
bk	Brahminy Kite
wk	Whistling Kite
wbse	White-bellied Sea-Eagl
sg	Silver Gull
wwte	White-winged Tern
gbt	Gull-billed Tern
cpt	Caspian Tern
cmt	Common Tern
lt	Little Tern
crt	Crested Tern
lct	Lesser Crested Tern

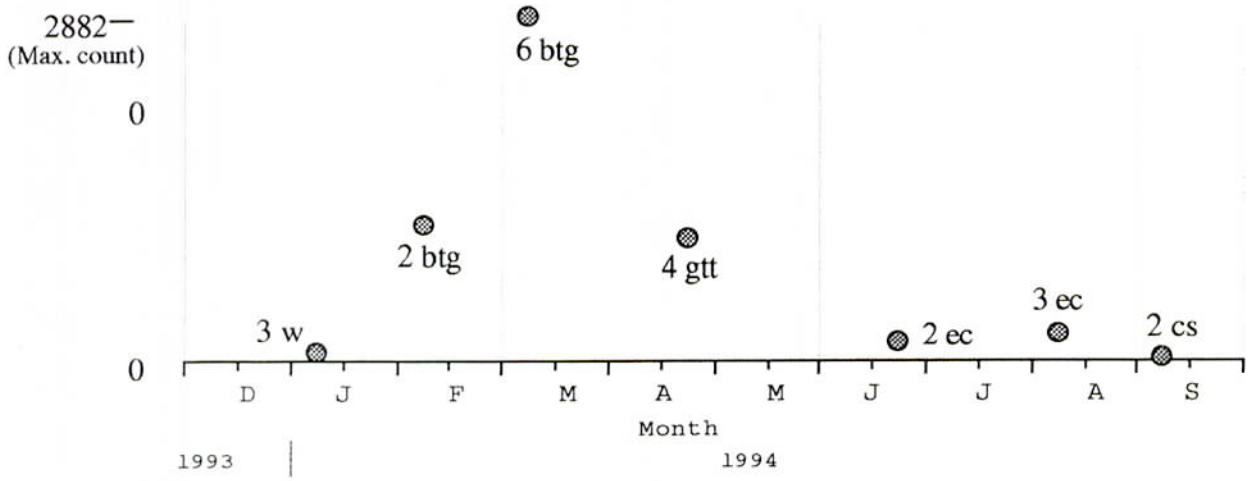
Key to sites:

AMPO	Amity Point Nth Stradbroke Island
BSIS	Bishop Island
CATC	Cabbage Tree Creek mouth
CLRB	Cleveland/Raby Bay
FICP	Fisherman Is. claypan
LUPO	Luggage Point
LYN2	Lytton Claypan No. 2
LYTT	Lytton
MAHA	Manly Harbour
MALE	Manly Lota Esplanade
MIPO	Mirapool Moreton Island
REPO	Reeders Point Moreton Island
SHIH	St Helena Is homestead
SHIN	St Helena Is north
SHIP	St Helena Is pier
SHIS	St Helena Is south east

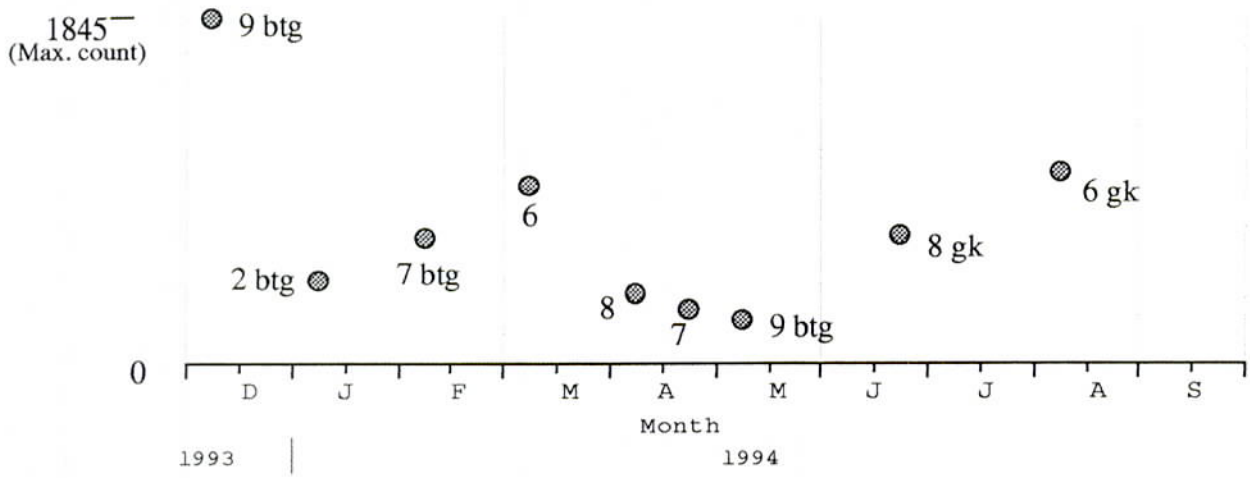
Appendix I

Graphical presentation of total counts of migratory waders counted at high tide roost sites in the central region of Moreton Bay (mostly QWSG count data) See also Figure 5 for counts at the main roost at Fisherman Islands and Appendix G for more details. Only those counts made during the period of the last Fisherman Islands survey are represented (December 1994 to September 1994). Numbers beside points on the graphs indicate the number of migratory wader species represented in the count. The species which were represented by over half of the migratory wading birds for particular counts are represented by the following initials: rk - Red Knot, gk - Great Knot, cs - Curlew Sandpiper, rns - Red-necked Stint, w - Whimbrel, btg - Bar-tailed Godwit, gtt - Grey-tailed Tattler, ec - Eastern Curlew.

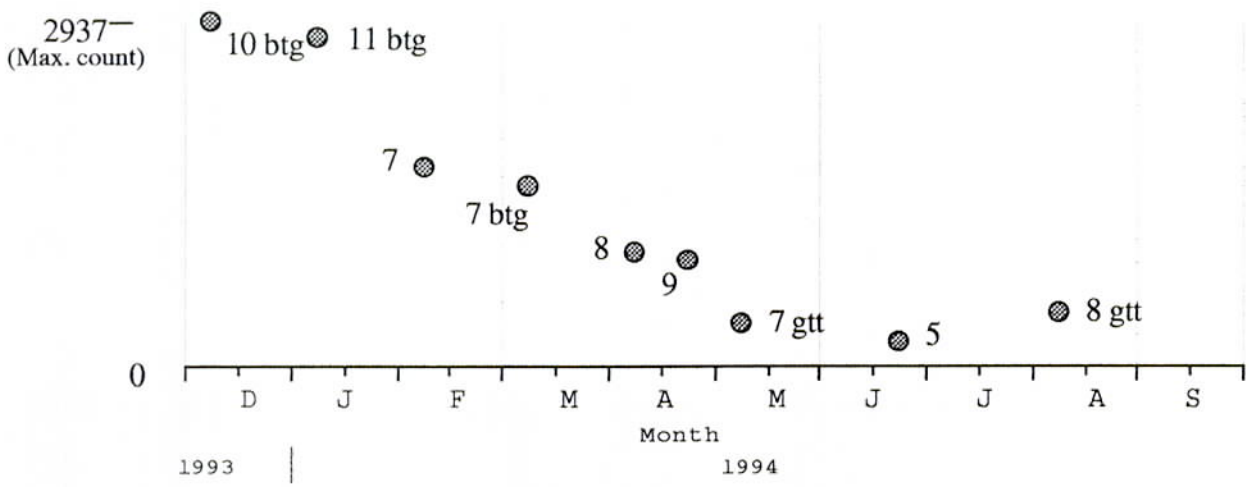
Migratory waders at Amity Spit



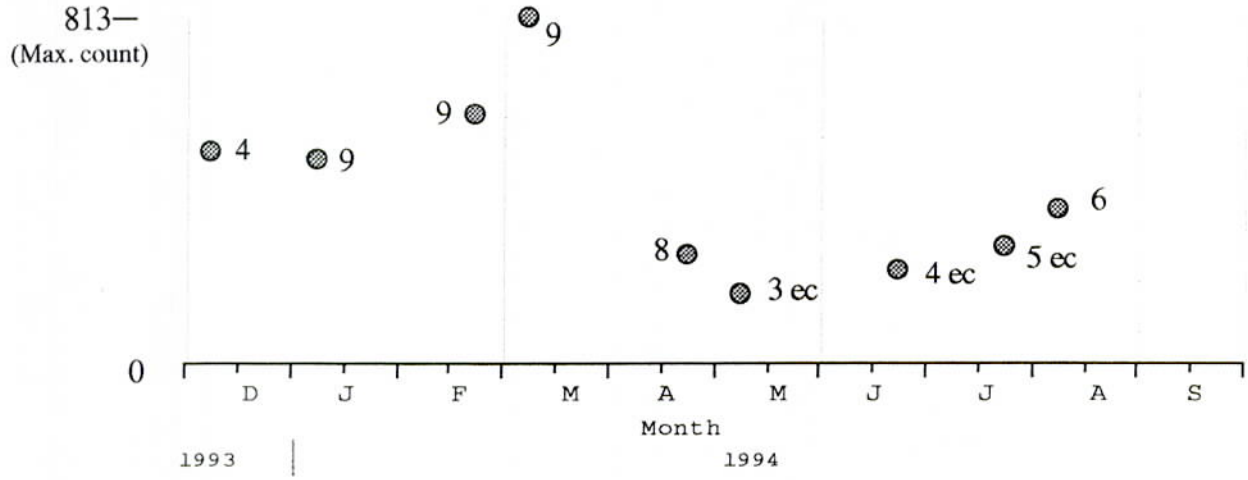
Cabbage Tree Creek mouth



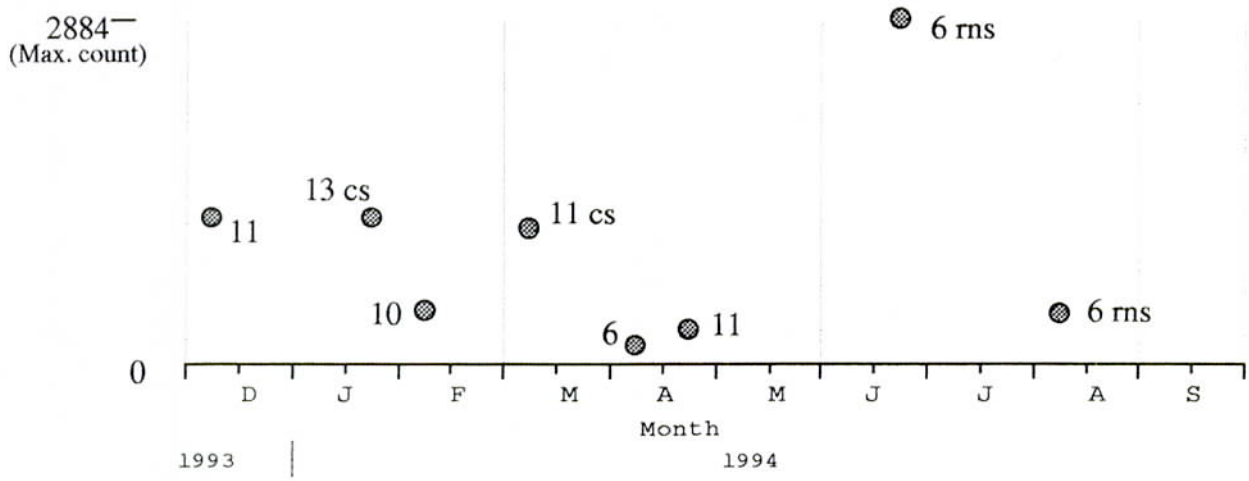
Raby Bay



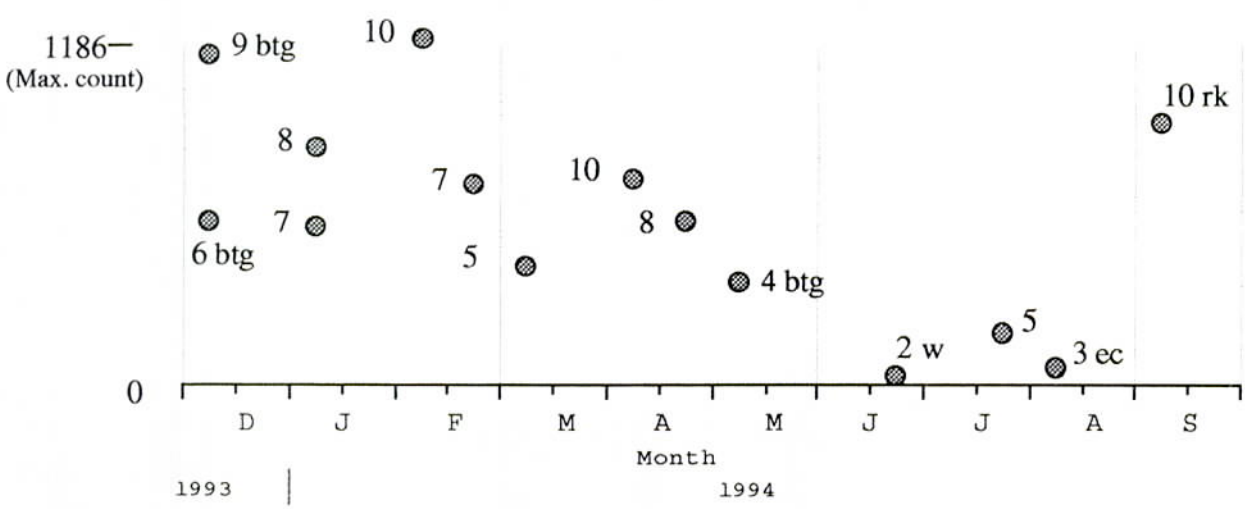
Fisherman Islands claypan roost



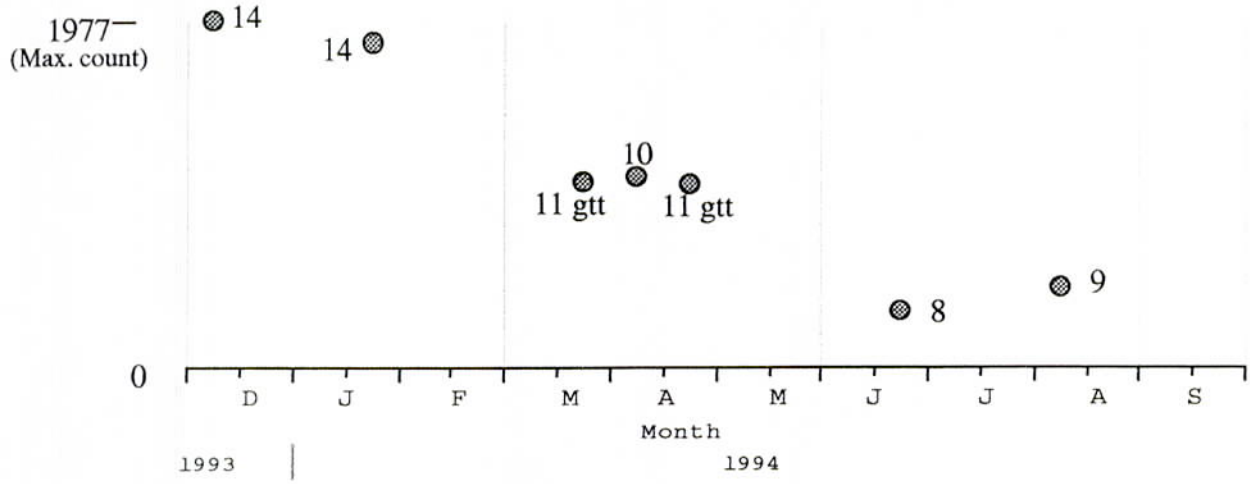
Luggage Point claypan roost



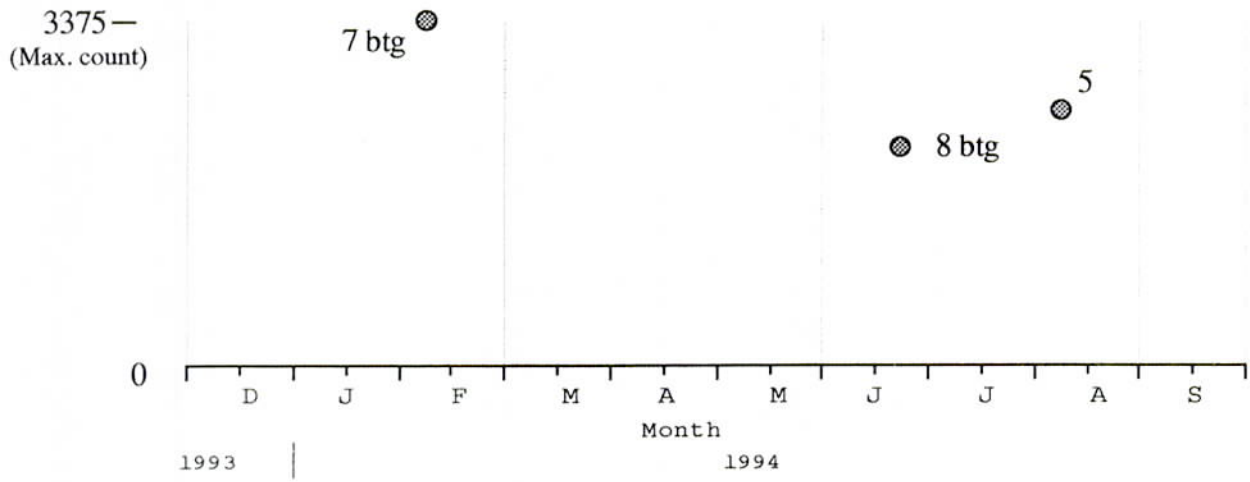
Lytton roosts (LYTT & LYN2)



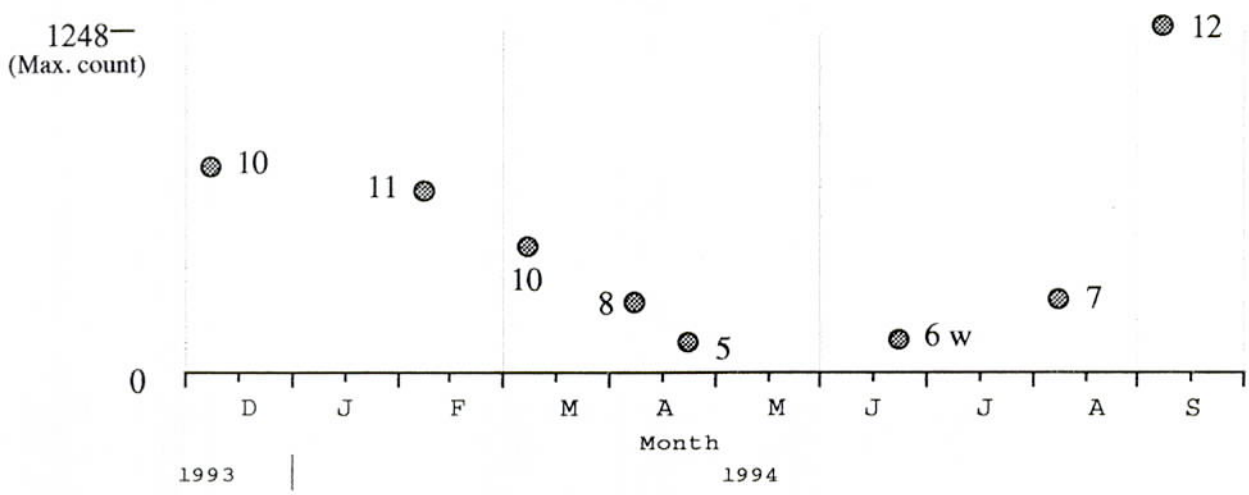
Manly roosts (MAHA & MALE)



Moreton Island roosts (MIPO & REPO)



St Helena Island roosts



Bird Populations of Fisherman Islands: Continued Monitoring and Three Year Assessment of Changes

Peter V. Driscoll, Ph. D.

Report prepared for the Port of Brisbane Corporation,

October 1994

Contents

Appendices