Table 1. Nest-building material of Little Ringed Plovers *Charadrius dubius* breeding on the Bulgarian Black Sea coast in 2000 and 2001.

	Type of nest-building material	2000 (n = 47)	2001 (n = 80)	Total (n = 127)	
				number	%
Occurring naturally on the beaches					
1	Shell fragments	42	70	**112**	**88.2**
2	Twigs	40	67	**107**	**84.3**
3	*Mytilus galloprovincialis*	19	35	**54**	**42.5**
4	Seaweed	14	28	**42**	**33.1**
5	Seeds	19	22	**41**	**32.3**
6	Snails	5	10	**15**	**11.8**
7	Reed	4	10	**14**	**11.0**
8	Bark, wood	0	12	**13**	**10.2**
9	Pieces of coal	5	6	**11**	**8.7**
10	Sea snails	6	4	**10**	**7.9**
11	Insects	1	9	**10**	**7.9**
12	Crab's claw	1	7	**8**	**6.3**
13	Stones, cinder, piece of brick	3	4	**7**	**5.5**
14	Seeds of the Water Chestnut	2	2	**4**	**3.1**
15	Feathers	3	1	**4**	**3.1**
16	Barnacles	1	2	**3**	**2.4**
17	Leaves	0	2	**2**	**1.6**
18	Crustacea	0	2	**2**	**1.6**
19	Fish-bones	0	2	**2**	**1.6**
20	Pond snails	1	0	**1**	**0.8**
21	Piece of straw	0	1	**1**	**0.8**
22	Rapana	0	1	**1**	**0.8**
23	Meerchaum	0	1	**1**	**0.8**
Garbage left on the beaches by tourists					
24	Pumpkin and sunflower seeds	2	6	**8**	**6.3**
25	Stones of cherries, plums and peaches	1	6	**7**	**5.5**
26	Seeds of watermelon and apple	3	3	**6**	**4.7**
27	Cigarette ends	1	4	**5**	**3.9**
28	Glass	2	1	**3**	**2.4**
29	Paper	1	1	**2**	**1.6**
30	Cellophane	0	1	**1**	**0.8**
31	Wood stick of an ice-cream	0	1	**1**	**0.8**
Waste washed ashore by the sea					
32	Polythene granules	15	23	**38**	**29.9**
33	Plastics	12	16	**28**	**22.0**
34	Styrofoam	8	17	**25**	**19.7**
35	Black oil	9	7	**16**	**12.6**
36	Nylon	1	6	**7**	**5.5**
37	Rubber	1	1	**2**	**1.6**
38	Threads and cords	1	1	**2**	**1.6**

- **Reed:** Mainly small pieces washed ashore by the sea.
- **Bark and wood:** These were pieces of various different sizes. Larger ones concealed the nests and the brooding bird. Smaller pieces, 1–3 cm long, were used for the nest-platform. Sometimes the scrape was filled with pieces of wood, especially if they were plentiful on the beach.
- **Coal:** This consisted of small, light pieces, 1–2 cm long, that had been dispersed across the beaches by the wind.
- **Sea snails:** These had been washed ashore along with the shells. They were usually *Tritia reticulata* or of the genus *Ceritiolum*. They were quite small, only 0.5–1.5 cm long.
- **Insects:** These were dry and dead and wind-dispersed across the beaches. It is possible that the birds bring them to the nests, as there were five individuals in one scrape. Generally, though, they were seldom found in the nests.
- **Crab's claws:** These were to be found in small numbers among the shells on the beach and are probably used as building material in the same way as shells.
- **Stones, cinder, pieces of brick:** Stones used as building material were small and resembled shells. There was a piece of a cinder in one scrape and a piece of brick in another. They were larger and the bird used them for concealment of the nest and the eggs.
- **Seeds of Water Chestnut *Trapa natans*:** These are comparatively large and appear around the scrapes by chance. The birds arranged them around the nests for concealment.
- **Feathers:** Small feathers found singly and not very often.
- **Barnacles *Balanus* spp:** Fragments probably collected by the birds with the shells.
- **Leaves:** There were old dry leaves only in two scrapes. Probably the wind disperses them near the nests.

- **Crustacea:** Occasionally dry individuals were found in the nests. They may have fallen in accidentally or the birds collected them.
- **Fish-bones:** There were small fish bones in two nests. Probably the birds brought them with the shells.
- **Pond-snail:** Only in one nest on the beach along the marsh Alepu. Probably the birds brought it accidentally from the marsh.
- **Piece of straw:** There was one, 2 cm long, in one nest. Probably it was brought together with the sticks.
- **Rapana *Rapana thomasiana*:** One nest was built close to a large rapana shell (a mollusc introduced from the Far East). The birds had used it to conceal the nest.
- **Meerschaum:** Found in only one nest, probably chosen because of its resemblance to a stone.

Human garbage and waste

Tourists leave a considerable quantity of garbage on the beaches. Some of it can be found in the nests of Little Ringed Plovers. These are mainly the seeds of pumpkin, sunflower, watermelon and apple and the stones of cherries, plums and peaches. They resemble and are similar in size to shells and stones. They are light and the birds can easily use them as building material. Cigarette-ends were found in five nests, singly in four cases but in one nest there were five. There were also pieces of glass bottles, paper, cellophane and even a wooden stick from an ice-cream.

The sea washes ashore a great variety and quantity of waste. This mixes with the shells and sticks, which are the main building materials used by Little Ringed Plovers. Most common on the Black Sea beaches are polythene granules; small balls 5–10 mm in diameter in a variety of colours. They are very light and the wind disperses them on the beaches. Various plastic objects, such as container lids, bottles and bottle-tops, can also be found in the nests. It appears that the birds chose these items for concealing their nests. Sometimes small balls of styrofoam were deposited in the nests. They resemble the polythene granules, and are also light and dispersed by the wind. Unfortunately black oil can sometimes be found in the nests as well. The sea washes it ashore and occasionally whole beaches can be covered with it. There were balls of black oil in 16 scrapes (12.6%), ranging from several centimetres to big as human fist. Some of the brooding birds were also oiled. The black oil was removed from each nest in which it was found.

Pieces of nylon, rubber, threads and cords were found in single nests. It appeared that in most cases these items were used for concealment.

CONCLUSION

Most Little Ringed Plover nests found on the beaches of the Bulgarian Black Sea coast were built beside or under objects (55.1%, Types B & C together). This was often among waste washed ashore from the sea and strewn across the beach in piles (Type B), but sometimes it was by single, isolated objects such as sticks, stones and plants (Type C). Presumably the objects were used to afford some concealment for the nest and the brooding bird from predators. In a similar study of the nest sites of Kentish Plovers *C. alexandrinus* (= Snowy Plover) it was shown that nests located under objects where there were many objects or in open places where there were few objects had higher hatching success than those built beside isolated objects (Page *et al.* 1985). Presumably, where objects are numerous, they do not serve as clues for predators, but single twigs or stones may attract their attention. Therefore it seems that Type C nests contribute least to hatching success and this is presumably the reason why, at 16.3%, they are relatively uncommon.

Most frequently the nest was a scrape with varying amounts of building material arranged in different ways. Usually the building material was spread on the bottom and the walls of the scrape and consisted of small shell fragments and twigs. The birds would also heap building material on and around the scrape. This probably added to the concealment of the nest and reduced the profile of the sitting bird.

During fieldwork, it became evident that the distribution of feeding sites (most frequently outfalls of small rivers or marshy places) influences the density and distribution of nests. In particular, there were more nests on beaches that were backed by large freshwater marshes. Where nearby freshwater consisted of just a river mouth or small pond there were only 2–3 nests. All nests were built in the range of 2–150 m from freshwater.

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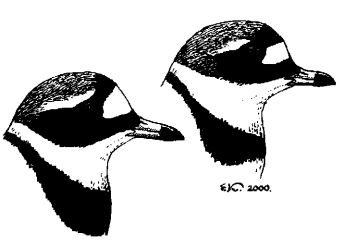

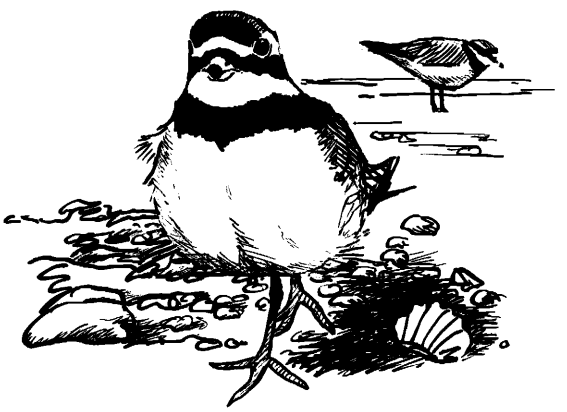

Migrant shorebirds at Península Valdés, Argentina: Report for the year 2000

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INTRODUCTION AND METHODS

We report observations of migrant shorebirds on the beaches of Península Valdés, Chubut, Argentina (42°30'S, 64°00'W), during their northward stopover in the year 2000. This follows a report for the 1999 season, which covered just one site, Fracasso beach, published in Bala *et al.* (2001).

During February to May, we made weekly counts of shorebirds and recorded those with colour-bands in three areas of Península Valdés: Fracasso beach (10 counts), Caleta Valdés (7 counts) and Punta Norte (3 counts) (Fig. 1). Fracasso beach is a 3.5 km^2 marine wetland in San José Gulf. It is sandy with fine and medium sediments. Caleta Valdés is on the east coast of Península Valdés and our study site there is the northern part, which is 5 km^2 at low water. There are many islands covered with salt-tolerant vegetation and the sediments comprise fine sand and mud. Punta Norte is at the northeast extremity of Península Valdés and is characterised by boulder beaches and rocky shores.

The benthic communities differ between the three sites. The main shorebird foods available at Fracasso beach are polychaetes and clams, at Caleta Valdés, polychaetes, and at Punta Norte, crustaceans and mussels.

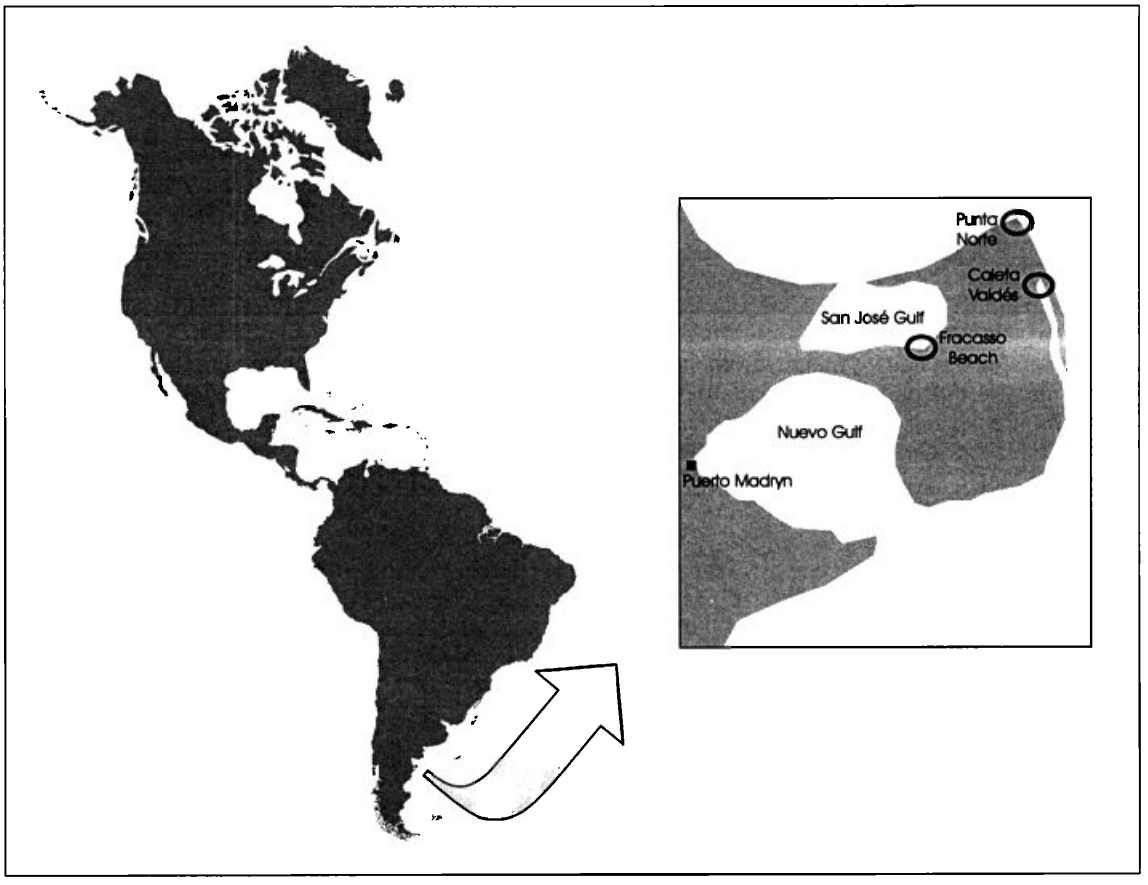

Fig. 1. Location of Península Valdés and the three study sites.

Table 1. Weekly shorebird counts at Fracasso beach, Península Valdés, Argentina, during March–May 2000.

Week	Date	*Calidris canutus*	*Calidris fuscicollis*	*Limosa haemastica*	*Charadrius falklandicus*	*Pluvianellus socialis*
2	Mar 2–3	0	57	0	316	0
3	Mar 8–9	0	7	0	81	0
4	Mar 16–17	10	15	0	22	0
5	Mar 21–24	100	200	0	300	0
6	Mar 28–31	490	200	1	180	0
7	Apr 5–7	2000	80	1	165	0
8	Apr 12–14	3000	6	1	200	0
9	Apr 17–18	800	0	0	106	3
10	Apr 27–28	0	0	1	10	0
11	May 4–5	0	0	0	200	0
Accumulated total bird/weeks		6400	565	4	1580	3

RESULTS AND DISCUSSION

Censuses

At Fracasso beach, Red Knots *Calidris canutus rufa* were the dominant species with a cumulative total of 6400 bird/weeks and a peak count of 3,000 in mid-April (Table 1). These figures are very similar to those for 1999 except that the peak count was earlier, at the end of March. However, the data reflect a much reduced population compared to the early 1980s when peak numbers were 5,000–6,000 in early April 1980 and 20,000 in early April 1981 (Brayton 1986, Morrison & Harrington 1992).

White-rumped Sandpipers *C. fuscicollis* at Fracasso peaked at only 200, much less than the 1,280 recorded in 1999 though the timing of the peak in the last ten days of March was similar. Two-banded Plovers *Charadrius falklandicus*, which are largely restricted to Argentina and Chile throughout the year, were recorded during every weekly count in about the same numbers that have been recorded in the past. The peak was towards the end of March, like 1999. As in previous years, a few Hudsonian Godwits *Limosa haemastica* and Magellenic Plovers *Pluvianellus socialis* were recorded though, unexpectedly, there were no Sanderlings *Calidris alba*.

The largest numbers of White-rumped Sandpipers and Two-banded Plovers were recorded at Caleta Valdés, about three times as many as at Fracasso, but virtually no Red Knots (Table 2). Peak numbers of White-rumped Sandpipers occurred in mid-April, rather later than the peak at Fracasso, so it is possible that some birds had moved from one site to the other. Caleta Valdés is by far the most important site on Península Valdés for Two-banded Plovers, with a peak population in March of 1,500. Other species recorded were Sanderling, with a flock of 100 in early March, Red Knot, Hudsonian Godwit, Magellanic Plover and Rufous-chested Dotterel *Charadrius modestus*.

Only Sanderlings were recorded on the rocky beaches of Punta Norte with the same number, 200, being counted on three occasions: week 1 (22 February), week 2 (2–3 March) and week 5 (21–24 March).

Colour-banded Red Knots

As a result of the International Shorebird Banding Project's sustained effort since 1994 to colour-band Red Knots throughout the West Atlantic flyway, a substantial proportion of the population was banded by 2000. We systematically scanned the knot flocks at Fracasso beach in order to establish their origins.

We made 115 separate observations of colour-banded birds, 1.8% of the aggregate total birds scanned (Table 3). A substantial number of these observations probably relate to the same birds being recorded in more than one scan. However, the minimum number of individual banded birds was 49 (based on the aggregate of the maximum number of birds

Table 2. Weekly shorebird counts at Caleta Valdés, Península Valdés, Argentina, during March–May 2000.

Week	Date	*Calidris canutus*	*Calidris fuscicollis*	*Calidris alba*	*Limosa haemastica*	*Charadruis falklandicus*	*Pluvianellus socialis*	*Charadrius modestus*
3	Mar 8–9	0	400	100	0	1500	0	0
5	Mar 21–24	0	50	0	0	900	0	0
6	Mar 28–31	0	300	1	0	1400	0	0
8	Apr 12–14	2	500	0	3	600	2	2
9	Apr 17–18	0	50	0	0	600	0	0
10	Apr 27–28	0	50	0	0	600	0	1
11	May 4–5	0	50	4	0	850	0	0
Accumulated total bird/weeks		2	1400	105	3	6450	2	3

Table 3. Observations of colour-banded Red Knots by date and country in which they were banded.

Date	Flock size	Total banded	Country in which banded				
			USA	Argentina	Brazil	Canada	unknown
24 March	103	8	8				
29 March	71	3	3				
29 March	80	3	3				
30 March	417	18	12	4	2		
06 April	60	4	4				
07 April	58	4	4				
13 April	2000	21	13	7		1	
13 April	260	5	3	2			
14 April	39	8	6	1			1
14 April	212	6	5	1			
14 April	56	1	1				
14 April	130	3	2				1
14 April	600	1	1				
14 April	800	4	3	1			
14 April	1200	14	10	2	1		1
18 April	311	12	11	1			
Aggregate sightings of banded birds		115	89	19	3	1	3
Minimum individual banded birds*		49	32	12	2	1	2

* The minimum number of individual banded birds is the aggregate of the maximum number of birds with each band combination recorded in a single scan.

with each band combination recorded in a single scan). Of these, 32 (65%) had been banded when stopping over during northward migration in Delaware Bay, USA, in 1997, 1998 or 1999. Twelve (24%) had been banded at other locations in Argentina, at least five when stopping over at San Antonio Oeste, 200 km north of Península Valdés. Two had been banded during stopover in Brazil (one from Lagoa do Peixe in April 1997) and one had been banded in Canada (because it carried a white flag on its left tibia), but we have been unable to trace its exact origin. (Any reader who can supply this information is asked to contact us. The band combination was: white flag left tibia, orange band left tarsus, white band right tarsus.) The origin of two other banded birds could not be determined because they had apparently lost their country-specific flag.

We found a significant negative correlation between flock-size and the proportion of colour-banded birds found in the flock ($p = 0.004$, $r_s = -0.679$, $n = 16$; Fig. 2). There

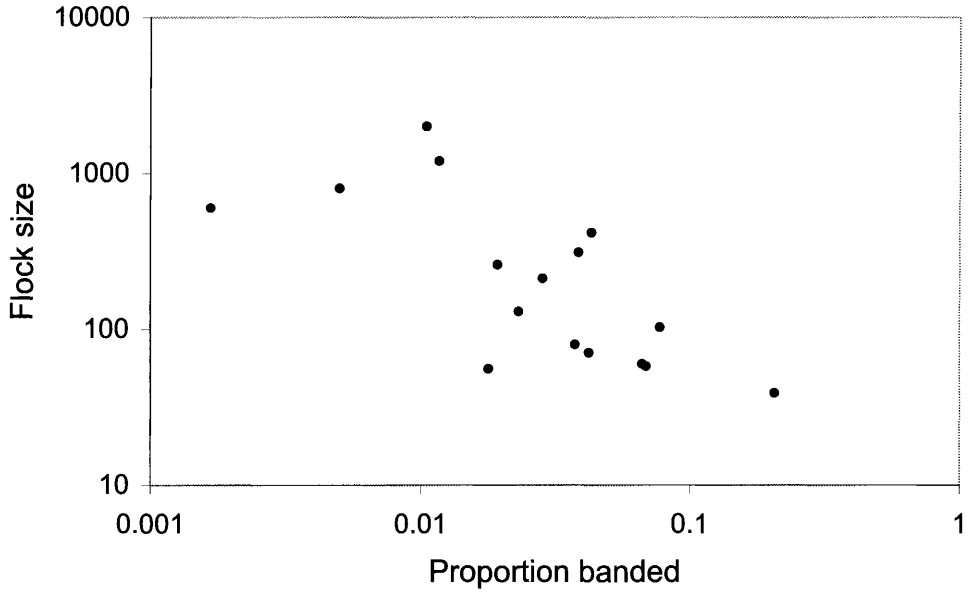

Fig. 2. Flock-size of Red Knots at Fracasso beach, Península Valdés, plotted against the proportion of colour-banded birds in each flock (note that log-scales are used for both axes). There is a significant negative correlation, as mentioned in the text.

would seem to be only two possible explanations: either it is a real effect or it is an artefact arising from our scanning method. It could only be a real effect if banded birds are more likely to be found in small flocks. We can think of no reason why this might be the case. On the other hand it would seem possible that, when scanning a large flock, there may be some over-recording of birds without bands. We invariably scan birds that are feeding because their legs are more easily seen when feeding than when roosting. However, this also means that the birds are continually on the move. To reduce double counting, we always scan in only one direction. However, it is easier to avoid double counting a banded bird because it is recognisable. It is more difficult to avoid double counting unbanded birds because they all look similar. It is likely that this problem is greater for large flocks than for small ones because scanning a large flock takes so much longer that proportionately more unbanded birds are double counted. Clearly this is an effect that needs to be investigated and properly understood because it can have a major effect on the results of studies such as ours, especially in relation to efforts to estimate total populations. For example, although the overall average proportion of banded birds was 1.8%, it increases to 5.6% if the four flocks of >500 birds are excluded.

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