

Some field notes on the breeding of the Greater Kelp Goose

PETER GLADSTONE and CHARLES MARTELL

Introduction

Together we spent from November 1964 to March 1965 in the Falkland Islands, South Atlantic, with the purpose of studying the Greater or Falkland Kelp Goose *Chloëphaga hybrida malvinarum*. It was also possible to make observations on the majority of other species of birds found in these islands.

We arrived separately in the islands on 4th November transported as guests of the Royal Navy. Peter Gladstone travelled in H.M.S. *Protector*, the Ice Patrol Vessel. Charles Martell travelled down the west coast of South America in H.M.S. *Tiger* and from South America to Port Stanley in the tanker R.F.A. *Wave Chief*. We arrived at our first camp on 12th November, the day the first Kelp goslings of the season left their nests.

Our chief area of study was at Port San Carlos on the west side of East Island, particularly on narrow Big Island (1½ miles long), named on maps as Fanning Island, but not so known locally, near Fanning Head. We also made observations round the coast of Port San Carlos, which covers an area about the same as the Isle of Wight, on the north end of Great Island in the Falkland Sound, on West Point Island, Carcass Island and New Island to the west.

We were probably lucky in visiting two areas where the Kelp Goose is particularly abundant, Great Island and Fanning Island. Roddy Napier, a leading ornithologist who has spent his life in the islands and knows them well, told us he knew of no other areas with so high a population.

In spite of the fourpenny bounty on the bills of other 'geese' the Kelp Geese suffer little from persecution by man. The bills are not acceptable for the bounty and are easily recognised, the female's being pink and the male's having a white spot on the upper mandible—a fact that may well have saved the bird from near extinction. Other factors favouring their survival are that the eggs are laid rather later than those of the other *Chloëphaga* species, at a time when lamb marking and castrating keep the local inhabitants busy; the nests are usually less accessible to human settlements than those of the Greater Magellanic Goose *Chloëphaga picta leucoptera* and the eggs are said to be foul-tasting.

Furthermore, the eggs of various species of penguin are more easily collected in large numbers—and fresh.

We had evidence that the breeding population was in many places at or near saturation with a reserve of non-breeding birds. When one female died egg-bound another arrived in the territory and paired with the gander within twelve hours. When a pair with young were washed from their territory by a storm, a new pair moved in within a few days. Apart from the area immediately around the town of Port Stanley we found no suitable territory which was unoccupied. It is almost certainly the specialized demands of the bird's ecology which keep the population comparatively low.

Habitat

The Kelp Goose feeds almost exclusively on green algae on the shore. Very occasionally birds feed on short grass and, probably more regularly, on the berries of 'Diddle-dee' *Empetrum rubrum* in the austral autumn, again nearly always close to the shore.

The breeding territories are found on rocky shores where the fine green algae, like *Enteromorpha*, grow in the intertidal zone, on comparatively calm coasts. Thus breeding Kelp Geese are found in bays, in sheltered sounds, in areas where there is a wide shallow underwater shelf, or, frequently, where the shore is protected from the main waves by the blanketing effect of the vast kelp seaweed *Porphyra umbilicalis*. This grows to great length and the fronds often cover the surface of large off-shore areas. The birds can even find territories on the north coast, where kelp abounds, though there is no land between there and the British Isles and the sea is seldom calm. It has been recorded by Boyson (1924) and by Cobb (1933), and frequently repeated, that the birds feed on this seaweed. This is certainly not the case. Their basic requirements appeared to be at least seven yards width of intertidal zone (tides average seven feet in height) with enough algal growth to make it appear greenish, rocks which will not move in storms and so destroy the algae, some nest cover close to the high tide mark, and shelter or a blanket of kelp.

During the breeding season territories are closely defended by both sexes, the

male being seen to chase away intruding males and females, and the female other females. The size of the territories varies considerably with local conditions. A single pair may be alone in miles of coastline because there is only one small bay with the necessary conditions. In other places nests may be as little as fifty yards apart, though seldom does a territory cover less than a hundred yards of shoreline.

Nests

We found 56 nests in use and a number which had been in use before we discovered them, or were from previous years. Some of the latter were close to present ones, suggesting traditional attachment to sites. Indeed in some cases we found several layers of old down and grass, one on top of the other.

Nest cover varied from a dense cover of ten-foot high tussac grass *Poa flabelata* to planks of old sailing ships (which littered the coast and provided much of our fuel for cooking and for heating hot-water bottles—for our tame goslings). However, with practice, we could usually pick out where the nest would be in any given territory. It would be partially hidden, but allowing the highly cryptic female to have a view out. Usually the bird could walk at least a couple of yards to the nest, though she might have to fly direct to a small hole in the vegetation. All nests save one were within ten yards of the high tide line, and most were closer than that. The exception was 100 yards from the shore of Great Island, against the first bit of cover inland from an otherwise perfect feeding territory. Where available a ledge amongst stunted tussac grass four to eight feet up a little cliff was preferred. On Great Island, where sheep have exterminated the tussac grass except on such cliffs, ground nests were beside drift-wood, an outstanding boulder, amongst *Empetrum*, or in the coarse white grass *Cortaderis pilosa* with which most of the islands are covered.

The scrape was lined with any available vegetable matter and down was added when the last egg was laid and incubation started. Where incubation was advanced there was normally a considerable quantity of grey down and the eggs were covered with this when the female left to feed. The white male does not take any part in incubation and has no brood patches.

Eggs and clutch size

The fresh eggs have a greasy texture and

are a slightly creamy white. The shape varies very considerably, some being long and thin but the majority tending to a blunter ovoid.

The clutch sizes of 44 nests found in which laying was complete and where there was nothing to suggest disturbance or that they were second clutches were as follows:

Clutch size	6	5	4	3
No. of nests	21	17	5	1

We heard that a clutch of eight has been seen but could not get details. Clutches of seven eggs do appear occasionally. Mr. Napier found one on West Point Island in 1957 but he considered it unusual. Pettingill (1955) records one on Kidney Island. Boyson (1924) recorded clutch size as 2 to 4. This is suggested as the normal size for the Lesser Kelp Goose *Chloëphaga hybrida hybrida* on off-shore islands in Chile by Johnson (1955). We found two newly-hatched broods of seven young after a storm in territories where neighbouring adults were missing and there may have been amalgamation, also two broods of seven well-grown young in February on New Island. Mr. Napier saw a brood of nine on Dunbar Island in 1957.

We measured the eggs of 10 clutches, 48 in all, and found the average to be 82.5×55.6 mm. (ranges 78-89 \times 53-58). One exceptional egg from an otherwise normal clutch measured 105×65 mm. Schönwetter (1960-1) gave the measurements of 27 eggs as 83.5×54.0 mm. (75-91 \times 53-58). Boyson (1924) gave ranges of 80-84 \times 55-58 mm.

When we arrived on 4th November most clutches were well incubated and we did not get a chance to discover the incubation period. (Delacour (1954) gives it as 30 days.) From the first sign of chipping, individual eggs hatched within 12 to 48 hours and the young normally left the nest together some hours after the last eggs hatched. In the majority of cases this was about 48 hours after we had found the first egg chipping, but sometimes considerably longer. Cobb (1937) states '... young leave the nest one by one as they hatch ...' and '... but the Kelp Ganders just sit about or feed, and do not appear to care if they lose the lot or not. This is perhaps a good thing, or the place would become smothered in Kelp Geese'. We saw one newly-hatched young tended carefully by a gander on one occasion whilst the goose sat up a cliff on a nest and Cobb's description is not of a normal situation. The first young to leave the nest did so

on 12th November and the majority of nests had hatched by 25th November, though several hatched some days later. A few still had eggs on 5th December. One nest had four eggs which started chipping on 9th January and the young left the nest on 14th January but we saw no evidence of other late broods. We suggest that reports of later hatching may be derived from underestimation of the ages of the young due to their extremely slow growth rate, particularly during the first few weeks.

Goslings

We got to know the goslings intimately as the two of us lived in a tent 4 ft. 4 in. by 6 ft. 6 in. with all our equipment and reared 25 goslings in it. This was not always an easy task as there were frequent gale-force winds often with near-horizontal hailstorms. We also had to guard the birds against the attentions of Cassin's Falcon *Falco peregrinus cassini* and the local Buzzards *Buteo polysoma* or *Buteo erythronotus*—we confirmed what had been suspected before that the Blue Buzzard is the male and the Red-backed Buzzard the female of the same species, as we found two nests and saw several other pairs. Johnson (1965) mentions no sexual dimorphism for the Red-backed Buzzard *B. polysoma* in Chile. The Falkland bird may prove to be a distinct species. If so it is one of the rarest birds in the world.

We also had to protect our 'family' from the attacks of the Greater Magellan Geese which held the territory in which we placed our tent. 'Martha', the female of this pair, came each morning to attack the goslings round the tent. She also stole our porridge whilst we were protecting the goslings, being completely fearless of human intervention. Picking up Martha and enclosing her in our little pen whilst the goslings grazed round the tent solved this problem at times—the Lorenz Inverse Cage Law in reverse! A few near-hits with a red plastic bucket made the buzzards wary of it even when it was slung flapping on a drift-wood pole near the tent.

The newly-hatched goslings are delightful little white birds with pitch black feet and bills. The egg-tooth is white. They have sharper claws than any other Anatidae we know and stumble over and round the rocks following their parents. They are only able to feed at comparatively low tide for a few hours each day, the actual period depending on the weather and the direction of the wind. This may explain why they grow so slowly, a feature we noticed both in the

wild and amongst our tame birds. The actual pre-flight period for any individual bird was not measured; it varies considerably but is always more than twelve weeks. The wild goslings fed on fine green algae of the *Enteromorpha* type, and a little on similar brown algae. Our birds fed on turkey starter crumbs which we had imported, short grass, leaves of dandelion *Taraxacum officinale*, an introduced plant found round settlements, porridge oats, flour and anything else available. Some even had hard-boiled eggs of Rockhopper *Eudyptes crestatus* and Gentoo Penguins *Pygoscelis papua*. As many of the local inhabitants feed their chickens and tame ducks and geese on carcasses of cattle and sheep we reckon our birds did well! We lost a few by chilling in spite of taking them into our sleeping bags, one was lost down a covered hole (together with our only young Flightless Steamer Duck *Tachyeres brachypterus*) and one was killed by Martha.

The slow growth rate was worrying to both of us as we had had experience of hand-rearing other waterfowl. The white down soon becomes greyish and the first feathers showed through after 17 to 25 days. This period varied with the weather and hence the available feeding time, both for our birds and those living under natural conditions. The first feathers of the females appear before and are darker than those of the males. It is easy to differentiate between the sexes some days before the feathers appear as the females start to get a croaking edge to their voices, the first sign of the musical 'qwa' of the adult females. The normal note of the young is a double 'cheep', and as the female 'qwa' appears the males develop a triple 'cheep' which is later further multiplied and develops into the adult male's whistling 'si'.

In getting the birds home we had great help from Ian Strange, the crew of R.M.S. *Darwin* and the firm of Maclean and Stapleton of Montevideo. We made cases of weldmesh lined with sacking, and having long since run out of turkey starter we fed the birds on dandelion, cabbage and porridge. From Port San Carlos to Port Stanley we travelled on the *Darwin*, the local steamer, on the after deck. This was an easy trip although it was necessary to struggle through sheep to reach the birds. From Stanley to Montevideo we had five days of hell, the only available space being on the forward deck and the sea being rough. Tending the goslings, together with the other ducks, geese and penguins which we brought

back, was a task not lightly to be undertaken again! Before the trip we had tried to inject the birds against aspergillosis but unfortunately the drug proved to be too granular for normal syringes. Hampered by this and the prevailing weather conditions, which were such that even the *Darwin's* sailing was delayed two days, we had to abandon the attempt after succeeding with three birds. At Montevideo we had fifty-six hours in a heat-wave feeding, cleaning out, repairing crates and keeping the birds cool with an ever-running fire hose.

By plane from Montevideo was an easy 17 hours though we were worried by the rise in temperature of the hold during a delay in Rio de Janeiro. We then syringed water forcibly into the birds using a long-necked garden syringe. This had proved invaluable on many occasions, particularly when it was too rough to leave water in the crates. We landed at Gatwick in snow and soon had the birds on the Land Rover, to arrive at Slimbridge at dawn to a right royal welcome. We released the birds looking as if they had never been crated. It is sad to relate that in spite of devoted care and the use of drugs every bird had died of aspergillosis within a few months. The January-hatched birds, which we had collected, survived best and were easiest to handle on the trip although they had only just started to feather when we left.

The goslings became well imprinted on us which made caring for them much easier than it otherwise might have been. They took the vicinity of the tent as their territory and seldom wandered more than twenty yards. In the wild they are (contrary to Cobb (1933)) attended by both parents and clearly imprinted on both (Plate Ib, facing p. 28). It is noteworthy that they are able to imprint on both parents despite such dissimilar plumages and voices. There are few other Anatidae where the parents show sexual dimorphism and both look after their young and there is no other species in which the sexual dimorphism is more strongly marked. The female normally guards the young and when she is present they follow her, keeping close behind on the side opposite danger. If the female is removed from the brood the young follow the male, creeping away along the shore, as closely as they normally follow the female, but when the female is released they again switch to her. The female usually broods the young, although if the male is sitting down they sometimes snuggle under him.

Causes of losses

It was little encouragement to two men in a tent to be told that they had experienced the worst summer in living memory in the Falkland Islands. The weather in these islands has not a pleasant reputation and during November and early December the temperature was constantly low with a little frost some nights. The wind was often gale force and a spade was as useful as armour plating against hailstones as for its accustomed purpose during the calls of nature. However there were glorious short periods when the wind dropped and we did witness better weather later in our stay.

We saw no predation of Kelp Geese in the wild, but major gosling mortality that season was easily ascribable to storms. These were so violent at one stage when the birds were hatching that we were unable to move round the south side of Fanning Island even at low tide. These conditions lasted several days and we then found one colour-ringed pair a mile across rough sea from their territory, with two dying young.

Of 166 eggs we found on Fanning Island or the opposite shore, about eight did not hatch. We removed 25 newly-hatched goslings from this area leaving about 129 in the natural state. There were probably two broods (about 11 young hatched) from nests we did not find. Of these 140 young less than 20 were alive at the end of February. This 14% survival rate may be exceptionally low, but it would probably have been but little higher if we had left all the goslings hatched. Few pairs had complete broods left by February when we removed two or three others. In a storm the parents do not appear able to protect stragglers, and always stay with one or more young, so all our captives might have been surplus. In some other areas the survival rate had obviously been higher as we saw well-grown large broods, but many had apparently been heavily reduced to one survivor and many adults had lost all their young. The survival rate of our tame birds was about 76% from hatching to Slimbridge.

We heard reliable accounts of goslings being attacked by Dominican Gulls *Larus dominicus*, but did not see this. Great Skuas *Catheracta skua antarctica* and *mackormici* are numerous in some areas and probably attack goslings. We found two Kelp nests with eggs apparently eaten by Brown Rats *Rattus norvegicus*. The parent birds were not alarmed by the large Carancho *Caracara caracara* though



Philippa Scott

- Plate I. (a) A pair of Greater Kelp Geese *Chloëphaga hybrida malvinarum* photographed in the Falkland Islands during the first British tourist excursion to Antarctica.
- (b) Young Greater Kelp Geese following the adult male, the female was bringing up the rear with two other young. (See p. 28)

Philippa Scott





Philippa Scott

- Plate II. (a) A pair of Falkland Island Flightless Steamer Ducks *Tachyeres brachypterus* photographed in the wild.
- (b) The first Magellanic Flightless Steamer Duck *Tachyeres pteneres* to be bred in captivity, at 14 days old. (See p. 32)

Zoological Society of Philadelphia



these were constantly on and around some of the territories. Sea Lions *Otaria byronia* and Leopard Seals *Hydrurga leptonyx* would certainly take any young or adults they could catch, but the latter is now uncommon round the islands and the birds never move voluntarily into water in which seals could swim. Few birds except Scoresby's Gulls *Gabianus scoresbyi*, Sheathbills *Chionis alba*, Turkey Vultures *Cathartes aura* and some passerines are seen around Sea Lion colonies. The gulls and vultures feed on dead seal pups and afterbirths and the Sheathbills, which look like angelic fantail pigeons in flight, feed mainly on the seal faeces, starting before the evacuation is complete. Obviously the presence of a seal colony eliminates the possibility of a Kelp Goose territory. The buzzards appear to feed largely on passerines and we did not see them taking goslings though they constantly hovered over our tent whilst our tame birds were small. No gosling remains were found at their nests. Cassin's Falcon is reported as taking young chickens from settlements but at Cape Dolphin two adults and a fledged young shared a territory with a brood of well-grown Kelp goslings. Here the falcons were feeding on Belcher's Prion *Pachyptila belcheri* which were often in large flocks within sight of land. We saw a male Kelp drive off a Turkey Vulture which landed in its territory.

The mysterious Falkland Island Fox which early explorers including Darwin report as having been abundant in the islands may have been a danger in the past. Patagonian Foxes have been introduced to a few of the western islands of the group to kill penguins and geese with the faulty idea of aiding the sheep. However they turned on the sheep and have cleared them from some islands. There are no other wild land carnivores except the feral cats which we never saw on the shore-line though they inhabit the wildest areas. We found one adult goose that died egg-bound. Two dead ganders were found eaten by scavengers near a deserted nest on Great Island. It is possible that these had been killed by a Magellan gander in whose territory the nest was situated.

The Kelp Geese in many areas show no fear of man and it is possible to catch them with a fish landing-net, but when they have young they often take to the water between and round the rocks on the approach of humans. (The birds normally dislike getting their feet wet.) It is difficult to get within ten yards of some non-breeders on a beach and of all adults

when they are flightless. We did not, unfortunately, see their reaction when surprised with young by the local sheep dogs. When a dog is near them they simply made for the water.

Kelp Geese fed quite close to parties of young Sea Lions and Elephant Seals *Mirounga leonina*. On Carcass Island a brood fed between the water and moulting bull Elephant Seals of several tons weight even when these monsters were wallowing their way ashore a few yards away. A pair was seen feeding close around a dead Sperm Whale *Physeter catodon*, 51 feet long, and they showed no reaction to White Dolphins just off the rocks.

It is interesting to note that none of the geese showed alarm at the helicopter (in which we were privileged to make several excursions). This contrasts markedly with the reactions of other species of geese, in Europe for instance.

Behaviour

When a trespassing bird invaded a territory, the territory-holding gander flew low over the ground towards it and landed facing it a few feet away. He landed with his chest raised and puffed out and his head tucked in above it, with the tail lifted to make an angle of about 130° to the ground. This is very similar to the aggressive display of the male Andean Goose *Chloëphaga melanoptera*. On landing he maintained this posture whilst running directly towards the intruder with his wings slightly open, possibly to display the calouses, possibly to add to his apparent size, but certainly to aid his balance over the rough rocks. Throughout the aggressive run the attacking male repeats a 'si-si-si' whistle, frequently composed of three, seven or eight syllables although any number up to and including nine was heard, at constant pitch and at a rate of about five notes per second. In many cases that we saw, the intruder invariably retreated, running if not near water, then flying low, nearly always over water a few yards off-shore. When moving the birds prefer to fly over water, but seldom many yards from the shore. Kelp Geese are short-winged and not strong fliers. We never saw them fly more than forty feet above the ground or water. They very seldom even flew over Fanning Island, 30 feet high and 100 yards wide, after a visit to the 'mainland'. Instead they would make a detour right round the island, each paired gander displaying as they passed.

The female will also chase straying birds in the same posture as the male,

with her white patch on the wing-joint showing (as it does every time she lands). She resembles an old woman with an enormous swaying front angrily chasing chickens, as she stumbles over the rough ground, with flank-feathers flapping like an apron in the wind. On one occasion an incubating female was seen to leave the nest and drive off a stray female to whom her gander was making advances.

When a paired female was picked up it was usually easy to catch the male as well as he either attacked us or displayed violently within a few feet. On some occasions we picked up the male whilst handling the female and threw him into the air several times to be rid of him, but he kept coming back to display at us and to attack. If there were young present the male usually slunk off along the shore instead, with the brood following. When we caught a male the female stood around looking bewildered, though again if there was a family she would make off along the shore with it. When we caught the young the parent birds showed no sign of aggression but rather appeared to try to call the young from us, keeping meanwhile within a few feet. The female would give a constantly repeated single 'qwa' note, the same as when leading the young. It may be that the female did not recognise humans as dangerous animals but rather reacted as if the young had got trapped behind a rock. On these occasions the male's call seldom had more than three notes and sometimes only one or two. We did record up to eight notes a few times.

Occasionally a brood of Greater Magellan Geese would wander on to the shore in a Kelp's territory. On these occasions each gander would display at the other, but neither responded to the other's aggressiveness by flight and there was some fighting, the caloused wings being brought into use. Once a Kelp female was seen to drive off a Magellan female. Kelp Geese took little notice of Ruddy-headed Geese *Chloëphaga rubidiceps*, Flightless Steamer Ducks *Tachyeres brachypterus*, or Crested Ducks *Lophonetta specularoides specularoides* (which are possibly distinct from the South American birds). These might well all share the territory together with a pair of Black Oystercatchers *Haematopus ater* and a pair of pied Garnot's Oystercatchers *Haematopus leucopodus*. Magellan Penguins *Spheniscus magellanicus* were constantly on the shore in Kelp territories and the birds took no notice of each other. Intra-specific fighting was not observed, one bird always acting recessively, but territories were well estab-

lished when we arrived. There was a little squabbling in non-breeding parties.

When the female left the nest either to feed or when disturbed she flew at once to the male who was standing guard some distance away, landing sideways on, almost touching him. She immediately took up a breast-down position with the tail right up, similar to that seen in the aggressive run, with the white wing-joint well forward and very distinct. Meanwhile she gave a repeated musical 'qwa-qwa-qwa' (frequently three notes, varying to seven), and the male would almost fall over backwards with an upright posture, his neck pumping up and down and his chest puffed up, uttering a 'si-si-si' whistle, seven or eight syllables being the most usual, at constant pitch but sounding more sing-song than when he is aggressive. This whistle of the male is less fluting than that of a Magellan gander. The birds would move and repeat the performance several times until the female either flew to fresh water to drink or started to feed. On Fanning Island there was no fresh water except temporary rock puddles and some birds went over to drink at rivulets on the coast of East Island. Birds also appeared to drink more at dawn than at other times of day, though there were many birds that we never saw take water. The male seldom ate when the female was on the nest. Some pairs flew to a neighbouring non-territorial beach to feed when the female came off.

We could see no significant difference between the greeting display and the presumed triumph display which occurred regularly when the male returned to the female after a chase.

Although we witnessed and filmed distraction display in the Greater Magellan Goose, we did not see it in Kelp Geese.

Several times we saw display with calling as the male flew close behind the female low over the water, especially early in the morning as the pair flew back from drinking. Here the neck pumping was semi-horizontal although there was considerable vertical movement, with the chest again puffed forward, making flight appear difficult. The male called (usually seven syllables) and the female answered during this display.

Non-breeding movements

The non-breeding birds form flocks and move about depending on the conditions of the weather and the availability of 'sea lettuce', bright green and similar to luche *Ulva*, growing below high tide level. This is normally washed up on shores

not used by breeding birds. It does not appear to occur on the most exposed beaches where there was a lot of drift-wood. The birds do not often move as a flock, but rather in small parties or singly. Several times we watched this food accumulating on the beach near our tent and the number of birds would gradually increase until there were more than 50. On 10th February we saw one flock of 316 Kelp, all over a year old and many flightless, on a beach on New Island. The first flightless bird we saw was a male on 26th November. Throughout males moulted earlier than females though there was considerable overlap.

There is some winter movement round the coasts, but we were unable to ascertain its extent. Apparently some of the birds remain in their summer haunts. They occur regularly in the bay of Port Stanley and we saw some there in early March before we left.

Although the birds normally keep their broods within their territorial limits until fully grown, they are occasionally driven from it by storms and then some young may become separated to join another family. Though this behaviour could be considered accidental and may be uncommon, we found one pair of adults feeding on grass beside a sandy beach with twenty-five well-grown young of varying ages. The area did not seem suitable for a breeding territory and we can only conjecture how they arrived there. Also this beach was sometimes infested with Leopard Seals which eat sea birds freely and have even attacked swimming dogs, cattle and men.

While breeding males were white, nearly all non-breeding ones had one or more black wing-feathers, usually primary-coverts. We saw three breeding males

with black feathers, one with a thin broken line down the back of his neck, one with some black tail-feathers and one with a black primary. One female of a territory-holding pair had black feathers on her rump. There were pure white males in non-breeding groups and these tended to be the most aggressive. They may have been adults which were unable to secure a territory. On the whole the legs of the birds which were not breeding were less bright in colour than those of the breeders, and this may be a method of telling fully mature from other post-juvenile birds. In the areas we visited there were more birds in flocks than there were holding territories.

Acknowledgements

One of us (P.G.) was given leave of absence from Shrewsbury School and a Travel Award by the Goldsmiths' Company. We owe a great deal to the Captain and crew of H.M.S. *Protector*, of H.M.S. *Tiger*, of R.F.A. *Wave Chief* and R.M.S. *Darwin* and to Admiral Sir Hugh Martell, to Dr. S. Slessor, Mrs. White, Ian Strange at Port Stanley, to the Napier family of West Point Island, the Bertrand family of Carcass Island and the Davies family of New Island. Every inhabitant of Port San Carlos settlement gave us unstinting help, particularly Bill Hogarth who fed the goslings whilst we toured other areas. Above all we must thank the Cameron family. No better hosts than Mr. and Mrs. Norman Cameron could be found anywhere; we camped on their ground, spent Christmas with them, and made free use of their home whenever we wished. Everywhere we met kindness and help. We also thank Dr. G. V. T. Matthews for many helpful comments on the manuscript.

References

- BOYSON, V. F. 1924. *The Falkland Islands*. Oxford : Clarendon Press .
 CAWKELL, E. M. and J. E. HAMILTON. 1961. Falkland Island Birds. *Ibis* 103a : 1-27.
 COBB, A. F. 1933. *Birds of the Falkland Islands*. London : Witherby.
 DELACOUR, J. 1954. *The Waterfowl of the World*. Vol. I. London : Country Life.
 JOHNSON, A. W. 1965. *The birds of Chile and adjacent regions of Argentina, Bolivia and Peru*. Vol. 1. Buenos Aires : Platt Establecimientos Graficos S.A.
 PETTINGILL, O. S. JR. 1965. Kelp Geese and Flightless Steamer Ducks in the Falkland Islands. *The Living Bird* 4 : 65-78.
 SCHÖNWETTER, M. 1960-61. *Handbuch der Oologie*, ed. W. Meise. Parts 2 and 3. Berlin : Akademie-Verlag.

Peter Gladstone, Shrewsbury School, Shrewsbury, Shropshire.

Charles Martell, Long Reach, Bosham Hoe, Chichester, Sussex.