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NOTES ON THE BIRDS OF MARION ISLAND.

By R. W. RAND.

Received on 13 November 1952.

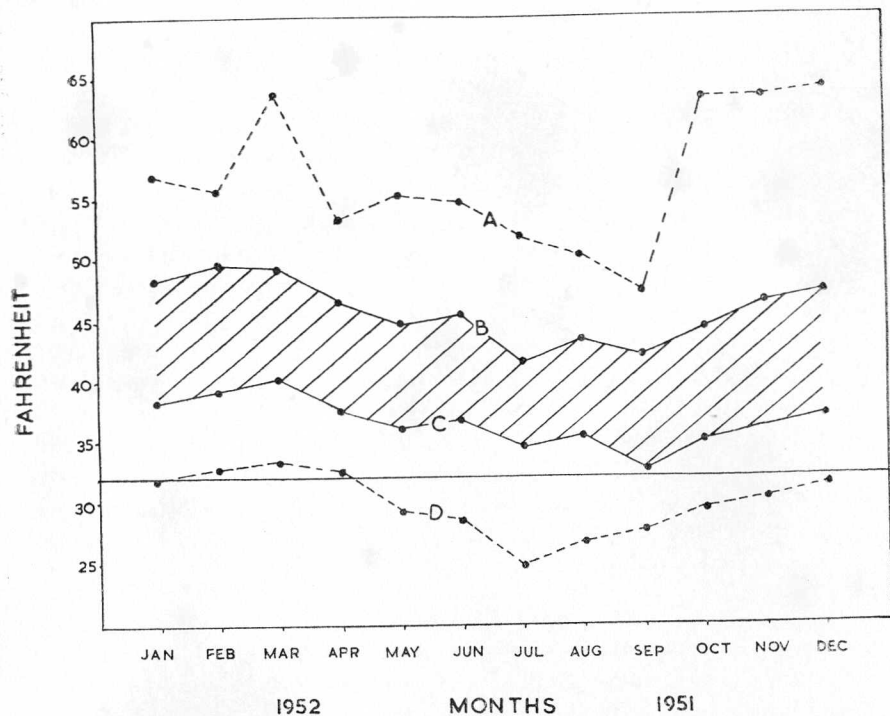
As a member of the Seventh Relief (October 1951 to April 1952), the writer spent six months of the southern summer making a faunal survey of Marion Island. The present ornithological account is based upon 137 specimens, of which 95 skins were brought back to South Africa for further examination. Notes were taken of birds discovered in nest-burrows or sighted in the open, and breeding habits were recorded whenever possible.

METHODS.

On Marion the meteorological station at Transvaal Cove was a base from which regular trips were made to different parts of the island. As most nesting birds were encountered near the bays and coves, these trips were really coastline surveys and were closely correlated with a regular (monthly) seal census. After initial investigations had determined the scope of the field work, particular coastal localities were visited without covering unnecessary ground. A trip round the coast could be undertaken only once a month. Pre-occupation with the coastal area made frequent visits to the mountains impossible. However, on two cross-country trips it was noticed that few birds occur above the snowline.

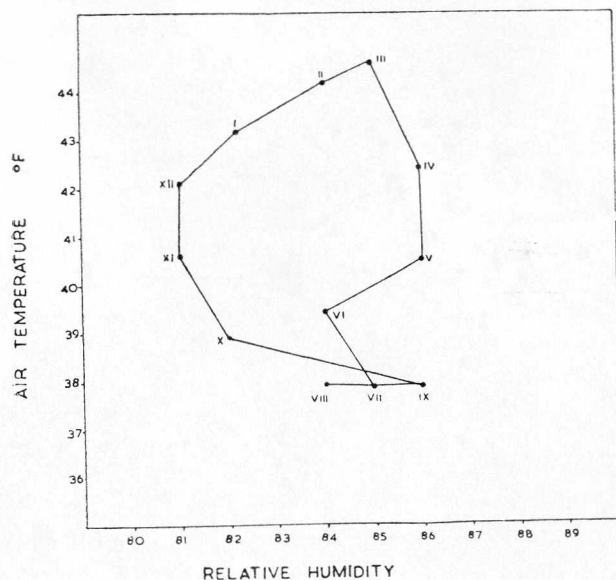
No boat was available at the island; all excursions were made on foot. Food and gear for periods of four to seven days away from the base were carried in a rucksack, including heavy equipment which left little space for specimens. The varying nature of the ground and the unpleasant climate made movement from place to place very fatiguing and detracted from the enjoyment and success of biological work. Rain, in particular, was a trying factor which could never be disregarded. The usual routes followed on distant excursions about the island are shown in the appended map.

FIGURE 1. The air temperatures of Marion Island.



A, highest temperature reached in each month. C, average of daily minima in each month. B, average of daily maxima in each month. D, lowest temperature reached in each month.

FIGURE 2. Climatograph for the year at Marion Island.



at Kaalkop and again after the cliffs above Trichaardts Bay and Cape Davis.

The coastal strip rises slowly in the east but steeply in the west to a second plateau which forms the lower level of winter snow. The peak of the volcanic cone is itself another small undulating plateau (at nearly 4000 ft.) carrying a mantle of permanent ice. Secondary cones (e.g. the "Brown Hills") are scattered throughout the island, but more especially on the high ground to the east and northeast. Regular snowfalls cover the mountains and hills but the snow melts rapidly on the coastal plain when temperature rises again.

The coastal cliffs are displaced by numerous bays and coves round which are concentrated all sizeable bird-populations. Indeed, they act as entrances into an otherwise impenetrable coast. At Goodhope Bay, lava sand gives a smooth landing-surface but elsewhere the beaches are covered with small or large boulders. In the west there are only two large coves ("Swartkop" and "Kaalkop"), but on the eastern side numerous bays provide shelter for penguins and sea-elephants.

Climate.

During our stay the weather varied considerably. Cold conditions (snow, rain and wind) prevailed during November but improved in December and subsequent months. Wind and rain in their many forms were regularly encountered. During April, heavy rain seemed to mark the change from summer to winter and cold was again felt at the end of that month. Relative humidity and temperature (records compiled partly from three years of observations and partly for June 1951–May 1952) are shown diagrammatically in Figs. 1 and 2.

Vegetation.

The plant-covering plays a big part in the lives of many burrowing birds. Apart from nesting material, it shelters burrows and is presumably an effective insulating agent against the cold. With the exception of the Diving Petrels no species nest beyond the upper limits of vegetation and none are entirely divorced from plant associations. The coastal plain is richly covered with a wide variety of grasses, ferns and mosses interspersed with various inconspicuous flowering plants. No large shrubs or trees exist on the island. The woody *Acaena* is a dominant species especially abundant on the ridges of the eastern side. *Azorella*, a large dense moss-like plant, spreads far up the hills and covers much of the lower lava-flows. Both plants shelter burrowing petrels.

Other animal species.

Large numbers of sea-elephants *Mirounga* frequent the island during the early summer (August to November) but decrease later as only

particular classes come ashore to moult over ensuing months. In August they haul out at the water's edge in all coves and bays. A rigid territorial system during the mating season divides the beaches in such a way as to preclude free access to the high ground. Yet it is amazing how the King Penguins, the birds chiefly affected, continue to live beside the seals. The annual rut finishes when the penguins commence nesting and by late November the beaches are almost clear of the sea-elephants. Later when these animals return to moult, they move far inland choosing tussock wallows upstream and do not congest beaches tenanted by nesting penguins.

Fur seals *Arctocephalus* (?) *gazella* inhabit a small rocky area near Trichardts Bay (Fur Seal Bay and Rocks). The main breeding herd does not encroach upon terrain that could be utilized by nesting birds but frequents boulders strewn below the cliffs. Non-breeding animals are scattered in nearby coves (Cape Davis, Swartkop).

A few domestic cats have gone feral and prey on the smaller petrels or mice that are widespread over the coastal plain.

PREVIOUS HUMAN OCCUPATION.

At the end of the eighteenth century, sealing and whaling ships occasionally visited the Prince Edward Group. Generally, small parties were left on the islands with limited provisions, to kill seals and collect pelts and blubber-oil. There is no doubt that the sealers supplemented their diet with sea-birds (Goodridge 1843). Evidence of the first organized exploitation of the birds can be gleaned from the report of the Challenger scientists. Moseley (1879) mentions that the King Penguin rookery on the north side "was only inhabited to about a quarter of its extent, but it was everywhere strewn with the bones of the penguins in heaps, and on the verge of the rookery was a small ruined hut, without a roof, and overgrown with weeds, containing an iron pot and several broken casks, and some hoop iron, evidently an old sealers' hut. The sealers probably employed their spare time in making penguin oil and perhaps taking skins, which are made up into rugs and mats at the Cape of Good Hope, often only the yellow streaked part about the neck being used. Hence the many bones and emptiness of the rookery."

Except for occasional castaways and sealers (wreck of the 'Solglint' in 1908, and sealing parties in 1921 and 1933), the island was seldom visited until the permanent annexation in 1948. A small settlement is today staffed by nine men concerned mainly with the collection of meteorological data.

Protective legislation ensures that no birds are killed and the situation of many colonies has placed them beyond everyday interference by station staff. There has been an inevitable withdrawal of birds from the vicinity of Transvaal Cove (Gentoo no longer nest at Gentoo Lake (Bennets 1948), and Giant Petrels are far less numerous on the coastal plain between Macaroni Bay and Ships Cove). Personnel are supplied with liberal rations,

including domestic fowl eggs, so that there is rarely need for large-scale eggging, although this has been indulged in to a great extent by some reliefs.

PAST RECORDS OF THE AVIFAUNA.

Captain Cook, who sighted but did not land at the Prince Edward Islands on 12 December 1776, mentions seeing "penguins and shags, the former so numerous that the rocks seemed covered with them as with a crust". Goodridge (1843) makes passing reference to Marion, but it was Harris, a ship's engineer and sealer, who gave us the first comprehensive account of the area. His observations, made in the summer of 1832, were recorded by Hutton (1865) who listed the following six breeding species: Sheathbill *Chionis minor*, Skua *Lestrnis catarrhactes*, Wandering Albatross *Diomedea exulans*, Sooty Albatross *Diomedea fuliginosa*, Giant Petrel *Procellaria gigantea*, Grey Petrel *Procellaria haesitata*.

Hutton (*op. cit.*) also mentions that penguins were at all islands and adds that *Procellaria macroptera* and *P. mollis* were not found there.

The 'Challenger' expedition visited Marion in 1873, spending some eight hours ashore. Moseley (1879) added six species to the list of breeding birds: Southern Black-backed Gull *Larus dominicanus*, Diving Petrel *Pelecanoides urinatrix*, Kerguelen Tern *Sterna virgata*, Gentoo Penguin *Pygoscelis papua*, Rockhopper Penguin *Eudyptes crestatus*, King Penguin *Aptenodytes patagonicus*, Whalebird *Prion banksi*.

Since the South African Government established a climatological station at the island, two of the staff have published accounts of the avifauna (Bennets 1948, Crawford 1952). The latter author added six species to those known to nest on Marion: Cape Hen *Procellaria aequinoctialis*, Long-winged Petrel *Pterodroma macroptera*, Soft-plumaged Petrel *Pterodroma mollis*, Kerguelen Petrel *Pterodroma brevirostris*, Blue Petrel *Halobaena caerulea*, Cormorant *Phalacrocorax albiventer*.

Present investigations added only three species for the island: Light-mantled Sooty Albatross *Phoebastria palpebrata*, Wreathed Tern *Sterna vittata*, South Georgian Diving Petrel *Pelecanoides georgicus*.

I have followed Falla (1937) in the use of generic and specific names except in cases where more recent authors have demonstrated desirable taxonomic changes. Thus some subspecific names are allocated on the basis of descriptive accounts by Hagen (1952), Bierman & Voous (1950) and others. Popular names are mostly unknown at the island, relieving personnel being acquainted with the larger species only.

ACKNOWLEDGMENTS.

I am indebted to Mr. and Mrs. Rowan for their helpful remarks and critical appraisal; to Mr. R. Liversidge and Mr. W. Stanford; to Mrs. Campbell of the Transvaal Museum; to Max Downes of the Victorian Museum;

to Mr. H. F. I. Elliott, Dr. R. Falla, and Dr. R. Murphy for valuable comment on the smaller petrels; to the Director of the South African Weather Bureau for the use of unpublished weather data.

MAIN SYSTEMATIC LIST.

APTENODYTES PATAGONICUS Miller. King Penguin.

The culmens of four adults examined at Sea Elephant Bay and two at Sealers Cave were 85, 92, 95 (males) and 95 (female).

King Penguins were collected at Marion by the 'Challenger' expedition and listed under the synonym of *longirostris* (Sclater & Salvin 1878). Subspecific differentiation of the Marion-Kerguelen birds was suggested by Mathews (1927) and Peters (1931) but others have no evidence to support it (Falla 1937, Murphy 1936). Adult plumage of the Marion birds corresponds to descriptions of the species from other localities.

The presence of chicks indicates that the Kings resort to the island throughout the year. Greatest concentrations are at Kildalkey Bay, Sealers Beach, King Penguin Bay and Log Beach, with minor nesting colonies at Sea Elephant and Blue Petrel Bays and Sealers Cave. During present investigations there were fair-sized non-breeding groups at Trypot, Ships Cove, Killerwhale Cove and Goodhope Bay. Generally, the nesting colonies occurred on sheltered beaches giving easy landing and safe accommodation for the breeding birds. There were thus no Kings on the western side from Goodhope Bay till well east of Boot Rock (i.e. at Log Beach).

Nests are sited on level ground 20-100 yards from the sea. Boulder beaches are avoided and pebbly surfaces popular. At Kildalkey, Blue Petrel and other bays, the nesting ground is covered with smooth stones deeply embedded in the ground. This stratum enables surface mud to dry rapidly. No birds with eggs were seen on moss or grass, although unemployed or moulting birds frequently loitered there. They tended to avoid muddy patches unless forced there by sea-elephants. The presence of the latter and pools of standing water after rain reduce the amount of potential nesting-ground but usually the beaches are well-drained and the seals absent by the time eggs are laid. Pebble-filled nests are rare. A simple depression is formed by the shuffling movements of the nesting birds. The nest scoop so formed is often marked by radiating splashes of guano. A heavy deposition of guano pointed to long residence at particular sites. Indeed, in spite of their mobility, the Kings have territorial relations no less marked than in other penguin species.

A single egg is laid towards the end of November but eggs are produced as late as mid-February. A series of eggs from different colonies agree with those for Macquarie Island (Falla 1937) and elsewhere (Murphy 1936). Thirty-five eggs measured (maximum, average and minimum):—length,

112.5, 105.8, 93.8 mm.; width, 79, 74, 65.2 mm. Sixteen eggs weighed 351, 304, 243 gm.

On 29 October there were about 320 Kings at Ships Cove. Only two were moulting. However, more were moulting at Blue Petrel Bay the following day. Here were also a large number of yearling chicks. At Sealers Beach the bedraggled chicks (there had been rain the previous day) completely surrounded groups of wallowing sea-elephants. Some chicks had lost nearly all their brown down ("shawl stage"). Moulting adults were standing separately some distance west of the beach among the tussock clumps. Trypot Beach was packed with sea-elephants during the first week of November and no Kings were seen; they arrived later. At Kildalkey moulting birds spread over the outskirts of the main colony, then composed mostly of yearling birds. Only eight Kings were at Goodhope Bay on the first visit (6 November).

By mid-November brown chicks ("oakum boys") almost equalled the number of adults. Juvenile birds in their first summer plumage were more numerous and could readily be picked out among the mature birds by the yellow (instead of orange) auricular patch, the black or only dull red strip on the mandible and their slender build. By late November, Kings were at Trypot; most of the 200 adults there were moulting.

Eggs were first discovered at Kildalkey Bay on 30 November. This bay was packed with King and Macaroni Penguins, the former spreading far over the beach and grass-covered slopes beyond Green Hill, over 300 yards from the shore. Here they moulted in small groups of 50 to 100 individuals. Similar moulting concentrations were at other coves, the birds frequently wandering far up the water-courses or over the valley sides. The disposition of these groups was in part affected by nesting birds occupying the high part of the beach and also by the arrival of scores of moulting Macaroni Penguins. Moulting birds were seen throughout December when the nesting grounds increased in size too. Numbers of brown chicks decreased at this time and by the end of January most adults had finished moulting. Adults incubated eggs at many nests and chicks were hatched during late January. Kings in captivity average an incubation period of 52 days (Roberts 1940) and this agrees roughly with our observations of egg-laying in late November, the chicks hatching in middle January.

The egg-laying period is a long one. Although most eggs are laid in December, at Sealers Cave five were found freshly laid on 5 February, and the following evening two birds were seen copulating.

From 3 to 6 February only one yearling chick was seen among all the east-coast rookeries. Nesting areas were now much bigger and the colonies presented a fairly uniform appearance, with no brown chicks. By 7 March, adults were guarding eggs and chicks at Kildalkey Bay. Others were absent at sea, their new offspring congregating into the so-called creches of the

winter colonies. By the end of the month, brown concentrations of chicks were conspicuous but many young birds still stood beside their parents.

Roberts (1940) and also Lack (1947) have suggested three functions of the "creche system", viz., to facilitate communal feeding, to counteract low temperatures, and as a possible protection against predaceous petrels. On occasional visits to the rookeries, I witnessed the start of the casual creche-grouping. Unfortunately, lack of marked birds prevented a proper understanding of the parent-offspring relationships and communal feeding has still to be verified. It was evident, however, that when both parents leave the chick unguarded during the day, the latter invariably seeks the companionship of other chicks similarly placed and in this way obtains protection against adults upon whose territories the young bird might inadvertently trespass. As more chicks are left unguarded so the chick-groups grow. Skuas and Giant Petrels were never seen to attack the chicks. The grouping behaviour might well give some protection against inclement weather.

King Penguins do not compete with the sea-elephants for beach space. The latter commence hauling out in August and September but by November the seal harems have disintegrated. At Kildalkey, for instance, there were no cows on 29 November but the water-front pups numbered over 800. A few King Penguins, holding eggs, were nesting about 100 yards from this group. Moulting sea-elephants arriving in January and February seek their inland tussock-wallows and do not intrude upon areas occupied by the nesting birds. The ability of the incubating King Penguin to move its egg is thus seldom exercised, although they may have to avoid chance movements of the seals through the outskirts of their colonies.

PGOSCELIS PAPUA PAPUA (Forster). Gentoo Penguin.

A single adult female (3659), from the vicinity of Freshwater Stream, was caught a few weeks after the summer moult (March). The flipper measured 248, tail 53, culmen 60, tarsus and toe 110 mm. These dimensions approach those recorded from Crozet Island (Falla 1937:54). On the comparative evidence of Murphy (1947) we have allocated our specimen to the typical Falkland race but have not been able to compare it with other specimens. The colours of the naked parts were: iris, Buckthorn Brown; bill, Yellow Ochre (black above); toes and claws, black; tips of feathers on back, Green Blue Grey. Flippers have the white posterior border of the dorsal surface reaching a maximum width of 7 mm. Variations in the colour of the tail feathers are similar to those recorded by Falla (*op. cit.*), the outermost feather being white with a broad black shaft.

Gentoos were not numerous and were irregularly dispersed round the island in small groups. Colonies of from 50 to 100 birds were at Goodhope Bay, Kaalkop, Sealers Hut 1, Log Beach, King Penguin Bay, Blue Petrel

Bay, Sealers Beach, Ships Cove, Freshwater Stream, Trypot, Macaroni and Archway Bays, Killerwhale Cove, Kildalkey Bay and Crawford Bay West.

Nests were commonly found on high tussock clumps but sometimes lay in thick grass or on the soft outspread *Cotula* plants, always above and from 20 to 100 yards from a landing beach. Thus at Macaroni Bay, the Gentoos climbed a 60-foot cliff scarred with well-trodden paths, to reach their nests among the tussock on top. The colony at Goodhope Bay stretched over a low grassy plain some 50 yards from the sea. Moss, tussock and *Acaena* stems were piled to form crude nests partly sheltered from prevailing winds by low grassy mounds. At Killerwhale Cove, Gentoos were nesting on "tussock islands" in the bed of the stream, while others chose the thick grass of the adjacent valley slopes.

Clutches of two well-incubated eggs were found in November. Crawford (1952) mentions that two eggs are normally laid in the first week of June, sometimes a month later. Some replacement of clutches has been reported in the species (Hamilton 1894). Dimensions of four eggs from Marion were (maximum, average, minimum):—length, 68·2, 66·7, 65·0; width, 57·8, 57·3, 57·0 mm. One egg weighed 121 gm.

The breeding season on Marion stretches over eight months (May to November), egg-laying from June to October (Bennets 1948), which is much earlier than at more southerly localities (Roberts 1940). Murphy (1936:370) discloses a broad climatic correlation in this respect but our observations did not, of course, cover the entire egg-laying period. Bennets (1948) noted that chicks hatch as early as August.

On 28 October Gentoo chicks were first seen in a colony among the tussock above Macaroni Bay. One nest had a single egg. The chicks were in downy plumage, light grey above, darker (almost brown) below. The bill was yellow, culmen black. At Ships Cove the following day, one nest held similarly-aged chicks; 11 adults roosted near by. At Sealers Beach a day later, there was only one nest with eggs (c/2, of which one was pipped). Most birds had completed nesting. Nevertheless, more chicks were seen in November at newly-discovered colonies. The greatest number was ten near Softplume River. Eggs at Goodhope Bay were still incubated on 7 November. There were then about 50 adults at this colony but only four nests were occupied.

Commencement of the post-nuptial moult was first suspected when a party of 14 Gentoos was seen wandering far inland above Freshwater Stream (3 December). Throughout December, groups of moulting birds congregated on the grassy slopes about half a furlong from the sea. The *Cotula* patches near King Penguin Bay, Trypot, Sealers Hut 1, and elsewhere, were favourite moulting-sites during January and early February.

On 4 March there was active nest-building at a cove near King Penguin Bay. Subsequently nest-piling was noted in other areas, scrapes being

packed with grass and moss. This behaviour continued throughout March and April, when mated birds were at the nest. The random material-gathering during moulting was replaced by more directed nest-building in April. Yet my last visit to a Gentoo colony (19 April) failed to reveal newly-laid eggs.

EUDYPTES CHRYSOLOPHUS (Brandt). Macaroni Penguin.

Two adults (3458, 3459) were examined at Goodhope Bay. They were a male and female respectively, with dimensions: flipper, 210, 200; tail, 107, 105; culmen, 60, 56; toe and claw, 102, 99 mm. As yet there is no satisfactory reason for separating Marion Macaronis from those at Kerguelen and Heard Island. Mathews & Iredale (1935) find a different race on Macquarie Island but their measurements hardly differ from our own. The orange plumes of adult male 3458 measured 70, those of the female, 53; the black plumes were 40 and 24 mm. respectively.

Flat or gently sloping ground, fairly clear of boulders, is chosen for the nest. This habitat preference may account for the growth of very large colonies at Bullard Beach and Kildalkey Bay. Other extensive rookeries lie on the slopes of Swartkop Cove, at Rook's Bay and in a peculiar depression above Camps Bay (west side of Rook's Bay). Coastal colonies are also found at Trichaardts Bay and near Kildalkey, smaller colonies at Macaroni Bay. Flat-ground rookeries show considerable perimeter erosion caused by the movement of the birds. At Waterfall Rookery (Bullard Beach), the colony had expanded so much that some birds were moving overland to reach the water at Killerwhale Cove, where growth of small groups pointed to integration in the near future. Erosion round the outskirts of this somewhat sunken colony had resulted in the formation of mud traps in which several birds perished. Luckily such traps were not permanent topographical features.

Nest material is limited to a few pebbles or other solid debris. In Sealers Cave a small colony was nesting on a thick accumulation of guano and feathers. Nests were usually well drained although pools of muddy water collected on the flat colonies, inundating many nests temporarily. Colonies on the cliff slopes may be affected by streams caused by heavy rain or melting snow. Landslides are not infrequent.

Nesting had commenced when the Waterfall Rookery was first visited on 2 November. Clutches (c/1) of fresh eggs were again obtained on 24 November. Forty-one eggs vary little in size from the few recorded from Kerguelen and South Georgia. Their measurements were (maximum, average, minimum):—length, 84.0, 70.9, 59.1; width, 61.5, 51.4, 46.2 mm. No weights were obtained.

Incubation was observed throughout November and December, young chicks towards the end of the latter month. While the chicks were still at

the nests in February, immature Macaronis arrived to moult on the beaches or up the sides of streams. In fact, after the first week of February the rookeries looked rather disorganized, the outskirts being crowded with moulting yearlings. Chicks of the current season were rapidly losing their brown down, many appearing in steel-grey immature plumage. The rigid pattern of nesting territories had now almost disappeared. Yearling birds scattered far up the streams or formed temporary moulting-quarters whenever the main beaches were overcrowded.

Final stages of the nesting season were reached in late February. Adult birds were then loitering about the old nesting grounds or had departed for a pre-moult forage. Many of the older chicks carried small orange plumes above their eyes; some had even departed to sea. By 7 March all juvenile and immature birds had vanished, the rookeries being occupied by moulting adults. A general exodus took place about 25 April, the departure being almost simultaneous at all colonies.

EUDYPTES CRESTATUS (Miller). Rockhopper Penguin.

During January and February, six adult males and one female were examined at the station, a pair at Goodhope Bay. Dimensions of the males were (maximum, average, minimum):—flipper, 190, 177.1, 170; tail, 123, 101.9, 93; culmen, 51, 45.8, 40; plume, 83, 77.9, 65 mm. The females measured: flipper, 160, 155; tail, 104, 98; culmen, 40, 40; plume, 79, 73 mm.

The plumage of our specimens corresponds closely to descriptions of Rockhoppers from other localities. In one male the Blackish-brown dorsal feathers are tipped with Clear Green Blue Grey. Dimensions resemble those of the species at Crozet, Heard and Kerguelen (Falla 1937: 87) but the yellow-plumes are slightly longer in the Marion birds. Patterns of the under-flipper have been advocated for separating the races but this varied so much as to be of little systematic value.

Rockhoppers have spread round the island in coastal colonies of varying size, but seldom exceeding 500 nests. They are the only penguins able to breed on the hazardous western side, where they occupy the coastal edge north of Cape Crozier and also to the immediate south in the sunken lava field. At the Black Rocks Plateau jutting onto Cape Hooker, and also at Natal Point they nest among the lava far inland in spite of the tortuous routes to and from the sea. It is suspected that over-crowding of the water-front colonies has led to this curious disposition of the species to travel far inland among the lava. Usually the colonies are at the water's edge. At Goodhope Bay they nest over 200 ft. a.s.l. among or close to the Macaronis. Elsewhere on the eastern side populous colonies are among the rubble below cliff faces (Crawford Bay, east and west, Goodhope Bay, Trichaardts Bay) or on isolated lava outcrops (Freshwater Stream and elsewhere).

Nests are scattered among the loose boulders, perched on large rocks or hidden in crevices and among lava tufts. They may be piled with small pebbles or grass but are usually poorly lined. Two eggs are produced and no replacement laying was noticed after accidental loss of the first egg. There is much variation in size of the eggs, the smaller one of a clutch being laid first. The maximum, average and minimum dimensions of 109 eggs were:—length, 81.5, 68.6, 56.0; width, 69.2, 49.9, 42.2 mm.; and weight of 23: 131, 97, 72 gm. Data for individual clutches are given in Table 1.

TABLE 1. *Eudyptes crestatatus*: egg data.

Clutch	Small Eggs			Large Eggs		
	Length	Width	Weight	Length	Width	Weight
A	60.7	46.3	72	68.0	53.2	107
B	64.4	44.5	72	71.8	51.7	107
C	67.2	47.7	—	73.7	54.0	117
D	56.5	43.9	62	69.0	51.9	102
E	62.7	49.7	85	70.0	55.4	119
F	65.7	49.1	89	71.2	55.2	123
G	63.2	46.2	74	70.8	53.0	110
H	64.7	50.2	92	71.8	55.9	124
J	66.8	51.3	98	75.0	55.2	131

Nesting commences towards the end of October when males arrive singly at old nest-sites. A single male was guarding an empty nest near the station on 29 October, but others did not reach this colony until a week later. By 20 November there were single eggs in many nests. Clutches of two were noticed a few days later. Young birds appeared in late December. These newly-hatched chicks had conspicuously white throats and abdomens. The flippers were covered with a Smoky-grey down, the dorsal surface being Chaetura Drab. Older chicks are blackish-brown above and have a black, yellow-tipped bill. The legs are pink in front but black behind.

Immature birds (i.e. those in their second summer) greatly resembled the adults in size. However, they are easily distinguished by the yellow supra-orbital bar, lack of lateral plumes and a strikingly grey throat. Yearling chicks were at the larger colonies during the first week of January. After moulting they disappear to sea with the adults.

In early January moulting adults were standing on the edge of several colonies. The majority of nesting birds, however, did not start to moult until mid-March, when the chicks were fully fledged and had left their nests. They loitered at partially-deserted colonies until the end of April when other classes had already left the island. A curious feature of this last phase was the abortive nest-making by adults undergoing their post-nuptial

moult. Fresh grass, *Tillea* and *Cotula* stems were piled into scrapes over which the moulting birds crouched.

Crawford (1952) reported no Rockhoppers during the winter (April to end of August). Moulting adults were still present at colonies near the station on 28 April; the majority, however, had left by then.

PHOEBETRIA FUSCA (Hilsenberg). Sooty Albatross.

No specimens were collected.

There were many Sooty Albatrosses nesting above Ships Cove, visited on 26 October. Courting pairs and newly-built nests dotted high ledges on the grass-covered slopes. Two days later a small colony was examined on the cliff above Duiker Point. Of eight nests, four contained eggs (all c/1). There were more nests on ledges among the *Cotula* plants or tussock clumps clinging to the cliffs along the eastern side of the island. The high cliffs between Ships Cove and Duiker Point, above Macaroni Bay and Sealers Cave and the stretch of high ground approaching Kildalkey Bay, were areas most thickly populated by the Sooty. Trichaardts Bay and the cliffs above Goodhope and Rook's Bays were other nesting centres. From Rook's Bay to the northwest as far as Fur Seal Bay, the coast lacks high ground and held no nesting Sooty Albatrosses.

Nest groups varied in size, depending partly upon suitably-covered sloping ground. The largest number was 34 nests (near Ships Cove), one of which belonged to *Phoebetria palpebrata*. Although mostly located along the coastal edge overlooking the sea, nests were also scattered near the *Diomedea chrysostoma* colonies facing the lava field at Natal Point. A number were also concentrated on a peculiar buttress facing Trichaardts Bay but standing in the lava some 80 yards from the sea. Nests were often only a few feet above the water (Fur Seal Bay) but more usually were at heights of from 20 to 200 ft. (Ships Cove, Macaroni Bay). Sooty Albatrosses have a habit of flying far inland to perch on high crags, where they call loudly to each other. They were, however, never found to nest beyond the coastal plain.

Eggs were laid between late October and early November. Measurements (maximum, average, minimum) of length (20) were 110.0, 100.9, 79.6; of width, 69.6, 65.7, 58.9 mm.; and of weight (5), 271, 250, 220 gm.

Eggs are incubated throughout November and December. On 22 December there was a newly-hatched chick in a nest above Sealers Hut 2. Other nests in the vicinity still held eggs. Care of the chicks continued throughout February but by 24 March many were left unguarded. There was no special time of feeding of the chicks, but adults were more plentiful in the late afternoon, skimming round the cliffs or settling on their nests. In April fledglings were frequently seen exercising their wings and empty nests showed that many had already left for the open sea. These young

birds resembled their parents in having the distinctive white eye-ring but the sulcus was indistinctly greyish.

Hagen (1952) shows how extensive the range of *P. fusca* is. Falla (1937) notes the possibility of a breeding range that slightly overlaps *P. palpebrata* but failed to locate nesting birds at the Crozets, a possible transition area. Serventy (in Crawford 1952) speculates on the occurrence of the two Sooty Albatrosses on Marion and finds "*fusca* a somewhat discordant element". Nevertheless, Marion shows many climatological similarities to lower-latitude areas, especially in the heavy rainfall and absence of permanent snow over the whole island. It might be expected then that *fusca* and *palpebrata* would nest on the island, as indeed they do. Crozet may also hold an even greater number of *palpebrata* than *fusca*. The two species mix freely in the sub-antarctic (Routh 1949).

The Sooty Albatross has been kept specifically distinct although some, for example Vincent (1952), consider it only a subspecies. Routh (1949) remarks that plumage colours may not be a true taxonomic criterion and leaves dimensions and sulcus colour as the chief distinguishing marks. We identified *fusca* by the yellow sulcus and uniformly dark grey plumage. Otherwise it is very similar to *palpebrata*.

PHOEBETRIA PALPEBRATA (Forster). Light-mantled Sooty Albatross.

No specimens were collected.

Far less common than *fusca*, this species nevertheless occupies much the same habitat. Single nests were the rule and there tended to be no marked ecological isolation between the two species. However, one nest with a single chick was located (14 March) on the side of the second plateau in a shallow cave about 300 ft. a.s.l., considerably higher than the normal nesting range of *fusca*. Other nests were sited beside those of *fusca* at Duiker Point, Ships Cove, Sea Elephant Bay and probably at Trichardts Bay.

Owing to their inaccessibility, few nests could be visited regularly and little information was gained about their nesting habits. Like *fusca*, the species is timid, resentful of interference and liable to fly away under close scrutiny.

A single egg, greatly resembling that of *fusca*, forms the normal clutch produced in October. Maximum, average and minimum measurements of four eggs were respectively:—length, 106.9, 102.8, 99.1; width, 69.1, 67.0, 65.0 mm.; and weight, 272, 254, 242 gm. These can be compared with seven from Campbell Island (Sorenson 1950).

DIOMEDEA EXULANS CHIONOPTERA (Salvin). Wandering Albatross.

Two adults examined at Sealers Hut 2, one at the station. They were two females and one male with dimensions respectively:—length, 1130, 1130, 1160; wing, 670, 620, 660; tail, 220, 190, 210; culmen, 161, 150, 165; tarsus, 110, 100, 120 mm. The wing-span of one female was 2900 mm.

Other measurements of the three specimens are relatively large and agree with those given by Falla (1937) and Bierman & Voous (1950) for *D. exulans chionopectera*. Indeed, Mathews (1912) lists this race as breeding on Marion. Plumage characteristics follow those outlined by Falla for *chionopectera*. Recently White (1952) casts doubts on the distinctness of *chionopectera* from *exulans*.

Breeding adults could often (but not always) be sexed by the greater size of the male, dark patch on the crown of the female and darker feathers of the neck and wings of the latter. The faint orange throat-strip was a variable feature of obscure significance. The fleshy parts show slight colour-variation but I could not correlate this with definite climatic or physiological changes. The eyelid is a fleshy pink, at times tinged with blue or green.

Wandering Albatrosses were almost solely confined to the flat moss-covered ground of the coastal plain. The greatest number of nests (about 200) lies on the northeast corner between Boot Rock and Long Ridge (Gony Plain). Similar concentrations occur on the northwest side between Trichardts Bay and Cape Crozier. Wide lava-fields, stony ridges and uneven ground have affected the density of nests in other areas. Thus in February, there were five nests at Crawford Bay east (lava); from Kildalkey Bay to Sealers Cave (stony ground), 42 nests; thence to Bullard Beach (stony ground and morass), 32; thence to Hansen Point (moss), 61. Sometimes isolated groups of five to ten nests were seen inside a lava-field (Cape Davis, Met. Officer Hills) where sizeable patches of marshy ground exist. There was an estimated total of 700 nests on the island.

Nests were associated with the flat soggy ground. Flight requirements (landing and take-off) fix the ultimate position of the nest, which never lies on rocky ground. Moss and grass are scraped from the vicinity of the site and patted with the beak into a rough cone about 12 in. high. There is much variation in size of the nest, depending upon the zeal of the male prior to the arrival of the female and subsequently upon random packing by the incubating bird. Although old nests are sometimes renovated, they are usually so trampled by the previous chick that nests must be built afresh each breeding season. New nests often lie next to old ones, because the birds tend to return to the same locality but build a new nest—as was confirmed by banding in the case of a pair nesting near the wireless cabin. There is often a lush growth of vegetation (mainly tussock) round old nests, new ones having a denuded circle round them. During snowfalls the nest is high enough to keep the incubating bird well clear of the snow. The disposition of the nests ensures that they escape burial in deep snow-drifts. Mice often burrow into the nest cone but do no appreciable damage.

A single egg is laid during January. Dimensions of 47 eggs (maximum, average, minimum) were:—length, 142.5, 133.4, 123.5; width, 85.5, 81.0, 77.5 mm.; weight (9 eggs), 551, 484, 437 gm.

Chicks of the current season were at most nests during October and November but disappeared soon afterwards. Courting adults were more abundant during December, solitary males predominating at first. The arrival of the latter well in advance of the females enables them to claim old nests, renovate these, or make new ones. Courting couples were noticed from December till April. However, the majority were finally paired by January.

The first egg was discovered on 6 January. By the end of this month most nests held eggs. The young hatch out during late March when many adults are moulting near the nests. The chicks are covered with a thick whitish down. The iris is dark grey, eyelids lighter and feet bluish-grey with white claws. The young birds are closely guarded for about a month, after which they fend for themselves against inclement weather and predaceous petrels. Skuas were never seen to attack the chicks and it is suspected that their instinctive defensive reactions (beak-clapping) are enough to ward off any such attacks. The chicks do not leave their nests until many months later, the adults returning irregularly to feed them in the interim.

DIOMEDEA CHRYSOSTOMA Forster. Grey-headed Albatross.

Our single female from Goodhope Bay agrees in plumage with the descriptions given by Murphy (1936 : 514) and in size falls within the range of the species for the Marion-Kerguelen area (Lowe & Kinnear 1930 : 174). The dimensions were :—length, 850; wing, 530; tail, 200; culmen, 109; tarsus, 79 mm.

Breeding grounds on Marion were reported by Murphy (1936) and Bierman & Vouus (1950). During the present study colonies were encountered rather unexpectedly on 6 November on the high cliffs running inland above the lava field at Natal Point, some ten miles from the station. More nesting groups were again discovered in the same area, but on the slopes of the cliffs overlooking Goodhope and Rook's Bays. These localities on the sheltered southern side of the island were the only places where the species nested.

Some nests were isolated on small ledges, others were grouped together in the tussock on the cliff-side in denuded areas, or on wide muddy ledges. Nests resembled those of *P. fusca* but were higher and more strongly built. At first bare mud structures, they were soon grass-covered.

The usual albatross clutch of one egg is laid (one nest contained two eggs). On our first visit to Goodhope Bay we counted 41 nests in a group. Eleven were vacant, one was occupied but contained no egg, and the rest all held incubating birds. Egg measurements (maximum, average, minimum) were :—length (11 eggs), 114.4, 107.9, 101.5; width, 71.7, 68.5, 65.9 mm. No weights were taken. The eggs are slightly larger than a series from South Georgia.

Nesting commences before November. We saw many eggs on our first visit, but on return to the area on 12 January chicks were being brooded, some even unguarded at their nests. On the last visit to the colony (7 April) only a few adults were noticed and the chicks were rapidly losing their down. None were fully fledged yet.

Murphy (1936 : 515) states that *chrysostoma* and *melanophris* have "practically the same range". He mentions that the latter breeds on Prince Edward Island but we detected none on Marion nor in the vicinity.

MACRONECTES GIGANTEUS (Gmelin). Giant Petrel.

All specimens collected were in the adult plumage and at no time were white-plumaged adults seen. A gradual fading, especially of the head and neck feathers, was noted in most adults but otherwise characteristics closely follow those described for normal birds by Falla (1937 : 137) and Holgersen (1945 : 33). Wing and culmen dimensions of 5♂♂ and 1♀ averaged 536.0, 430 and 101.6, 90 mm. respectively.

Giant Petrels, or more appropriately "Stinkers", nest in small colonies on the coastal plain. They are commonly concentrated round penguin rookeries and seal beaches and are rarely found a great distance from the sea. They frequently breed on the "Gony plains" or nesting grounds of *D. exulans*, but may also be seen among scattered lava patches (Ships Cove). Many isolated nests are situated in the lee of lava outcrops.

The nest is a wide cone of grass and moss, somewhat similar to an old *D. exulans* nest but never reaching the same height. Mud is never added. Nesting had commenced when we reached the island and clutches of one egg were common. Crawford (1952) states that after nest-building in June "eggs are laid from 10 August onwards". Of a group of ten nests near Freshwater Stream on 13 November, eight had eggs. But we could never decide about the status of colonies on the eastern side as relief members had often collected eggs for consumption at the station. They claimed that replacement-laying was common but we never found evidence of this.

Eighteen eggs averaged slightly larger than those from South Georgia, Orkneys and Falkland Islands (Murphy 1936 : 585), their lengths being 113.7 (maximum), 104.1 (average), 96.0 (minimum); widths, 69.9, 67.1, 63.4 mm. Three eggs weighed 259, 232 and 262 gm.

The thick down of chicks hatched in early December or January is light grey, the bill light yellow, darker on the sides. These chicks grow rapidly and by the end of January have lost most of their down. At this stage they have been alone at the nests for some weeks. The plumage of nearly-fledged birds is almost black, the dark glossy tone being very uniform. The bill is still dull yellow, the gape pink, iris dark brown and the eyelids white. By mid-February many young birds are fully fledged but do not leave the vicinity of their nests immediately. During March, however, they are actively foraging for themselves at the various coves and beaches.

In October and November immature birds were occasionally seen soliciting nesting adults for food. It seemed that the young birds were loth to leave the island during their first year. On the other hand, considerable ranging does occur and a band return from an immature Stinker ringed on Heard Island and caught in Cape waters suggests that they disperse far from their original homes (Malin 1952).

Stinkers are not predators in the strict sense but prefer to dispose of carcasses. Their habit of nesting near seal beaches is correlated with an abundance of edible debris such as placental remains and dead pups during the parturition period of the seals. Twice we detected Stinkers eating penguins. Once young Stinkers waited expectantly near an injured penguin but made no effort to kill it. They were never seen among the penguin colonies and did not pilfer eggs and chicks. Unlike the skuas they did not prey upon the smaller swiftly-flying petrels.

PROCELLARIA AEQUINOCTIALIS AEQUINOCTIALIS Linnaeus. Cape Hen.

Two adults from the station, three examined at Sealers Hut 2. Males had wing, 376, 380; tail, 122, 128; culmen, 55, 51. Females had wing, 365, 365, 380; tail, 119, 118, 125; culmen, 52, 51, 50 mm. Rowan, Elliott & Rowan (1951) describe a distinct race on Tristan. Hagen (1952) summarizes existing knowledge about Cape Hens in other parts. On these and descriptions by Murphy (1936) and Falla (1937) we have referred our specimens to the typical subspecies. No spectacled forms (*conspicillata*) were seen.

Cape Hen burrows were scattered irregularly on the eastern and north-western side of the island. Theirs were the largest of the sea-bird burrows and were easily detected entering the lava outcrops or low moss-covered ridges. They were restricted to the seaward side of the coastal plain and seldom extended more than 50 yards inland. Hagen (1952) gives details of the Tristan nests. Some of the larger Marion burrows were very similar but others were smaller and inconspicuous, resembling the nest holes of *Pterodroma macroptera*. Indeed we could never decide if they originally belonged to this species and had been usurped by the Cape Hens. The larger tunnels entered the soft clayey soil for a distance of 50 to 80 inches. Sometimes they were simple holes but more usually slightly curved. Large tunnels were found at the base of low ridges or under lava, smaller ones on the nearly level ground at the cliff edge. The nest chamber was slightly raised but drainage was inefficient. Water brought in from the mouth of the burrow and not infiltration from above, caused a muddy passageway. In starting burrows no effort is made to conceal the entrance. One burrow near the Fur Seal Rocks was tunnelled at the rate of about 12 inches overnight. Later construction is done during the day. A few scraps of grass line the nest.

A single egg is laid in October and November. The dimensions of four

eggs (max., av., min.) are :—length, 83.0, 80.4, 79.1; width, 55.0, 52.9, 51.7 mm.; weights of three eggs were 128, 114.5, 104 gm. They are smaller than eggs from South Georgia (Murphy 1936 : 641).

In mid-January eggs were pipped and chicks present in most burrows uncovered. On 21 March a partly-fledged chick was unearthed near Freshwater Stream. Although still showing grey down, this bird had the typical white chin-feathers and yellow latericorn of the adult. We did not investigate burrows during late April and so gained no information about the final stages of the nesting season. However, Crawford (1952) states that the young start to fly by the end of that month.

ADAMASTOR CINEREUS (Gmelin). Grey Petrel.

Two females, one caught at the station, the other near Fur Seal Bay, had wing, 290, 324; tail, 108, 112; culmen, 47, 48 mm., and weighed 990, 1016 gm. respectively. These measurements agree with those from other sub-antarctic islands.

Grey Petrels were not common. The first one captured (14 March) was alone in a shallow burrow running along the lee of a small hillock. The nest-hole had been dug only recently and the discarded soil at the entrance gave away the position which would otherwise have been well-hidden by the thick growth of *Acaena*. A single *Pterodroma macroptera* burrow lay about five feet from this one. No other birds nested on the hill. Roberts (1948) notes that on Tristan the birds "nest in small caves scraped out in a bank or cliff usually many feet up a mountain-side".

From accounts by Falla (1937 : 178) it would seem that the specimens had just reached the island to prepare for winter breeding. We did not see them in flight or at their burrows before March. On the morning of 14 March while surveying the second plateau above Fur Seal Bay, I noticed two Grey Petrels soaring past the cliff below. An hour or so later I dug up a specimen. No others were seen. On Kerguelen, Falla records how newly-opened burrows contained single birds at the end of February and he considered March or April the probable laying time. On Marion there was no evidence of an earlier breeding season but the actual laying date could not, of course, be detected. On Tristan, Hagen (1952 : 91) thinks that eggs are laid in April.

PTERODROMA MACROPTERA MACROPTERA (Smith). Great-winged Petrel.

Five adults from Fur Seal Bay, four from the station, 14 March–17 April, 1952. Dimensions of males (max., av., min.) were wing, 311, 306, 300; tail, 126, 122, 120; culmen, 39, 37, 36; tarsus, 44, 41.5, 40 mm.; weight 597, 572, 526 gm. Females : wing, 312, 307, 301; tail, 129, 122, 116; culmen, 38, 36, 34; tarsus, 41, 41, 40 mm.; weight, 582, 515, 484 gm.

Although these measurements agree fairly well with those given by Falla (1937) and Hagen (1952) for the species at Kerguelen and Tristan respectively,

wing and tail are slightly shorter in the Marion birds. But these fall well within the measurements recently tabulated by Murphy & Pennoyer (1952). All Marion males and most of the females weigh more than the Tristan birds. Jouanin (1951 : 349) cites data agreeing with our own but a single female from Hoskyn Island weighed 640 gm., much more than our heaviest male. All our specimens show the slightly greyer chin and forehead, in some more marked than in others. They closely resemble three specimens from Kerguelen (lent by the Victoria Museum).

The specimens were all mated birds or solitary individuals of either sex, dug from freshly-excavated burrows. Many nests were isolated but others were grouped on tussock slopes and ridges (e.g. Long Ridge) where the soft soil was easily worked. In some places (especially at the base of Junior Kop and near Kaalkop), Great-winged Petrels and Blue Petrels burrowed together in mixed groups, sometimes using the same entrances.

After renovation, the old nest-holes are packed with grass and *Cotula* stems, leaves being strewn untidily about the entrance and along the passage leading to the nest. Occasional nests were bored into the base of tussock clumps fringing old sea-elephant wallows. Burrows were usually sited where surface water could not settle.

No eggs were found. Cleaning and stocking of burrows with lining material went on throughout April. At Kerguelen, Falla (1937 : 181) notes that the species cleans "burrows from March till May, eggs would be laid in June and the young finally leave the nests as observed in November". We caught no young in burrows during the latter month but did not dig extensively for petrels then. A long pre-breeding occupation of the burrows (March to June) is stressed for the New Zealand birds (Murphy & Pennoyer 1952 : 13).

PTERODROMA BREVIROSTRIS Lesson. Kerguelen Petrel.

Two adults from Sealers Hut 2 (27 February), another found dead at the station (29 March). They were compared with two specimens from Kerguelen labelled *lugens* (Victoria Museum). The first two Marion specimens were a mated pair caught lengthening a narrow tunnel under *Cotula* plants topping the cliff above the Fur Seal Rocks.

Much difficulty was experienced in identifying these birds. 3699 was sent to the British Museum and the others have been submitted to various authorities (Rowan, Elliott, Falla and Murphy) for confirmation. When, however, we were able to compare our specimens with the two *lugens* females from Kerguelen, differences were at once apparent in the brown legs, smaller bill (greatest width of culmen in *lugens* 5 mm., in *brevirostris*, 7 mm.), laterally compressed nostrils and lighter underwings of *lugens*. In our *brevirostris* the bill is heavy and except for size resembles that of *macroptera*. The nostrils are raised, bulbous and have a visible septum. In *lugens* the

TABLE 2. *Dimensions (mm.) and weights (gm.) of P. brevirostris and P. lugens.*

Number	Sex	Wing	Tail	Culmen	Tarsus	Weight
Marion specimens						
3533	♀	251	105	25.8	34	329
3534	♂	242	105	26.4	37	335
3699	♂	250	104	27.5	38	336
Kerguelen specimens (<i>lugens</i>)						
4052	♀	244	101	24	35	—
4053	♀	233	98	24	34	—

bill is small and slender with the nostrils flattened, partly closed and the septum hidden. In 3699 the closed wing extended 10 mm. beyond the tail but in one Kerguelen specimen only 5 mm. beyond and in the other not at all. Mathews & Hallstrom (1942) emphasize these differences and separate a low-latitude *brevirostris* and high-latitude *lugens*.

General colour of Marion birds was Mouse Grey. Feathers of the abdomen were faintly tipped with white, lighter below than above. Under tail-feathers were uniformly Mouse Grey, shafts greyish (in *lugens* the under-tail is much lighter, with shafts of feathers white). Under wing-coverts Mouse Grey (in *lugens* they are heavily bordered with white, giving a much lighter appearance). White alar strip inconspicuous from above (in *lugens* this is more pronounced).

Our specimens were all caught in the autumn and none were found nesting during previous (summer) months when the other grey petrel (*Pterodroma mollis*, dark phase) was so abundant. In view of their activities when caught, we have decided to retain the specimens among the winter breeding birds of Marion. This is, however, not at all conclusive.

PTERODROMA MOLLIS MOLLIS (Gould). Soft-plumaged Petrel.

On Marion a normal white-phase *mollis* was nesting in the summer as well as a grey form differing only in ventral coloration, which is here considered to be the dark phase of the same species. Mathews (1934 : 167) has shown that there are two colour-phases of the Soft-plumaged Petrel but the dark phase has seldom been mentioned. Falla (1937 : 186) fancied the possibility that *brevirostris* might be a dark-phase *mollis*. Murphy & Pennoyer (1952 : 22) regard this as unlikely.

(a) *Light-phase mollis.*

Two adults from Fur Seal Bay, one from Trypot and one from Blue Petrel Bay collected between 27 December and 31 January. Specimen 3258 was sent to the British Museum and 3361 to the American Museum for verification of identity.

The typical subspecies comes from Tristan. Unfortunately Hagen (1952) has few data and those of Murphy (1936) are general rather than specific. Measurements and plumage colours of our birds fall well within the range given by the latter authority. Mathews (1934: 179) gives the dimensions of various northern races, all of which could apply to our specimens. Data from the sub-antarctic are meagre but we have referred our specimens to the typical race.

Our first specimen was discovered incubating a single egg in a burrow on the cliff side at Blue Petrel Bay. It was not till 15 January that the species was again seen. That day a forked burrow contained an incubating bird, the second chamber being unoccupied. Another specimen crouched in a shallow burrow on the cliff side near by. Dry grass and *Acaena* stems lined the nest. Our last specimen came from a winding burrow tunnelled into a low slope near Trypot Beach. Here an adult male brooded over a grey downy chick.

TABLE 3. *Dimensions (mm.) and weights (gm.) of P. mollis.*

Number	Sex	Wing	Tail	Culmen	Tarsus	Weight
<i>Light-phase mollis</i>						
3258	♀	249	109	27	36	365
3361	♀	252	107	27	34	282
3362	♂	254	111	29	33	321
3413	♂	245	109	28	35	337
<i>Dark-phase mollis</i>						
3148	♂	252	99	27	39	348
3150	♂	253	104	27	35	304
3151	♂	254	98	27	36	304

Egg dimensions (max., av., min.) are :—length (3 eggs), 58·8, 57·9, 57·5; width, 43·0, 42·5, 42·0 mm.; weight (2 eggs) 53, 52 gm. They are generally similar in size to those from Cape Verde Islands. Hagen (1952) summarizes known egg-records, many of which seem to be confused.

(b) *Dark-phase mollis.*

Plumage variation in *mollis* is well-known. Nevertheless a uniformly dark-grey petrel bearing similarities to *mollis* does not seem to have been recorded as a genuine dark-phase in the high latitudes. On Marion, what we consider as dark-phase birds were extremely common during the summer, nesting in muddy burrows along the coastal edge. Three adult males and a juvenile female (3382) came from the station during October and January.

Confusion about the identity of these nesting petrels lay in their general resemblance to *P. brevirostris*, thought to be a summer nester as well. Study

specimens have been submitted to various authorities, who do not all agree that they are a colour-phase of *mollis*. Murphy (*in litt.*) considers them *brevirostris*. Until the matter is settled we shall regard them as a dark-phase of *mollis*.

General plumage characters :—crown of head, Neutral Grey; forehead, grey tinged with brown; dorsal plumage, Blackish Brown (3) to Fuscous Black. Feathers of body tipped with light grey; tail above Blackish Brown, lighter below (Neutral Grey); ventral plumage almost Dark Greyish Brown over abdomen, chest and throat. Wings much longer than tail (25 mm.). White alar strip conspicuous (feathers Dusky Drab widely bordered with white in contrast to the grey narrowly white-bordered feathers of *brevirostris*).

Dark-phase *mollis* were plentiful near the station and along the coastal plain near the water's edge. During November and December at least 15 nests (all dark-phase) were opened before a single light-phase bird was found. They were unearthed below Tristan House (above the slopes overlooking Gentoo Lake at Transvaal Cove) and other parts of the station. All nests opened onto a steep incline. They lay in curved burrows with gently sloping floors that drained away surplus water through a special channel leading round the nest and down one side of the tunnel. A pool of water often collected at the mouth of the burrow where the ground was flat.

Incubating birds with single eggs were in four of five burrows opened in November. But on 25 December nest burrows near Duiker Point all contained young chicks unattended by their parents. By February many fledglings had apparently left their nests, which were covered with a silvery layer of discarded down. Egg dimensions (max., av., min.) were : length (19), 60·2, 56·7, 54·7; width, 46·7, 44·8, 43·6 mm.; weight, 63, 55·6, 50 gm.

HALOBAENA CAERULEA (Gmelin). Blue Petrel.

During April, 24 adults were collected from the vicinity of Transvaal Cove, Sea Elephant Bay and Blue Petrel Bay. A single female was found at the station on 16 November. Dimensions of 13 males (max., av., min.) were :—wing, 221, 213, 205; tail, 91, 87, 79; culmen, 28, 27, 25; tarsus, 33, 31, 29; toe, 43, 41, 38 mm.; weight, 219, 198, 164 gm.; females (10) :—wing, 218, 213, 206; tail, 90, 87, 77; culmen, 27, 26, 25; tarsus, 33, 31, 29; toe, 43, 40, 37 mm.; weight, 219, 189, 154 gm. These dimensions agree with those summarized by Bierman & Voous (1950: 89), except that mean tail- and wing-lengths are smaller and weights greater.

Blue Petrels were first encountered in numbers in April when their continual vocal activity made their whereabouts unmistakable. Some months previously (16 November) a single female was picked up dead under the wireless aerials. She was in breeding condition with prominent brood-patches. No other Blue Petrels were discovered until April, despite widespread digging.

Burrows were located under tussock and in the *Acaena-Azorella* areas below Junior Kop on 15 April. Single and paired birds occupied old tunnels and the impression was gained that the birds had just arrived to renovate their nests. However, there was no egg-laying during April. Falla (1937) gives a summer nesting season for the species. Crawford (1952) found no eggs and does not state when he discovered nest burrows. Only one of our specimens was in breeding condition in November. The limits of the mating season on Marion are therefore only doubtfully known. It may be that the sudden appearance of the petrels in April and their feverish activity were connected with normal burrow renovation in preparation for a nesting season somewhat earlier than on Kerguelen (October). On the other hand, it is now known that such renovation is not necessarily a sure sign of imminent mating, which may only occur three or four months later.

PACHYPTILA SALVINI SALVINI (Mathews). Salvin's Whale-bird.

18 adults collected from the station between 29 October and 1 March. Dimensions (max., av., min.) were:—12 males, wing, 195, 191, 187; tail, 96, 91, 87; culmen length, 33, 31, 28; culmen width, 17.6, 16.5, 14.6; tarsus, 34, 32, 28 mm.; weight, 182, 154, 136 gm.; 6 females, wing, 195, 189, 185; tail, 97, 93, 90; culmen length, 31, 29, 28; culmen width, 16.6, 16.1, 15.7; tarsus, 33, 32, 31 mm.; weight, 174, 154, 133 gm.

Bierman & Voous (1950 : 73) list dimensions with which our specimens agree. The type is said to come from Marion (Mathews 1912 : 211).

Whale-birds were encountered near Trypot towards the end of October. They were very common. The birds had apparently only just started to nest and had no eggs. Over the next two months they were frequently seen on the coastal plain and among the low hills, either flying over the cliffs or congregating above the kelp in big off-shore flocks. By March the chicks had left their nests. No whale-birds were observed in April.

Burrows were scattered among a variety of habitats; shallow tunnels twisted under the *Azorella* clumps on the slopes of Junior Kop, others were dispersed about the island at lower levels wherever suitable cover and soil were found. They were in the lava fields and even under the floor of Sealers Hut 2 and in the cave at Goodhope Bay. Nests were seldom isolated but two or three would be grouped in a system of radiating burrows. Tunnels usually ran across the slope of the ground and had no special drainage.

We did not dig for whale-birds during January and the records for February and March are of birds noticed casually at the station or on trips afield. For instance, on 18 March an immature female was picked up under the food store. Down was still adhering to the contour feathers and the bird had apparently just started to fly. The day before, while crossing the ice plateau, many immatures (some still alive) were found partly frozen in the hard snow. Skuas and Dominican Gulls were unearthing and devouring

them. No adults were found in the mountains or on other parts of the island during subsequent months.

A single egg is laid. Maximum, average and minimum dimensions are:—length (16 eggs), 52.6, 50.3, 47.2; width, 37.7, 35.9, 33.3 mm.; weight (12 eggs), 36, 32, 27 gm.

PELECANOIDES GEORGICUS Murphy & Harper. South Georgian Diving Petrel.

Five specimens from Junior Kop, two from the plateau above Sealers Hut 2, collected between 4 December and 15 January. Dimensions (max., av., min.) of three males are:—wing, 124, 121, 119; tail, 41, 40.5, 40; culmen, 14.7, 14.3, 13.9; tarsus, 23, 21, 20 mm.; weight, 120, 110, 100 gm. Females (four):—wing, 122, 119, 114; tail, 43, 41, 37; culmen, 15.5, 14.6, 13.9; tarsus, 23, 22, 21 mm.; weight, 138, 134, 104 gm.

Plumage characters and general dimensions fall well within the range given for the South Georgian birds (Murphy & Harper 1921 : 520). The pale inner web of the primaries was useful in distinguishing this species from the closely-allied *P. exsul*.

The species was commonly found at high altitudes. Groups of nests occurred in the soft crumbling slopes of secondary cones such as Cape Crozier, Junior Kop, Borain's Hill. The tunnels, only two or three inches wide, zig-zagged some three feet below the surface, at first horizontal but later sloping steeply downward to the final nest-chamber. The petrels preferred open sandy slopes to those covered with vegetation but sometimes the tunnels spread under the *Azorella* clumps. As there was the possibility of admixture in the coastal areas (bare lava-sand patches such as at Goodhope Bay and Sealers Hut 1), records were disregarded of birds not collected and later identified. Yet there seemed to be a distinct ecological preference on the part of the two species, *georgicus* frequenting open sandy places in high altitudes, while *exsul* was found on the low-lying grass slopes.

All nests uncovered during December and January held eggs. On 28 February while travelling over the mountains, we dug out several nests with small chicks. Five eggs had (max., av., min.):—length, 41.0, 38.6, 36.0; width, 33.2, 33.5, 30.5 mm.; weight, 22, 19, 16 gm. They are very similar to those from Kerguelen and South Georgia (Murphy & Harper 1921).

PELECANOIDES EXSUL Salvin. Kerguelen Diving Petrel.

Five adults from the vicinity of the station, collected during November and December. Two males measured:—wing, 113, 113; tail, 37, 35; culmen, 16.3, 14.8; tarsus 24.6, 22.7 mm., weight, 175, 151 gm.; three females:—wing, 117–122; tail, 36–38; culmen, 15.1–16.0; tarsus, 23.5–25.4 mm.; weight, 133–154 gm.

There is still some doubt about the taxonomy of this petrel but we have followed Murphy & Harper (1921 : 545) in giving it specific status. Plumage

and general characters (nasal septum especially) agree with the descriptions reviewed by these authors.

The petrels are widely distributed over the coastal plain, where they burrow under tussock and moss near the cliff edge. They are found in close association with *Halobaena* and *Pachyptila* colonies. At Freshwater Stream short burrows lay across the slope immediately beneath surface moss and grass. There was usually a thin layer of dry grass in the nest chamber.

A single egg is laid in early November. The maximum, average and minimum dimensions were:—length (4 eggs), 41.8, 39.3, 37.7; width, 33.3, 32.5, 31.3 mm.; and weight, 22, 19.3, 17 gm. These data agree with those of eggs from Kerguelen (Murphy & Harper 1921), Heard (Falla 1937) and elsewhere.

PHALACROCORAX ALBIVENTER MELANOGENIS (Blyth). Marion Island
Cormorant.

Two adults and three juveniles from Duiker Point, 8 March 1952.

Holgersen (1945) reviews the distribution of the antarctic Phalacrocoracidae. The species *albiventer* is widely spread over the sub-antarctic with subspecies reputed to be at Macquarie, Kerguelen, Crozet and Falklands Islands. My specimens resemble the subspecies from Macquarie and the Falklands but their measurements place them with *melanogenis*, a subspecies first reported from the Crozets. Murphy, Falla, Holgersen and Jouanin discuss the affinities of the various subspecies. Macquarie Island specimens seem larger than the others. However, the possibility of different techniques in measuring makes it difficult to appraise the data, much of which is based on too few birds.

Plumage characters and dimensions:—The adults measured (♂♀):—wing, 276, 275; tail, 127, 112; culmen, 56, 55; tarsus, 60, 78 mm. Colour of the naked parts of the adult male (3617) in full breeding plumage were:—iris, Dresden Brown; eyelids, Payne's Grey; naked patch round the eye, black; spots of gular pouch, Yellow Ochre; tip of lower mandible, brownish yellow; tarsus, Geranium Pink, fading on death to Brownish Buff. In the adult female (3615) the eyelids were a deep Dutch Blue. Caruncles, as in the male, were Yellow Ochre. The alar strip in both birds varied from 60 to 70 mm. In the juveniles the eyelids were black; the gular sac, pale Violet Plumbeous with posterior border black; tarsus, horn-colour.

The total population of cormorants on Marion was estimated at only 250–300 adults. Small colonies were perched on cliff-side outcrops or at the base of the coastal rocks. The largest colony (51 nests) was at Macaroni Bay, situated on the tussock fringing the rocks at the water's edge. Smaller groups were discovered at the mouth of Soft-plume River, Sealer's Cave, Sealer's Hut 2, Sealer's Beach, Ship's Cove and Duiker Point. It was only

at the Macaroni Bay Rocks and Mixed Pickle Cove (Sealer's Hut 2) that Rockhopper Penguins nested among the cormorants.

Of 11 nests at Duiker Point on 29 October, four had eggs. Two days later, in another colony at Sealer's Beach four nests out of 21 contained one to three eggs. In mid-December most colonies had small chicks and also well-incubated eggs. The chicks grew rapidly and by the end of the next month had lost their down, replacing this with plumage white below, dusky brown above. By 7 March many chicks were fully fledged and had left the colonies which were partially deserted. During early April roosting adults lingered near the old nests but most immatures had disappeared. Later, no birds were seen that could be allocated (on colour of naked parts) to the mature breeding class or chicks of the current season. Crawford (1952) saw cormorants throughout the period January to August and thought that they did not migrate. He considered that they laid eggs in late August. There was a decided dwindling in numbers after the mating season but we never detected cormorants fishing around the island and assumed that they had moved further afield. The extent of their ranging is, however, still unknown.

Nests were rough piles of tussock and other debris cemented by guano deposited over the sites. As in the case of *Phoebetria fusca*, nests were always situated close to the sea on bare ledges or rock faces immediately above the water's edge. Two to three eggs formed the normal clutch. Thus, at Macaroni Bay, the ratio c/1 : c/2 : c/3 was 1 : 13 : 8 on 27 December. Egg dimensions (max., av., min.) were as follows:—length (39 eggs), 68.8, 61.9, 57.3; width, 41.3, 38.2, 36.6 mm. Three eggs weighed 52, 50, 50 gm.

LARUS DOMINICANUS Lichtenstein. Dominican or Southern Black-backed
Gull.

Two adults and two immatures from Transvaal Cove between 15 December and 23 February. The dimensions of the adults (♂♀) were:—wing, 386, 365; tail, 162, 132; culmen, 47, 43; tarsus, 64, 57 mm.

The gulls were surprisingly rare on Marion. Breeding colonies contained an estimated 100 adults. They nested in small groups at various places mostly on the eastern coast. Numbers seemed correlated with the abundance of intertidal molluscs rather than nesting space. Nests were found near Sealer's Cove, Rook's Bay (Seagull Plain) and in less abundance at Transvaal Cove, King Penguin Bay and Trichaardts Bay.

Nests were built beside or under rocks. Near Sealer's Cave the colony occupied a thick patch of *Cotula*, some nests lying in the open, others partly hidden near the rocks. At Seagull Plain nests were disposed among the waterfront rocks. There was always a thick accumulation of limpet shells (*Cellana*) and small stones littering the sites. The nests themselves were thickly packed with seaweed and mixed plant-debris. Clutches of two eggs were laid during November. Their dimensions (max., av., min.) were:—

length (11 eggs), 79.6, 70.9, 66.9; width, 51.1, 48.9, 46.7 mm. Three eggs weighed 81, 80, 79 gm.

It was not till December that nests were discovered near Transvaal Cove. They were either on the cliff edge about 30 ft. a.s.l., or on protected ledges immediately above high-water mark. Most nests had two chicks but some still held eggs. On 4 January a small chick was found hiding among the rocks near Rook's Bay. There were then only two nests with eggs (c/2) among six nests eventually located. Subsequently, immature birds were noticed regularly accompanying adults at all the old nesting grounds.

Although there was a sizeable flock near the station, gulls were too timid to forage like the skuas. They were intertidal feeders rather than scavengers.

CATHARACTA SKUA LÖNNBERGI (Mathews). Brown Skua.

One adult male and two females from the station. Respective dimensions were:—wing, 435, 410, 420; tail, 160, 150, 170; culmen, 47, 52, 58; tarsus, 74, 68, 71 mm.

Skuas are widely distributed about the island. They move freely among the mountains and over the coastal plain, nesting in a variety of places but most often near penguin colonies or seal beaches.

Nesting had started when we reached the island in October, but eggs were still laid in November. The nests were poorly hidden in grassy patches or simply sited in the open on moss-covered ground. Advantage was sometimes taken of lush vegetation growing round old *D. exulans* nests, giving protection against wind. The nest was a rough grass-lined saucer, hardly raised above the ground.

Hagen (1952 : 136) summarizes dimensions of eggs of different races of *Catharacta skua*. *C. skua lönnbergi* has distinctly larger eggs than others and our Marion eggs are even bigger than Hagen's series. Dimensions (max., av., min.) were:—length (43 eggs), 84.2, 76.6, 72.2; width, 60.2, 52.6, 50.1 mm.; weight (21 eggs), 119, 100, 84 gm. I can find no data from the Crozet, Heard or Kerguelen Islands.

Young chicks were seen in mid-November and by early February were able to fly. They were dependent upon their parents during this month but soon afterwards foraged independently. Few immature birds were seen in March and April, although they occasionally joined adults feeding near the station.

Roosting adults congregated at popular areas, near water, to preen and sleep. These special assembly grounds were marked by an accumulation of regurgitated petrel-bones. They were found at Skua Ridge, Met Officer Hills and on sandy patches near the Sealers Huts. During my first trip over the mountains, I saw several skuas feeding on frozen whale-birds partly embedded in the snow. Apparently the skuas were wont to prey on these birds lost or injured in the mountains (altitude 4000 ft.). Normally the skua

forages on the beaches, alert for placental remains during the pupping season of the sea-elephants, eggs and any smaller petrels that can be caught. Burrowing-petrel chicks are sometimes deliberately hunted as they leave their burrows and may even be dug from nests situated close to the surface.

STERNA VIRGATA Cabanis. Kerguelen Tern.

Three adults from the stony ridge above Macaroni Bay between 16 November and 31 December 1951. The dimensions are respectively (2♂♂, 1♀):—wing, 270, 260, 256; tail, 130, 132, 118; culmen, 29, 29, 28; tarsus, 15, 14, 16 mm.; weight, 139, 121, 119 gm. They fall within the range given by Murphy (1938 : 6) and Falla (1937 : 255) for the species.

Nesting Kerguelen Terns were confined to stony areas, although resting birds were occasionally seen on the intertidal rocks or near the coast edge (Transvaal Cove, King Penguin Bay, Fur Seal Bay). Nests were difficult to find but colonies were located among the stones above Macaroni Bay and Sealers Cave. They were simple depressions on the raised grass patches lying among the rock slabs. The grass foundation provided a slight lining to the nest, no special material being added. Eggs are not laid on the bare ground. Clutches of single eggs only were found in October. Murphy (1938) states that at Kerguelen two eggs are laid in October and November. On Marion, Crawford (1952) also reports clutches of two in February, but I found only single eggs in all nests on Marion. Sharpe (1879) and Hall (1900) consider one egg the normal clutch on Kerguelen. Three Marion eggs were 46.4, 44.6, 43.2 mm. long, 32.2, 31.9, 31.7 wide. One weighed 22 gm. These data agree with those from Kerguelen (Falla 1937).

CHIONARCHUS MINOR MARIONENSIS (Reichenow). Marion Island Sheathbill.

Eight adults from the station and Trypot Beach, one in December the rest taken in February. Two males had wings, 210, 208; tails, 88, 85; culmens, 33, 32; tarsi, 40, 40 mm.; weights 516, 438 gm. Max., av. and min. for six females were:—wing, 210, 199, 190; tail, 93, 87, 81; culmen, 33, 30, 29; tarsus, 41, 39, 38 mm.; weight, 471, 425, 370 gm.

There has been a tendency to treat the Sheathbills from each subantarctic island as belonging to separate species. Reichenow (1908) described the Marion Sheathbill as a new species, basing his classification upon bill form. It is felt that the small differences do not warrant specific distinction but I am unable to compare my specimens with those from other localities.

Sheathbills (or paddies) are commonly found on all beaches, flocking in numbers (20–30) to feed on penguin eggs or the general debris of the rookeries (excreta and insects). They forage far inland during the late summer, scouring the moss and grass for insects and other edible matter.

Nests are sited in cavities or crevices among the rocks or at the base of cliffs abutting on penguin rookeries. The untidy mass of egg-shells and

other material strewn about the entrance enables one to find the nests easily. They lie, however, just beyond arm's length under the rocks.

A clutch of two eggs is laid in late December. One nest contained three eggs. Dimensions (max., av., min.) were :—length (10 eggs), 60.0, 55.0, 52.1; width, 38.7, 37.0, 34.9 mm.; weight (6 eggs), 40, 37, 33 gm. They are larger than those of the Kerguelen Sheathbill (Werth 1925) but appear to be similar to those from the South Orkneys (Clarke 1907).

ADDITIONAL RECORDS.

I cannot list all birds occurring in the waters near Marion but certain species warrant further mention. Crawford (1952) refers to six species not known to nest at the island. Some of these have been dealt with above but others (questionable nesting species) are discussed below.

GARRODIA NEREIS (Gould). Grey-backed Storm-petrel.

No storm-petrels nest on the island and they are presumably pelagic visitors only. This species breeds on Kerguelen but has not been seen nesting on low-latitude islands in the South Atlantic.

DAPTION CAPENSIS (Linnaeus). Cape Pigeon.

No Cape Pigeons were seen in the vicinity of Marion. Although ranging widely, they nest in high latitudes only. My last record of the species (two adults) was at sea en route to the island (noon 25 October) at 38° 51' S., 34° 32' E. Crawford (1952) sighted his specimens some hours after leaving the island.

PACHYPTILA TURTUR. Whale-bird.

No individuals were collected and Crawford's specimen is of interest in demonstrating the extent of ranging of the species. Fleming (1941) considers it more southerly in range.

PACHYPTILA DESOLATA DESOLATA (Gmelin). Whale-bird.

A single female was caught while hiding in a box outside the living quarters on 21 March. Wing, 198; tail, 91; culmen length, 30.9; culmen width, 14.9; culmen depth, 6.6; tarsus, 34; toe, 38 mm.; weight, 137 gm.

The specimen agrees with the series described as caught at sea in the southern ocean by Bierman & Voous (1950:76). Its mandibular ramus measures 10.8 mm., but not having comparative material it is difficult to be certain about its subspecific identification. General impression of colour : Light Alice Blue above (as compared to the darker Colombia Blue of *salvini*). In the dry skin the culmen is a distinct horn-colour but black in *salvini*. It was not found nesting on Marion.

STERNA VITTATA VITTATA Gmelin. Wreathed Tern.

One adult from the stony patch above Macaroni Bay (31 December), three others from the same area on 21 February. Measurements and general characters agree with descriptions of the typical race at Kerguelen (Murphy 1938:8). The scant observations made on Marion support the habitat preferences and nesting season described for the species at Kerguelen (Falla 1937).

All birds were obtained at the old nesting grounds of *S. virgata*. Although no eggs or newly-constructed nests were located, there was some evidence of breeding in the courtship flights witnessed over Trypot in late February.

A female was dissected and its stomach was filled with a light grey semi-solid mass of partially digested fish. In contrast to this the stomach of an adult male *Sterna virgata* was packed with crustaceans.

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