# BIRD-BANDING

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## ANTARCTIC BIRD-BANDING BY THE FALKLAND ISLANDS DEPENDENCIES SURVEY, 1945-1957


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The Falkland Islands Dependencies Survey (FIDS) organizes exploration and research in the British sector of the Antarctic, and is unique in having maintained bases in the Antarctic for more than 13 consecutive years. FIDS originated in 1943, and its first bases were established in 1944. At the end of 1956 there were 10 bases permanently occupied, with a total of 76 men in the wintering parties (Map I and *Polar Record* **8**(57) : 526-31, 1957), also a temporary one at Halley Bay on the Weddell Sea for the Royal Society's program for the International Geophysical Year (IGY), 1957-1958. In 1957 another base (Base J) was established and occupied on the Graham Coast, Graham Land (Palmer Peninsula).

Unlike that of most other Antarctic expeditions, FIDS policy is to encourage men to stay for 2 years, and to have half the personnel changing every year. The resulting mixture of experienced with inexperienced men facilitates continuity in research. Although represented by relatively few scientists in the research projects, biology has benefited greatly from this continuity. No better example of this can be found than in the FIDS bird-banding scheme, which was the first extensive banding program for the Antarctic. Other banding in the Antarctic has been summarized by Austin (1957). Here will be outlined the objectives, methods and some of the more interesting results of the FIDS bird-banding, with which both of us have been closely associated. Sladen was medical officer and biologist to the expedition in 1947-51; he spent 1 year at Hope Bay (Base D), 1 at Signy Island (Base H) and another on *R.R.S. John Biscoe*, the expedition ship. Tickell spent over 2 years, in 1954-57, as biologist and meteorologist at Signy Island.

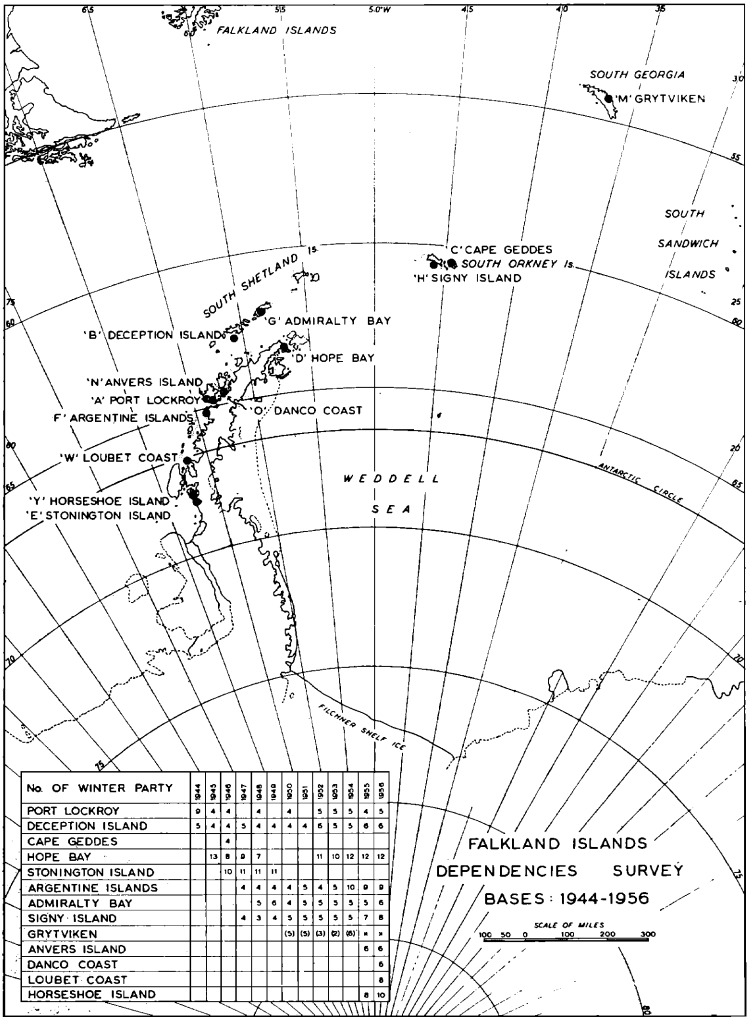
### HISTORY OF THE FIDS BIRD-RINGING* SCHEME

In late 1944 B. B. Roberts sent from London to 3 FIDS bases, some strips of aluminum alloy for marking penguins, and a set of number punches for inscribing them. They were 4 by ½ inches in size, and were to be bent in a circle and fastened with a clip (as in Fig. 1 C) on the leg. They bore no address. The first were put on 50 nestling Gentoo Penguins by G. Lockley at Port Lockroy, Wiencke Island, in February 1945. It was probably in this same rookery, 30 years earlier, that L.

* This is the official title but because this paper is published in the United States, we use 'band,' except in this one instance. Other nations working in the Antarctic, including Australia and New Zealand, use 'band.'

Gain of the French Antarctic Expedition marked 50 Gentoo Penguins with green celluloid bands (Gain, 1914, and Haverschmidt, 1934). Between November 1946 and January 1948, 477 Adelie Penguins were banded in FIDS with the same aluminum strips, in 1946 at Hope Bay (Andrew and Roberts, 1952), and in 1948 at Red Rock Ridge, Marguerite Bay, by B. Stonehouse of FIDS and W. Latady of the Finn Ronne Antarctic Research Expedition.

These trials on penguins justified further banding, and in September 1947, Sladen organised for the first time a scheme for using bands bearing an address. The designs and sizes of bands taken to the Ant-




| No. OF WINTER PARTY | 1944 | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 | 1955 | 1956 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PORT LOCKROY | 9 | 4 | 4 | | 4 | | 4 | | 5 | 5 | 5 | 4 | 5 |
| DECEPTION ISLAND | 5 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 6 | 5 | 5 | 6 | 6 |
| CAPE GEDDES | | | 4 | | | | | | | | | | |
| HOPE BAY | | 13 | 8 | 9 | 7 | | | | 11 | 10 | 12 | 12 | 12 |
| STONINGTON ISLAND | | | 10 | 11 | 11 | 11 | | | | | | | |
| ARGENTINE ISLANDS | | | | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 10 | 9 | 9 |
| ADMIRALTY BAY | | | | | 5 | 6 | 4 | 5 | 5 | 5 | 5 | 5 | 6 |
| SIGNY ISLAND | | | | 4 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 7 | 8 |
| GRYTVIKEN | | | | | | | (5) | (5) | (3) | (2) | (8) | » | » |
| ANVERS ISLAND | | | | | | | | | | | | 6 | 6 |
| DANCO COAST | | | | | | | | | | | | | 6 |
| LOUBET COAST | | | | | | | | | | | | | 8 |
| HORSESHOE ISLAND | | | | | | | | | | | | 8 | 10 |

MAP I

*FIDS Bases, 1944-56*

arctic were like those used by the British Trust for Ornithology (BTO), and read "INFORM F.I.D.S. COLONIAL OFFICE LONDON." They were to be used at Hope Bay (Base D) and at Signy Island (Base H). One of these addressed bands, put on nestling Giant Petrels by R. M. Laws on 20 March 1948 at Signy Island, gave Antarctic bird-banding its first long-distance recovery. On 10 July 1948, about 9 weeks after one of these young birds had left its nest on Signy Island in early May, it was taken alive by a fisherman in Fremantle harbour, West Australia, and released 12 days later in good condition (Serventy, 1948). During the brief period, this bird had learned to fly and had traveled at least, and probably much more than, 10,000 statute miles. Details of further Giant Petrel recoveries are given in Table V.

In October 1948 addressed bands were used on penguins at Hope Bay (Sladen, 1957). Trials at the same time with coloured celluloid flipper bands led to the later use, in December 1949, of addressed aluminum flipper bands on Gentoos in the Falkland Islands, and in 1950 on Adelies and Chinstraps at Signy Island (Sladen 1952; 543).

The FIDS bird-banding scheme has now become a well-established program at almost all of the expedition's bases. More than 7,200 birds of 17 Antarctic species have been banded (Table X). Each year or two FIDS headquarters in London send mimeographed instructions to the FIDS bases and to other interested organizations, such as the Australian National Antarctic Research Expedition (ANARE), the Scott Polar Research Institute, the IGY Antarctic bases, and holders of FIDS Operational Instructions.

## OBJECTIVES

1. *To study local seasonal movements, and the relations of breeding grounds to feeding areas*

Many birds feed in the pack ice, but where in relation to their breeding grounds is still unknown. For Pygoscelid Penguins evidence suggests that different species have different feeding habitats, e.g. in pack ice as opposed to open water (Sladen, 1955: 245). Flipper bands can easily be seen from a ship moving through pack ice. Local bird movements are of special interest in comparing adult movements with those of immatures.

2. *To study more distant migrations to other regions*

Giant Petrels are the only species so far recovered away from their Antarctic breeding grounds. Other species that make long travels during the Antarctic winter are discussed later.

3. *To study longevity*

There are few data on the longevity of sea birds. Species found in the Antarctic are long-lived, and are therefore worth banding for this objective. Large numbers of young must be banded each year, as the mortality in yearlings is high. Continuity is important, and recognition of the individuals must be assured by replacing very worn bands, or adding new ones.

4. *Life-history and behaviour studies*

Studies on species that breed at or near the bases are being undertaken from time to time by FIDS specialists.

5. *Work on penguins*

Our objectives are outlined later in the discussion of the Pygoscelid Penguins.

## THE BANDS

In 1953 the address *Inform F. I. D. S. Colonial Office London* was changed to *INFORM F. I. D. S. BRITISH MUSEUM NAT. HIST. LONDON*, but existing stocks of old bands were used up first. The metal used is 99% aluminum, of soft temper, and is the same as that used by the British Trust for Ornithology (BTO). The FIDS scheme has always kept in close liaison with the BTO.

With the exception of the penguin strips, which are received flat and have to be specially fitted, all bands are supplied partly bent into shape by machine. No permanent bands have been put on Emperor Penguins in FIDS. Stonehouse (1956) flipper-banded 149 King Penguins, *Aptenodytes patagonicus*, in South Georgia in 1953-55. The penguin strips described here are for the small Pygoscelid and the Macaroni Penguins.

With the exception of size 6, the serial numbers of which have reached 70,000 and over, the first figure of all reference numbers on FIDS bands indicates the size of the band; e.g. 201673 is size 2; 50812 is size 5.

As soon as it was discovered in 1955-56 that the end-to-end (butt-end) bands for Skuas, Gulls and Sheathbills frequently came off, or wore down too rapidly, all size 4 bands were recalled and replaced by size 4 *Di* (double-inscription).

## SUMMARY OF GENERAL INSTRUCTIONS SENT TO THE BASES

Antarctic birds may be divided into two groups for banding purposes (Sladen, 1956:55). *Group I:* consists of birds that migrate for long distances away from the Antarctic. If they are banded in large enough numbers, long-distance recoveries will provide information on migration and wintering quarters. They are, in order of priority, the Giant Petrel, Antarctic Skua, Dominican Gull, Sheathbill, Cape Pigeon, Antarctic Tern and Wilson's Petrel. All these, with the exception of Wilson's Petrel, for which no suitable bands have yet been provided in FIDS, can be banded anywhere in large numbers. *Group II:* consists of birds whose migrations to and from the pack ice, or Southern Oceans, make distant recoveries unlikely, but which breed in large colonies and can be found from year to year in the places where originally banded. They are the Adelie, Chinstrap, Gentoo and Macaroni Penguins, Blue-eyed Shag, Dove Prion, Snow Petrel, Black-bellied Storm Petrel, Antarctic Petrel, Antarctic Fulmar. They are banded only according to the research plans of specialists. There is nothing to be gained by banding indiscriminately, for instance, casual penguins marked on the beaches are unlikely to be recovered and waste time and material.

TABLE I

*FIDS bands, compared with BTO and F & WS bands*

| FIDS size | First issued (October) | Width in mm. | Gauge SWG | Fig. 1 illustration | Nearest equivalent (internal diameter) sizes | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | BTO | | F & WS | |
| | | | | | Size | Gauge (SWG) | Size | Gauge (AWG) |
| 2 | 1948 | 8.5 | 19 | — | 2 | 23 | 3A | 20 |
| 2*Di* | 1955 | 8.5 | 23 | D(v) | 2 | 23 | 3A | 20 |
| 3 | 1947 | 8.5 | 19 | — | 3 | 19 | 5 | 18 |
| 4 | 1947 | 9.0 | 19 | — | 4 | 19 | 7A | 16 |
| 4*Di* | 1955 | 9.0 | 19 | D(iv) | 4 | 19 | 7A | 16 |
| 5*Di* | 1953 | 12.5 | 16 | D(i-iii) | 5 | 16 | 8 | 14 |
| *Penguin (and Giant Petrel) strips* | | | | | *Remarks* | | | |
| 6 | 1947 | 11.5 | 18 | — | Hand-punched with address. Numbers 3 mm. high. Cut to right length by bander. Used as leg or flipper bands with clips for Pygoscelid Penguins, and as tarsus bands with clips for Giant Petrels. | | | |
| 6 | 1953 | 12.5 | 18 | A(i-vi) | Machine-punched; 115 mm. long, numbers 6 mm. high. Used as flipper bands with clips, or cut short and used as penguin leg bands with clips. | | | |
| 6 | 1955 | 12.5 | 16 | B(i-iv) | Like the 1953 design, but of thicker metal so that it can be fitted around the flipper with a simple overlap. | | | |

*NOTES:*— *Di*—Double-inscription band. The inscription is repeated at one end where it is protected by the overlap (see section on Giant Petrel banding).
SWG—Standard (British Imperial) Wire Gauge.
AWG—American Wire Gauge. (There is a slight difference between SWG and AWG.)
BTO—British Trust for Ornithology.
F & WS—United States Fish and Wildlife Service.

*Banding, and recaptures*

Only experienced people should put on bands. An aluminum band is not likely to last a bird's lifetime, so careful checks must be made from year to year. Worn bands should be replaced, or preferably left untouched and supplemented with new bands on other limbs. In this way it will be possible to learn the length of life of bands on the various species.

*Recording data*

Two types of forms for records are provided, the "Banded Birds Form" and the "Recapture Form." These are filled in by typewriting in triplicate, one copy being kept at base, the others sent back to the FIDS Scientific Bureau in London. Bands taken from dead birds, and worn bands replaced by new ones, are also sent back. No band, however badly worn, should be thrown away. Even apparently illegible bands can usually be deciphered by a chemical etching process.

During the IGY many bases in Antarctica will be banding birds, and some of these birds are likely to appear at FIDS bases. The Skuas banded at the Argentine and Chilean bases along the Graham Land coast, and Giant Petrels banded by the ANARE on Macquarie Island, may appear. Every effort should be made to catch banded birds alive. If that is not possible, birds wearing bands that are obviously not of FIDS origin, and are therefore of particular interest, should be shot and the band returned to London for forwarding to the banders concerned. If the bird is alive with a band in good condition, the bird should be released with the band on. A worn band must be replaced or supplemented by a FIDS one.

When banding forms are returned to the Scientific Bureau, they are accompanied by a brief summary of a) total birds banded, b) bands still unused, with their numbers, c) new bands needed and d) suggestions for improvements. New supplies of bands are ordered with the aim of keeping one year's stock as a reserve.

*Conservation of wildlife*

It is of utmost importance to protect Antarctic wildlife (Sladen, 1956:57). This applies as much to the predators and scavengers, such as the Skuas and Giant Petrels, as to the penguins and non-predators. Husky dogs can cause much damage to breeding birds. Unattended dogs should not be allowed to roam away from base.

## NOTES ON SPECIES BANDED BY FIDS; AND SELECTED RECAPTURES AND RECOVERIES

1. *The Pygoscelid Penguins; Adelie (Pygoscelis adeliae), Chinstrap (P. antarctica), and Gentoo (P. papua).* (Tables III and IV)

*Band size recommended:*—6. Strips are provided, and are bent to shape (Fig. 1 A & B).

Corrals were used at Signy Is. by Tickell and Hall in 1956 for web-marking about 800 nestling Adelies. Corrals are efficient for collecting large numbers of penguins. However, because of the disturbance to the colonies, they can be used for adults only before egg-laying, and

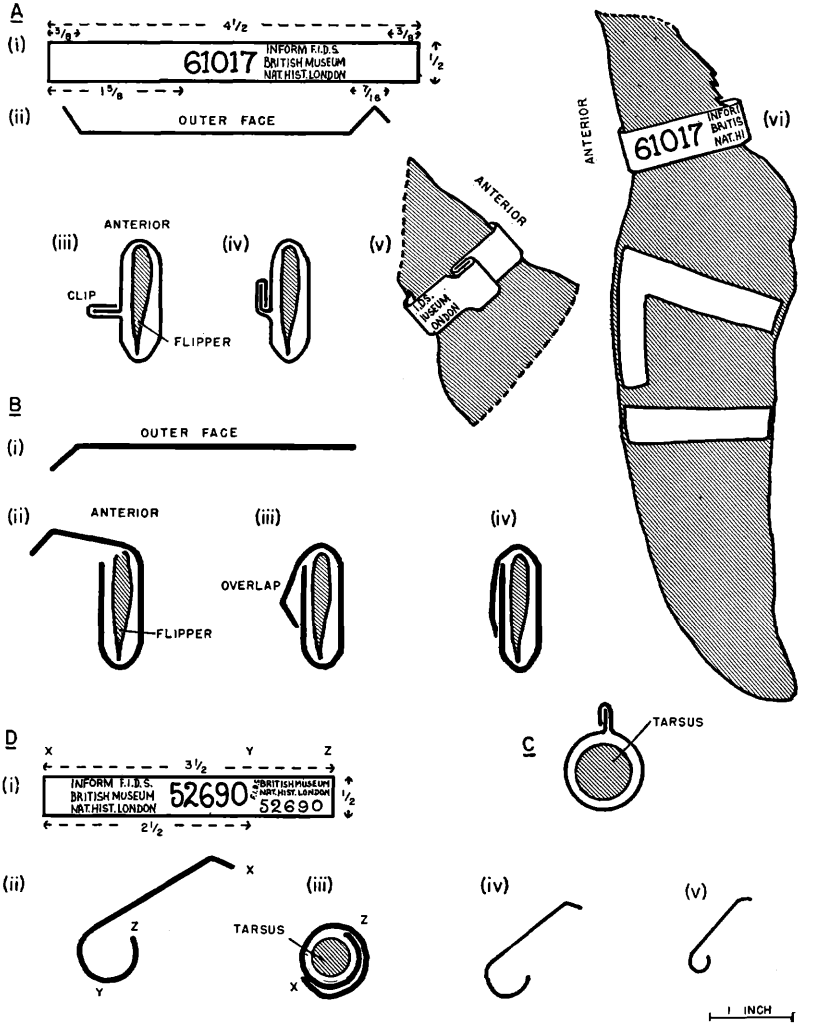



Figure 1 *Some FIDS bands (see also Table I)*

*A (i-vi) 1953 design flipper bands for penguins.* (i) strip as supplied. (ii) first shaping. (iii) shaping around flipper. (iv-vi) final position. (v) position of the clip on the inside of the flipper. (vi) the left flipper as held to the side of the body. The same shaping was used for the 1947 design flipper band. 17 is painted on the flipper for temporary identification.

*B (i-iv) 1955 design flipper bands for penguins.* (i-iii) stages in shaping. (iv) final position, the kink has been flattened with pliers so that the overlap lies flush with the rest of the band.

*C 1947 design leg bands for penguins (or Giant Petrel tarsus bands).* The first shaping of this band is shown in A (ii). The clip is left in the position shown. The same shaping was used for penguin bands 1945-48 (1944 design, see p. 1) with no address.

*D (i-v) Double-inscription bands.* (i-iii) for Giant Petrel (Size 5 *Di).* (iii) final position around tarsus. (iv) Size 4 *Di.* (v) Size 2 *Di.*

The bands are drawn to scale. All measurements are given in inches.

for chicks only when they are old enough to be changing second down for immature plumage (i.e., a week before they leave the rookeries). It is best to build a corral away from nest sites and to drive birds to it, but for some purposes it can be erected within a colony and the birds allowed to occupy their nests within the enclosure. A 3-foot chicken-wire fence of ½-inch mesh with guy-roped posts at intervals has been used, but it is difficult to keep erect on rocky ground. Corrals must be removed after use because they encourage snow drifting.

FIDS has 3 chief objectives at present in banding penguins:

(a) *To test whether flipper bands are as durable as leg bands, and whether or not they decrease the birds' chances of survival.* With very few exceptions (see Table III) the Pygoscelid Penguins have not been banded successfully on the tarsus. Attempts by several Antarctic workers have injured the birds. Perhaps narrower bands should have been used. Richdale's (1951) recommendation for the tarsus of the Yellow-eyed Penguin of New Zealand, is an aluminum band 10 mm. wide, of 16 SWG, with a clip (as in Fig. 1 C). FIDS bands have not been less than 11.5 mm. wide (Table I). Richdale (1951:50) claims his bands will stay on for at least two seasons, but have to be renewed every third season. The bands' shortness of life is due to rock-abrasion; the tarsus touches the ground in standing and walking (this is so in the Pygoscelid Penguins too). Most of the early FIDS bands were put around the leg, that is, on the feathered tibia above the tarsus, and in this position an 11.5 or 12.5 mm. band does extremely well.

Some of the recaptures recorded below show that leg bands last a long time. Unfortunately they are usually hidden by feathers, so that birds must be caught to determine whether or not they carry bands, and it is not possible to search for leg bands in colonies of many thousands of breeding birds. Flipper bands have several advantages. They are conspicuous, and when correctly fixed, their ¼-inch-high reference numbers can be read from 60 feet through 8x binoculars. Their disadvantage is that they must be put on very carefully by properly instructed people. The most important points to remember are that (i) the flipper almost doubles its thickness during the annual moult; (ii) the swimming movements of the flipper must not be restricted; (iii) the band must not be so loose as to slip down over the joint of the flipper (see Sladen, 1957, for fuller details). FIDS policy has therefore been that *flipper bands should not be widely used until their efficiency has been thoroughly tested and compared with that of leg bands.*

The following test is now in progress. From one penguin colony are chosen two groups each of 40-50 breeding pairs in similar situations, with the same numbers of peripheral and central nests. Limits of the groups are marked and photographed. The birds in one group are marked with leg bands, in the other with both leg and flipper bands, and the survival of birds and bands are noted in following seasons.

(b) *To confirm, with larger samples, that adults return to the same nest sites and keep the same mates from year to year.* Andrew and

Roberts (1952) first proved that Adelies return to their nest sites of the previous season, and on the whole are faithful to their former mates. (Gain (1914) could not recognize his birds individually with the colored bands he used.) Their samples were small and the nest sites were clearly recognizable from rocks and other local landmarks. Sladen (1957) gives evidence that Adelies that have become established breeders will keep the same mates although they may shift their nest sites. He suggests that individual recognition and the affinity of the birds for each other are as important in maintaining the pair bond as coming together again on known ground. The FIDS scheme aims to collect more data on the three Pygoscelid species by banding complete small colonies, and, aided with sketches and photographs, describing the nest sites and their occupants from season to season.

(c) *By banding or web-marking nestlings each year, to make populations of individuals of known ages available for future work.* Marking of nestlings is the easiest and most useful penguin work that can be done at present, but they must be marked in large numbers every year. Richdale (1951) was the first to mark penguin foot-webs. *In FIDS only young of the year are web-marked.* A different position on the web is used each year and any species of penguin can be marked with this (see Table II). A hand-punch for leather with a revolving head that carries several sizes of cutters is used.

After web-marking, the young are not likely to be seen for 2 or 3 years. Those recaptured are marked with aluminum bands.

*Some recaptures of marked Adelies.*

Of 20 breeding Adelies banded by Andrew at Hope Bay in November 1946 (Andrew and Roberts, 1952), 2 were recaptured at their respective original nest sites by B. Hunt in October and November 1952 (this is the latest of many recaptures of these individuals). As these birds must have been at least 2 years old in 1946, they were no less than 8 years old in 1952. The bands (Fig. 1 C), which were on the feathered leg, were apparently in good condition after 6 years (Sladen, 1957, Table XIII).

Of 18 chicks in a small colony at Hope Bay banded by J. M. Roberts in January 1948, one (No. 1040, no address) was taken by B. Hunt 28 October 1952 (Sladen, 1957, Table XIII). This 4-year-old Adelie was breeding in the colony where it was hatched.

TABLE II

*Web-marking patterns used for penguins*

| Date Jan.-Feb. | Number of holes | Position of holes |
|---|---|---|
| 1954 | 1 | Right foot. In middle of right web. |
| 1955 | 1 | Left foot. In middle of right web. |
| 1956 | 1 | Right foot. In middle of left web. |
| 1957 | 1 | Left foot. In middle of left web. |
| 1958 | 2 | Right foot. In middle of both webs. |
| 1959 | 2 | Left foot. In middle of both webs. |

No distinction of pattern is made between species.

TABLE III

*Some Chinstrap recaptures (5 birds)*

| Band number | Limb banded | Date banded | Date(s) recaptured | Notes |
|---|---|---|---|---|
| 62081 | RT* | 6. 1.49 | | Breeding. Banded by Laws. |
| | | | 22.12.49 | No information. |
| 63907 | RF** | 27.12.50 | 27.12.50 | Breeding. Band added by Sladen. |
| | | | 2. 2.53 | Breeding (Mansfield). |
| | | | 10. 2.54 | On nest. |
| 68510 | LF** | 23.12.55 | 23.12.55 | Incubating 2 eggs. Some wearing of leg and flipper, and clip of flipper band partly unfolded. Both previous bands replaced by 68510 (Tickell). |
| | | | Nov. 1957 | Back in same colony. Now at least 11 years old (Scotland). |
| 63936 | LF | 18. 2.51 | | Nestling. Banded by Sladen. |
| | | | 22. 1.53 | Found by Mansfield standing by Colony IV. 2 years old. |
| | | | 7. 3.53 | Just completed moult in nest site in Colony IV. |
| | | | 24. 1.54 | Incubating 2 eggs. Probably breeding for first time. 3 years old. |
| 68506 | RF | 23.12.55 | 23.12.55 | Incubating 2 eggs. Slight wearing of flipper by partly unfolded clip. 63936 replaced by band 68506 (Scotland). |
| | | | Nov. 1957 | Back in same colony. Nearly 7 years old (Scotland). |
| 63937 | LF | 18. 2.51 | | Nestling. |
| | | | 24. 1.54 | Recaptured by Tickell in same colony. |
| 63980 | LF | 26. 2.51 | | Nestling. |
| | | | 10. 1.53 | Found by Mansfield roosting on snow slope 400 yards from Colony IV. |
| 68511 | RF | 23.12.55 | 23.12.55 | Incubating 2 eggs in Colony IV. Slight wearing of flipper by partly unfolded clip. Band 63980 replaced by 68511 (Scotland). Bird was 4 years old. |
| 63985 | LF | 1. 3.51 | | Nestling. |
| | | | 23.12.55 | Incubating 2 eggs in Colony IV. 4 years old (Scotland). |

*RT—right tarsus. **RF or LF—Right or left flipper.

All these Chinstraps were in Colony IV, which is a group of about 140 Chinstraps, surrounded by an Adelie colony in the Gourlay rookery, Signy Is.

The last 4 birds are the total recaptures from 21 nestlings banded by Sladen in Colony IV in 1951.

Of 100 breeding adults marked with flipper bands at the Gourlay rookery, Signy Is., by Sladen in the 1950-51 breeding season, 32 were found by J. Cheal on 8 November 1951 in the colonies where they were banded. These flipper bands were the 1947 design (Table I), and were fixed as in figure 1 A. Cheal reported one flipper to be "rather worn," otherwise the birds and bands were in good condition.

As we go to press, we have just received a report from C. Scotland at Signy Is. of his finding two Adelies with flipper bands 63751 and 62151, in October 1957. No. 63751 was a nestling when Sladen banded it 2 February 1951, and it is now therefore nearly 7 years old. No.

TABLE IV
*Some Gentoo recaptures (2 birds)*

| Band number | Limb banded | Date banded | Date(s) recaptured | Notes |
|---|---|---|---|---|
| 47 | LLg* | Feb. 1945 | | Nestling banded by Lockley. |
| 63096 | RLg | 29. 1.56 | 29. 1.50 | Found by Sladen. Original band replaced by leg and flipper bands. |
| 64060 | RF** | | | |
| 63065 | RLg | 29. 1.50 | | Adult banded by Sladen. |
| 64070 | RF | | | |
| | | | 1950-51 season | Bird and bands in good condition (Chaplin). |
| | | | 28.12.52 | Breeding. Bird and bands in good condition (Lenton). |

*LLg or RLg—Left or right leg (feathered tibia). **RF—Right flipper.
The birds were banded and recaptured in the same colony at Port Lockroy (Base A), Wiencke Is., Graham Land. There have been other returns and repeats of less interest.

62151, banded on 22 October 1950, had one of the first flipper bands and the clip was put at the anterior edge of the flipper. Scotland reports that the band and the plumage were in "perfect condition" after 7 years. In spite of the long survival, we do not recommend putting the clip on the anterior edge of the flipper (compare Gwynn, 1955). No. 62151 bred in 1950, so it is now no less than 9 years old.

*Some recaptures of marked Chinstraps.*

In January and February 1949, Laws leg-banded 45 adult Chinstraps at their nests. In December he found 10 of these back at the same nest sites. During the 1950-51 season (i.e. two seasons after banding) Sladen recaptured 30 of the original 45 adults. Of 17 nestlings banded by Laws in February 1949, none was recovered in the 1950-51 season.

In the 1950-51 breeding season, Sladen flipper-banded 127 yearlings and adults in Colony IV of the Gourlay rookery. Mansfield recovered 45 of these 2 years later during a one-day visit (he was unable to go again to the rookery). All the flipper bands were in good condition, and only one bird showed "slight wearing of the leading (anterior) edge of the flipper and in the axilla."

When Mansfield recaptured tarsus band 62081 (Table III) in February 1953 he did not record damage to band or tarsus, and the band had been on for more than 4 years. When the same bird was examined in December 1955 by Scotland, the tarsus band had been on for nearly 7 years and the flipper band (63907) for 5 years. Recaptured by Scotland in November 1957, this bird is now no less than 11 years old: the oldest bird age recorded so far with FIDS bands.

Two 2-year-olds (63936 and 63980) were back at the rookery, but probably did not breed. One of these bred when 3 years old in the rookery where it was hatched (Table III).

*Further comments on penguin bands.*

(a) *Wing tags* (for seals) used experimentally by Austin (1957:9) on 50 Adelies at McMurdo Sound on 26 January 1956, were seen one

year later to be causing some damage to the flippers of a sample recaptured (Eklund, personal communication). Also, two of these birds (tag nos. 12573 & 12585) captured in November 1957 in the same area and flown back to the U.S.A. show the tags to be in good condition but the flippers damaged with evidence of frostbite. It is unwise to use any method that involves piercing the flipper, because the flipper becomes thickened and tender during the molt.

(b) *Flipper bands.* The 1947 flipper-band design appears to have lasted well (Table I), our longest records so far being 7 years on an Adelie, with the band still in excellent condition, and 5 years on Chinstraps, with little abrasion of the band and only slight wearing of the flipper. The clips were loosening on the Chinstrap bands examined in 1955. It is suspected that ice may force the clip apart. Also the clip is too difficult for common use, so the 1955 design has thicker metal and a simple overlap (Fig. 1 B). It is too early to report on the success of the 1953 and 1955 designs.

The use of flipper bands by Expéditions Polaires Françaises in Adélie Land in 1951 is described by Sapin-Jaloustre (1952:81) and Sapin-Jaloustre and Bourliere (1951:66).

We agree with Gwynn (1955:8) that flipper bands should be narrower than 12.5 mm., but do not think they should be as narrow as 6.5 mm. An even thicker, tougher metal such as Monel metal should also be considered. Damage resulting from flipper-banding 330 Rockhopper Penguins, *Eudyptes cristatus*, at Heard Island (Gwynn, 1955:12) emphasizes that flipper bands should not be widely used until thoroughly tested for the species concerned.

(c) *Leg bands* (i.e. on the feathered tibia) may remain the safest method of marking breeding penguins which are known to return to the same nesting area in successive years. We suggest that a 16 SWG "double-inscription" band like the ones used for Giant Petrels (1953 design, Fig. 1D), but 10 mm. wide instead of 12.5 mm., and made of Monel metal, would be an improvement on the present clip design (Fig. 1C).

2. *Macaroni Penguin (Eudyptes chrysolophus)*
*Band size recommended:*—6

This is an uncommon bird in the Falkland Islands Dependencies, breeding in relatively small numbers at Deception Island (Base B) and in the South Orkneys (Clarke 1913). During the last few years it has established itself as a breeding species on Signy Island (Base H). There, on 5 December 1954, Tickell placed flipper band 68304 on a Macaroni incubating an egg (subsequently found broken) in the middle of Adelie Colony XXI, Gourlay rookery. It was almost certainly breeding for the first time; *i.e.* it was an 'unestablished breeder' (Sladen 1957). The same season, on 13 February 1955, the bird was found with two unmarked Macaronis over 4 miles away at the North Point rookery in the midst of breeding Chinstrap Penguins. During the following breeding season, on 25 January and on 2 February 1956, it was again observed at the North Point rookery at an empty nest with an unmarked bird (then banded 68713). It is not known if 68304 bred during the 1956-7 season.

On 2 February 1956 at the North Point rookery a Macaroni, banded 68171, was 'keeping company' with another banded 68172. Later, on 22 March 1956, 68171 was alone at a nest site, in full moult. The next season, 1956-7, it mated with an unmarked bird, in the same rookery, and successfully reared a chick.

3. *Giant Petrel (Macronectes giganteus)* (Table V)

*Band size recommended:*—5 *Di* (Fig. 1D (i-iii) )

The first Giant Petrel recoveries were reported by Serventy (1948), Roberts and Sladen (1952) and Purser (1952). Some recent FIDS recoveries are being discussed by Stonehouse (in press, *Ibis*), and the rest are given in Table V. Map II summarizes the recoveries since the FIDS banding scheme started in 1948.

R. Laws banded 11 adults between December 1948 and January 1949 at seven marked nest sites on Signy Island. They included four pairs. He recaptured 7 of these birds during the next breeding season, in November and December 1949. Five were at their previous nest sites, and one pair was again together at the same site. Unfortunately the Giant Petrels later deserted this colony, because of its proximity to the base.

More than 2,000 Giant Petrels have been banded in FIDS, principally by Hall, Hooper, Laws, Sladen and Tickell, at Signy and Anvers Islands, and nearly all have been nestlings. All the long-distance recoveries have been of young birds. So far none of these has been recaptured as an adult at the place where banded, but this may be because they have not been looked for at the right time. Downes *et al.* (1954) recommend that the best time for catching adult birds in snares is the first two weeks after the eggs have hatched, when the chicks are being fed.

The recoveries of young Giant Petrels banded by FIDS and by the Australian National Antarctic Research Expedition (ANARE) on Heard and Macquarie Islands (Chittleborough and Ealey 1905; Downes *et al.* 1954; Howard 1956), continue to add support to Murphy's suggestion (1936:547) that some species of sea birds of the Southern Oceans circumnavigate the world in the west-wind zone. Murphy *(loc. cit.)* cited a Wandering Albatross, *Diomedea exulans*, that was banded at a nest on Kerguelem Island in 1913 and recovered 3 years later at sea near Cape Horn (Menegaux 1917). Howard (1954) reports the recovery in Australia of two Black-browed Albatrosses, *D. melanophris*, one of which was banded at Macquarie Island as an adult, and the other at Heard Island as a nestling.

Interesting evidence of eastward travel of a Blue Petrel, *Halobaena caerulea*, is reported by Bargmann (1952). The bird was banded in June 1951 when it was attracted aboard *RRS Discovery II* by strong arc lamps, when the ship was in position 64° 97′ S., 131° 50′ E. Two

*Note to Table V: 51679* gives the first evidence of a westward movement, unless this bird circled the world in four months.

*51311* is the second record of a FIDS bird recovered in its second year; and the most northerly recovery.

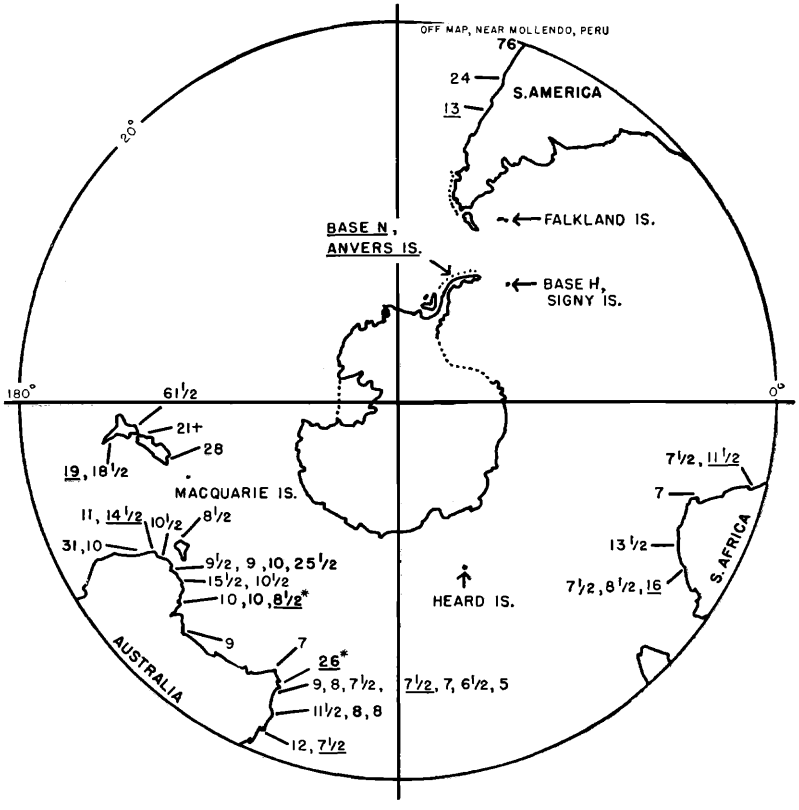
TABLE V

*Recoveries of Giant Petrels in 1957 (see also Map II)*

| Band no. | FIDS Base See Map I | Date banded | Date recovered 1957 | Condition | Location of recovery |
|---|---|---|---|---|---|
| 52432 | H | Feb-Mar 57 | 9 June | Dead | 30 miles S. of Fremantle, W. Australia. |
| 52491 | H | " | 23 June | Dead | 26 miles S. of Fremantle. |
| 52109 | H | " | 24 June | Dead | 23 miles S. of Fremantle. |
| 52602 | N | " | 28 June | ? | 4 miles N. of Swan River Mouth, W. Australia. |
| 52698 | H | " | 29 June | Alive and released | 7 miles S. of Fremantle. |
| 52902 | H | " | 29 June | Dead | Cape Cross, Swakopmund, S.W. Africa. |
| 52568 | H | " | 2 July | Dead | Geraldton, W. Australia. |
| 52499 | H | " | 4 July | Alive and released | Nr. Fremantle, W. Australia. |
| 52768 | H | " | 7 July | Alive and released (band removed) | S.E. Tasmania. |
| 51679 | N | " | 7 July | Alive and released | Kangaroo Is., S. Australia. |
| 52690 | H | " | 9 July | Dead | St. Peter Is., S. Australia. |
| 52295 | H | " | 9 July | Alive and released (band removed) | Lorne, Victoria, Australia. |
| 67016 | H | 4. 3.56 | 13 July | — | Palliser Bay, N. Is., New Zealand. |
| 52405 | H | Feb-Mar 57 | 14 July | Alive and released | 3 miles off Port Phillip Heads, Australia. |
| 53027 | H | " | 15 July | Alive and released | 25 miles S. of Sydney, Australia. |
| 52293 | H | " | 16 July | Alive and released (band removed) | Lorne, Victoria, Australia. |
| 52470 | H | " | Mid-July | — | Mouth of R. Murray, S. Australia. |
| 52627 | H | " | 17 July | Alive and released | Encounter Bay, S. Australia. |
| 52693 | H | " | 20 July | Dead | Port Fairy, Victoria, Australia. |
| 52217 | H | " | 4 July | Dead | Houtman Abrolhos Is., W. Australia. |
| 52538 | H | " | 25 July | Alive and released | Eden, New South Wales, Australia. |
| 53058 | H | " | 1 Aug. | Alive and released | Shark Bay, W. Australia. |
| 52791 | H | " | 11 Aug. | Alive and released | Cape Morgan, S. Africa, Lat. 32° 47′ S., Long. 28° 29′ E. |
| 52860 | H | " | 24 Aug. | Dead | Port Fairy, Australia. |

*Footnote:*—the following 1957 recoveries have come in since going to press. They have been included in Map II.

| | | | | | |
|---|---|---|---|---|---|
| 51679 | N | Feb-Mar 57 | 4 Nov. | Alive and released | Busselton, Geographic Bay, W. Australia, about 1200 miles west of Kangaroo Is. where caught on 7 July (see above). |
| 51311 | H | 7. 4.56 | 23 Oct. | Dead | S. of Mollendo, Peru. (17° 10′ S., 71° 49′ W.) |
| 52906 | H | Feb-Mar 57 | 1 Nov. | Alive and released; in poor condition | Barwon Heads, Geelong, Victoria, Australia. |
| 53028 | H | " | 9 Dec. | Dead | Belmont, near Newcastle, N.S.W., Australia. |




MAP II

*FIDS Giant Petrel recoveries 1948-57.* All 45 records are of nestlings. Each number is the approximate time *in weeks* between a bird's leaving its nest, and being found at the place where the number is shown. (Time of leaving the nest is not known for each individual; here an average is used from previous base-reports, which is 7 May.) Birds hatched on Anvers Is. are represented by underlined numbers; the rest hatched on Signy Is.* is the same bird (51679—Table V).

days later, when the ship had moved 400 miles to the east, the bird came aboard again and was recaptured. This species does not follow ships but it is frequently attracted to lights at night, giving it the name of Fire Bird in the Falkland Islands.

It will be interesting to know how dependent on the winds are the various species that have pelagic movements in this zone. Blue Petrels and also Prions may be less bound to the direction of the prevailing winds than are other species. They fly closer to the water and do less soaring than the Giant Petrels and Albatrosses. Tickell (unpublished) took away banded Prions breeding on Signy Is., and released them from a distance, to see if they would return. Two arrived back within 2 days from South Georgia, 500 miles away to the northeast, having

travelled against the prevailing westerlies. One released in the Falkland Islands, 900 miles away to the northwest, took 5 days to return with the northwesterly winds. However, movements in homing experiments on breeding birds may not be comparable with winter movements, with which most of the banding recoveries have been concerned (including the Blue Petrel mentioned above). More banding of all these interesting species is needed.

The 1947 design of band (Fig. 1C and table I) for Giant Petrels, used from 1948-56, often became badly abraded by rocks before the young left the nest. The 1953 "double inscription" band (Fig. 1D) is of a similar design to those used on the Manx Shearwater in Britain by Lockley (1942), and recently by Serventy (1956) for burrowing petrels in Australia. The extensive overlap completely covers and protects the inscription that is duplicated at one end.

4. *Antarctic Fulmar or Silver-grey Petrel (Fulmaris glacialoides)*
*Band size recommended:*—3 *Di*

Only one of this species has been banded, and size 4 *Di* was used. However, a double inscription size 3 band is thought to be better.

5. *Cape Pigeon or Pintado Petrel (Daption capensis)* (Table VI)
*Band size recommended:*—3 *Di*

Size 3 with a small overlap has been used so far. One of these has lasted for 7 years and was in excellent condition when last seen. As these bands are often abraded, a double inscription band, size 3, is recommended.

TABLE VI

*Some Cape Pigeon recaptures (4 birds)*

| Band number | FIDS base* | Date banded | Date recaptured | Notes |
|---|---|---|---|---|
| 301051 | H | 30. 3.48 | | Adult banded by Laws. |
| | | | 9.12.49 | Recaptured in original nest site (Laws). |
| 300880 | H | 24.10.48 | | Adult banded by Laws. |
| 301703 | | 12.10.55 | 12.10.55 | Not known if back in original nest as mark had worn off rocks. Band 300880 in excellent condition after 7 years, but removed and replaced by 301703. |
| 301045 | H | 13.12.48 | | Adult banded by Laws. |
| | | | 14.11.49 | Recaptured in original nest site (Laws). |
| 301704 | | 12.10.55 | 12.10.55 | Recaptured at unidentified nest with 300880 (see above); they were in separate nests when banded in 1948. Replaced by band 301704 (Tickell). |
| 301109 | B | 19. 2.49 | | Adult banded by Sladen. Caught by hand when feeding on whale blubber, Whaler's Bay, Deception Is. |
| | | | 6. 2.50 | Taken by a Chilean biologist at the Chilean Base near Whaler's Bay. |

*—see Map I.

R. Laws banded 18 adults at marked nests between 24 October 1948 and 14 January 1949, but apparently no mated pairs were included. He recaptured 10 of these 18 adults in November and December 1949, and all 10 were at their original nest sites. So far, no Cape Pigeons banded as nestlings have been recovered.

The Cape Pigeon is one of the commonest migrants from the far south to be seen off west South America, where it closely follows the Humboldt Current (Murphy 1936:306). It has also been reported regularly in temperate waters along the west coast of South Africa (Oordt 1939, and others), and occasionally it reaches the North Atlantic. The scavenging habits of the Cape Pigeon make it an easy bird to catch even by hand when it is feeding close to the shore in the Antarctic, and there are many records of its being caught on fishhooks by seamen. This and its extensive journeys make this bird a very suitable subject for an intensive banding program with good prospects of interesting results.

7. *Dove Prion (Pachyptila desolata)* (Table VII)

*Band size recommended:*—2 *Di*

The 1955 design of double-inscription band, size 2, has replaced the 1948 design. Inscriptions on the old bands were often unreadable after 3 or 4 years. Tickell has made an extensive study of the breeding and behaviour of this species at Signy Island (to be published shortly). He suggests that a further improvement for Prion bands would be to use Monel metal (Serventy 1956) with special pliers for applying them. Many Dove Prions have been recaptured in the nest where they were banded. Tickell has also retaken the same pairs in the same nests in successive seasons.

TABLE VII

*Some Dove Prion recaptures on Signy Island (Base H), (2 birds)*

| Band number | Date banded | Date recaptured | Notes |
|---|---|---|---|
| 200200 | 19. 3.52 | | Adult banded by Mansfield. |
| 301561 | 16.12.54 | 16.12.54 | Incubating egg in original nest site. The old band just readable and very thin, after being on for 2 years and 9 months; replaced by 301561 (Tickell). |
| 200169 | 9. 3.52 | | Adult banded by Mansfield. |
| 301562 | 16.12.54 | 16.12.54 | Incubating egg in original nest site. Band replaced by 301562 (Tickell). |

8. *Snow Petrel (Pagodroma nivea)* (Table VIII)

*Band size recommended:*—3 *Di*

Though one size 3 band with a small overlap has lasted 7 years and 8 months, we recommend a double inscription band of size 3, like that for the Cape Pigeon.

R. Laws banded 5 adults at marked nest sites between 30 March and 27 April 1948; they included one pair. He found all five at the same nest sites, either in the following breeding season (December 1948) or two seasons later (November or December 1949). The pair were

together two seasons later. So far, no Snow Petrels banded as nestlings have been recaptured but many other local recaptures of banded Snow Petrels have been made, besides those given in Table VIII.

TABLE VIII

*Some Snow Petrel recaptures at Signy Island (Base H) (3 birds)*

| Band number | Date banded | Date recaptured | Notes |
|---|---|---|---|
| 301054 | 30. 3.48 | | Adult banded by Laws. |
| | | 25.11.49 | Back in original nest site (Laws). |
| 301542 | 9.11.55 | 9.11.55 | Probably again in original nest site (according to Laws' sketch-map; but paint marks had gone). Band replaced by 301542 (Tickell). |
| 301046 | 27. 4.48 | | Adult, banded by Laws, in the same nest as 301052. |
| | | 5.11.49 | In original nest site with 301052 (Laws). |
| 301052 | 27. 4.48 | | Adult, banded by Laws, in same nest as 301046. |
| | | 13.12.48 | Alone at nest site where banded. |
| | | 5.11.49 | With 301046 in original nest site (Laws). |

9. *Wilson's Petrel (Oceanites oceanicus)*

For the few Wilson's Petrels that have been banded, size 2 bands have been used, but they are too large. Size la (BTO) double inscription bands would be better.

In 1935 Roberts (1940) banded 23 pairs of Wilson's Petrels in the Argentine Islands off the west coast of Graham Land, during the British Graham Land Expedition. They all were with the same mates at the same nest sites, in the second breeding season. Roberts' bands had no addresses. His recaptures, with those of Lockley (1930), gives some of the first evidence that the *Procellariidae* return after their pelagic wanderings, to their former nest sites and mates in successive breeding seasons.

One of several interesting FIDS Wilson's Petrel recaptures was an adult, 200003, that Sladen banded on Signy Island (Base H) on 10 March 1950, and Tickell recaptured in the same nesting area on 12 December 1955. The band was only slightly worn, though it had been on the bird for nearly 6 years. The number was legible and there was no injury to the tarsus.

Wilson's Petrel is the smallest of the Antarctic petrels, yet it is the only truly Antarctic bird species known to winter regularly in large numbers north of the equator. It is reported by Wynne-Edwards (1935:285) to reach as far as 50° N in the Atlantic, and is occasionally seen off the British coast. Movements in the Indian and Pacific Ocean are less well known, but apparently of much less magnitude, the winter quarters there being on the seas surrounding NW, N and probably NE Australia (Serventy 1952). Because of its pelagic habits and the infrequency of its being caught by sailors and fishermen, or washed up on coasts, Wilson's Petrel is unlikely to produce many long-distance banding recoveries.

10. *Black-bellied Storm Petrel (Fregetta tropica)*

The Black-bellied Storm Petrel is a rare bird in the Falkland Islands Dependencies, breeding in small numbers at Deception Island (Base B), the South Shetlands (Bennett 1927), and in the South Orkneys on Laurie Island (Clarke 1913). In 1950 Sladen found it breeding on Signy Island. Tickell banded three Black-bellied Storm Petrels at Signy in 1955. He used size 2 bands, but size la, as for Wilson's Petrel, might be preferable. There have been no recoveries.

11. *Antarctic Blue-eyed Shag (Phalacrocorax atriceps)*

*Band size recommended:*—5 *Di*

Some of these birds, nearly all nestlings, have been banded at the Argentine Islands (Base F), Port Lockroy (Base A) and Signy Island (Base H), but no recoveries or returns have so far been reported. They do not shift far from their breeding grounds in winter, so banding them, like penguins, is of value mainly for local studies.

12. *Sheathbill (Chionis alba)* (Table IX)

*Band size recommended:*—4 *Di*

Sheathbills are aberrant shore birds, and the only species in the Antarctic without webbed feet. They breed among penguin or shag colonies, but very little is known of their ecological relation with these, or in fact of any of their natural history and behaviour. Mansfield counted 58 Sheathbill nests in the Gourlay penguin rookery at Signy Is. of an estimated 40,000 Adelie and Chinstrap Penguins, in the 1952-53 season. The Sheathbills were evenly distributed throughout the rookery; they appear to have sharply defined nesting and foraging territories. We have one record of a change of nest site due no doubt to an unusual food supply for these omnivorous scavengers. A pair nested in "Gash Cove," the rubbish dump near Base H, 2½ miles from the nearest penguin rookery, in 1953-54, but there is no record of breeding success and they did not return next season.

TABLE IX

*Some recaptures of Sheathbills at Signy Island (Base H) (3 birds)*

| Band number | Date banded | Date recaptured | Notes |
|---|---|---|---|
| 300818 | 27.10.49 | November 1950 | Adult banded by Laws near base hut. Seen a number of times at the Gourlay penguin rookery, 2½ miles from base (Sladen). |
| 300813 | 27.10.49 | 24.10.52 | Adult banded by Laws near base hut. Recaptured around base. One of the original 2 colour bands was missing (Mansfield). |
| 400840 | 9. 2.51 | 7. 1.53 | Nestling banded by Sladen at the Gourlay penguin rookery. Recaptured with an unmarked bird (then banded 401068) at a nest in the same rookery with 3 eggs. This bird was therefore breeding at age of 2 years (Mansfield). |

Sheathbills are easy birds to catch, being easily baited. Also, when not breeding they roost at night along the rocky coast, and on a dark stormy night can be approached and dazzled with a flashlight, and will be reluctant to fly.

Bird No. 400840 (Table IX) gives the first evidence that a Sheathbill will breed at the age of 2 years.

Laws at Signy Is. (Base H) in October 1949, banded 18 adults with size 3 metal bands on one tarsus and variously coloured celluloid bands on the other. Sladen looked for these from the time he arrived at Signy in February 1950. Few Sheathbills appeared during the winter and no banded ones were seen from February until 28 July 1950. From then on more birds came to the base and banded ones were occasionally seen. During the breeding season most Sheathbills left the base, and banded ones were then seen regularly at the Gourlay penguin rookery 2½ miles away. Some of the birds had lost their aluminum bands though the color celluloid bands were in good condition. Several times ice was seen encasing the bands even though the rest of the tarsus was free. Some metal bands were observed to be opening up and it was suspected that this was due to the ice forming between the band and the tarsus. Elmes (1955:153) has observed the same cause of loss of a band in a Blackbird *(Turdus merula)*. Size 4 *Di* is now being used for Sheathbills.

Marking will help to determine their migrations: bands on the tarsus are conspicuous and the white plumage is suitable for dyeing. So far no FIDS bands have been recovered away from the breeding areas. Apparently most Sheathbills cross Drake's Passage to winter in the Falkland Islands and along the southern coasts of Argentina and Chile. Of other records, Murphy (1936:1002) gives instances of Sheathbills seen far from land, often travelling on icebergs, and Bierman and Voous (1950:104) record a Sheathbill around a whale catcher over 700 miles from both Bouvet Island and the South Sandwich Islands.

13. *Antarctic Skua (Catharacta skua)*
*Band size recommended:*—4 *Di*

H. M. Bryant of the U. S. Antarctic Service Expedition banded 15 adult McCormick's Skuas *(C. s. maccormicki)* on 10 and 11 March 1941 at Marguerite Bay near the present FIDS Base E (Eklund 1945: 303 and information from U. S. Fish and Wildlife Service). The bands were addressed *"Notify Biological Survey, Washington, D. C."* Two of these were seen on 29 November 1946 at FIDS Base E, and one was shot. The band was worn and the number not completely readable. More than 8½ years after banding, on 11 November 1949, another, 40/605604, was shot at Base E (Stonehouse, personal communication). This is a long time for survival of a butt-end band.

The butt-end bands used by FIDS prior to the 1955-56 season did not consistently stay on the birds, again like the Sheathbill bands perhaps because of ice formation. Now the 1955 double-inscription design is in use (Fig 1 D) (iv) ).

The Skua's circumpolar distribution, and its movements, are being studied during the IGY by Carl Eklund, leader and biologist at U. S. Wilkes Base on the Knox Coast. Eklund (1957) is supplying thermo-

plastic tarsus bands of various colors to other bases, and so far Argentina, Australia, Japan, Norway, the U. K. (FIDS Bases) and the U. S. S. R. have agreed to band skuas at their bases. FIDS has done this at Bases B, F and H and hopes to include G and J in the 1957-8 season. The Skuas marked with thermoplastic bands will also carry a metal band on the other tarsus.

Related species, the Arctic Skua, or Parasitic Jaeger *(Stercorarius parasiticus)*, and the Pomarine Skua, or Jaeger *(S. pomarinus)*, with Arctic breeding areas migrate to the southern hemisphere in the Arctic winter, and have recently been recorded as far south as the Antarctic (Sladen 1952a and 1954). *Catharacta skua* is the only bird species with breeding populations in both the Arctic and Antarctic. These populations are of different subspecies which are very difficult to distinguish in the field. We suspect that there is a movement of the Arctic subspecies to the Southern hemisphere in the Arctic winter, and of the Antarctic subspecies to the northern hemisphere in the Antarctic winter, which would be difficult to detect with unmarked individuals. Marking large numbers of them might well reveal such interesting movements.

For a study on the Brown Skua *(C. s. lönnbergi)* at South Georgia in 1953-55, FIDS biologist B. Stonehouse used bands supplied by the National Institute of Oceanography (Bargmann 1952) bearing the inscription *"Inform N.I.O. c/o Museum (Nat. Hist.) London"* (Stonehouse 1956a).

14. *Southern Black-backed or Dominican Gull (Larus dominicanus)*
*Band size recommended:—* 4 *Di*

Only a few have been banded by FIDS, but they are worth more attention because of their interesting range. The breeding range covers about 60° of latitude of the southern hemisphere, and is circumpolar in a broad subantarctic belt (Murphy 1936:1059). They are present at all FIDS bases and are usually seen in small numbers during the winter months. No recoveries of banded birds have been reported.

15. *Antarctic Tern (Sterna vittata)*
*Band size recommended:—* 2

Only a few have been banded at FIDS bases, and there have been no recoveries so far. Nothing is known about their movements, or their possible intermixing with other species of terns. The Antarctic Tern is almost indistinguishable in the field from the Arctic Tern, *S. paradisaea*, though Downes (1952) has recently given some good differentiating field characteristics from observations at Heard Island. Murphy (1936) summarized the records of the Arctic Tern wintering in the Antarctic pack ice; for more recent records see Friedmann (1945) and Bierman & Voous (1950). We see no reason why the Antarctic Tern should not migrate into the northern hemisphere during the Antarctic winter, but no specimen has yet been taken there. Dye coloring would be very suitable for Antarctic Terns especially if based on an international program.

TABLE X

*Birds banded in the Antarctic by FIDS from seasons 1945/6 to 1956/7.*

| Species | 1945 -1951* | 1951/2 | 1952/3 | 1953/4 | 1954/5 | 1955/6 | 1956/7 | Total |
|---|---|---|---|---|---|---|---|---|
| Adelie Penguin | 781 | 3 | — | 527 | — | 4 | 249 | 1564 |
| Chinstrap Penguin | 275 | 72 | — | 36 | 137 | — | 1 | 521 |
| Gentoo Penguin | 307 | 23 | 30 | 45 | 123 | 113 | 90 | 731 |
| Macaroni Penguin | — | — | — | 2 | — | 4 | 4 | 10 |
| King Penguin | — | — | — | — | 149** | — | — | 149 |
| Giant Petrel | 123 | — | — | — | 1 | 683 | 1222 | 2029 |
| Antarctic Fulmar | — | — | — | — | — | — | 1 | 1 |
| Cape Pigeon | 113 | 18 | 160 | 67 | 103 | — | 213 | 674 |
| Dove Prion | 2 | 127 | 131 | 26 | 138 | — | 141 | 565 |
| Snow Petrel | 59 | — | 97 | 15 | 37 | — | — | 208 |
| Wilson's Petrel | 12 | — | — | 8 | 4 | — | — | 24 |
| Black-bellied Storm-Petrel | — | — | — | — | 3 | — | 7 | 10 |
| Blue-eyed Shag | 61 | — | — | — | 14 | — | — | 75 |
| Sheathbill | 71 | 5 | 55 | 42 | 7 | 5 | 117 | 302 |
| Antarctic Skua | 10 | — | 26 | — | 16 | 42 | 217 | 311 |
| Dominican Gull | 8 | — | — | — | — | 12 | 23 | 43 |
| Antarctic Tern | — | — | — | — | — | 6 | 8 | 14 |
| TOTALS | 1822 | 248 | 499 | 768 | 732 | 869 | 2293 | 7231 |

*—Robert and Sladen, 1952:540.

**—The King Penguins were banded at South Georgia 1953-55 (Stonehouse 1956).

## FIDS BANDS USED OUTSIDE THE ANTARCTIC

1. *Falkland Islands.* In 1949-52 265 FIDS bands were put on the following 8 species of birds in the Falkland Islands: Gentoo Penguin—120, Magellanic Penguin *(Spheniscus magellanicus)*—4, Black-browed Albatross *(Diomedea melanophris)*—40, Belcher's Prion *(Pachyptila belcheri)*—41, Rock Shag *(Phalacrocorax magellanicus)*—46, Dominican Gull—6, Dolphin Gull *(Leucophaeus scoresbii)*—2, and the Falkland Islands Thrush *(Turdus f. falklandii)*—5.

Sladen banded 94 Gentoo Penguins and 1 Rock Shag between December 1949 and May 1951 and all the rest were banded by E. M. Cawkell in 1951-52. Some of the original Gentoo Penguins were recaptured in the same rookeries at Fox Bay and Sparrow Cove in subsequent seasons, but we have no records of recoveries or returns of other banded species.

2. *Gough Island.* Some size 5 *Di* bands supplied to the Gough Island Scientific Survey were put on about 220 adult and nestling Wandering Albatrosses *(Diomedea exulans)* during 1955-56 (M. Swales, personal communication). No recoveries have yet been published.

TABLE XI

*Summary of data from recoveries*

| Species | Banded when breeding: Recaptured in later breeding seasons: in original colony | at original nest-site | with original mate | Banded as nestlings: Ages (years) of youngest birds when recaptured in later breeding seasons: in original colony, but probably not breeding | breeding | Longevity of birds (years) | Survival of bands: Type of band (see Table I) | Years | Months |
|---|---|---|---|---|---|---|---|---|---|
| Adelie Penguin | many | some for 5th season | some for 4th season | — | 4 | 9+ | Leg Size 6 (1947) | 6 | 0 |
| | | | | | | | Flipper Size 6 (1947) | 7 | 0 |
| Chinstrap Penguin | many | yes | yes | 2 | 3 | 11+ | Tarsus Size 6 (1947) | 7 | 0 |
| | | | | | | | Flipper Size 6 (1947) | 5 | 0 |
| Gentoo Penguin | many | probably | probably | ? | 5 probably breeding | 5 | Leg Size 6 (1947) | 5 | 0 |
| | | | | | | | Flipper Size 6 (1947) | 2 | 11 |
| Macaroni Penguin | yes | no data yet | | — | — | 3+ | Flipper Size 6 (1953) | 1 | 2 |
| Giant Petrel | yes | yes | yes | none | none | 3+ | Size 5 *Di* | 1 | 9 |
| Cape Pigeon | many | many | yes | none | none | 9+ | Size 3 | 7 | 0 |
| Dove Prion | many | many | many | none | none | 5+ | Size 2 | 2 | 9 |
| Snow Petrel | many | many | yes | none | none | 10+ | Size 3 | 7 | 8 |
| Wilson's Petrel | yes | *many | *many | no data yet | | 8+ | Size 2 | 5 | 9 |
| Sheathbill | yes | probably | probably | ? | 2 | 5+ | Size 3 | 3 | 0 |
| Skua | †many | †in different site | †yes | no data yet | | **10+ | United States band | **8 | 8 |

Birds were banded around the tarsus, unless otherwise stated.
*Longevity:* it is assumed that birds banded when breeding were at least 2 years old at that time.
*Evidence from Roberts (1940). †Evidence from Stonehouse (1956a) that the Brown Skua *(C. s. lonnbergi)* returns to the same colony each year, but changes its nest-site. **An American band recovered by FIDS.

## CONCLUSIONS

The FIDS bird-banding scheme has been dependent upon, and improved by, the following factors: Permanent occupation of bases in the Antarctic and participation by many members of the expedition; long-term planning; radio communication between bases and, when needed, with FIDS headquarters and other expeditions; cooperation from other countries. The importance of international cooperation has been long established in bird banding. Birds of the southern oceans are mainly circumpolar in breeding distribution, and therefore need to be studied and protected on an international scale.

The following advice to interested expedition members, before their departure, has proved profitable: Specialists should concentrate on thorough investigations of single species, using banding as a foundation; birds that are known to have been banded in previous seasons in certain breeding places should be looked for carefully; a foundation should be laid for future population studies on marked birds of known ages by banding or web-marking each year large numbers of young birds (particularly penguins, which are ideal study subjects).

Antarctic and Subantarctic breeding species that migrate for long distances can be tentatively classified in the following way according to their types of movements: i) Those with circumpolar routes, e.g. the Giant Petrel, for which there are substantial banding data, the Albatrosses, and possibly the Prions (Bargmann 1952). ii) Those with north-south migration routes within the southern hemisphere, e.g. the Dominican Gull and Sheathbill. iii) Those with north-south routes that cross the equator, e.g. Wilson's Petrel and the Cape Pigeon. The Antarctic Skua and the Antarctic Tern also are suspected of having migration routes of type iii). The suspicion is based mostly on the fact that closely related species breeding in the Arctic migrate to the Antarctic. The terns are in particular need of banding because it is difficult to distinguish the Antarctic from the Arctic species in the field.

Giant Petrels banded by FIDS provided the first evidence that these birds follow a circumpolar route (Serventy 1948: Roberts and Sladen 1952), and, along with the excellent results of the Australian (ANARE) banding, more data continue to accumulate.

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## SUMMARY

The FIDS Bird Ringing Scheme originated in 1947, the first addressed aluminum bands being used in 1948. Three years before this, several hundred penguins had been marked with aluminum bands with reference numbers only. By the end of the 1956-57 season, more than 7,200 Antarctic birds of 17 species had been banded at FIDS bases (Table X). In the Falkland Islands an additional 265 bands were put on 8 species between 1949 and 1952. The Gough Island Scientific Survey 1955-56 also banded about 220 Wandering Albatrosses with FIDS addressed bands. Details of the kinds of bands used are given in Table I. Many of the species banded have been shown, for the first time, to return to their former nest sites after their long pelagic wanderings, and to keep the same mates in successive seasons (Table XI). Some of the recent circumpolar recoveries of the Giant Petrels are summarized in Table V and all the FIDS recoveries so far in Map II. A Chinstrap Penguin has been reported as at least 11, probably more, years old; a Snow Petrel at least 10 years old; Adelie Penguins and Cape Pigeons at least 9 years old. One of the first flipper bands put on an Adelie Penguin in 1950 was recently observed to be in good condition with no wear on the flipper after 7 years. Another band has been recovered on a Snow Petrel after nearly 8 years. A McCormick's Skua banded by the U. S. Antarctic Service Expedition in 1941 was recovered by FIDS more than 8½ years later when the bird was at least 10 years old. Other data on longevity and on survival of bands are given in Table XI. The importance of international cooperation, and of conservation of Antarctic wildlife, are emphasized.

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