

## THE OCCURRENCE OF MOTTLED PETRELS IN THE BERING SEA\*

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**Abstract:** We summarized seabird census data from five research cruises, 1979 to 1985, in order to clarify the distribution of Mottled Petrels (*Pterodroma inexpectata*) in the Bering Sea.

The northward incursion of Mottled Petrels into the Bering Sea occurred during the period from late June to mid-July. Most petrels were restricted to the central Aleutian Basin, where surface water temperatures were about 5.0–10.9°C.

The number of Mottled Petrels in the Bering Sea was estimated to be about 1500000 birds.

### 1. Introduction

The Mottled Petrel (*Pterodroma inexpectata*) is one of the least known seabirds in the subarctic North Pacific region. With grayish upperparts and whitish underparts, the bird blends with its cloudy and foggy background (Fig. 1), and it readily avoids ships at some distance. These factors have contributed to the lack of information on the species in the northern as well as southern hemispheres.

The Mottled Petrel was first reported in the Bering Sea by KENYON and PHILLIPS (1965), who saw 28 birds on 25 July 1961, at 55°28'N, 175°25'W. Since then, many seabird workers have reported small numbers in oceanic waters of the Bering Sea (SHUNTOV, 1972; WAHL, 1978; AINLEY and MANOLIS, 1979; GOULD *et al.*, 1982). GOULD *et al.* (1982) described the species to be uncommon. AINLEY and MANOLIS (1979) described the entire range of the Mottled Petrel from the Antarctic to the Bering Sea, based on many scattered sight records, and established this bird as a common May–October resident in the subarctic North Pacific. Though they noted the species' presence in the Bering Sea, the data were not sufficient to provide much detail.

In this paper, we report the occurrence patterns of the Mottled Petrel in the Bering Sea by summarizing systematic seabird observations on five research cruises 1979–1985.

### 2. Census Method

Birds were censused from the bridge wing or flying bridge using a 10× binocular. Individuals were counted to a distance of 200 m, in a 180° arc from bow to stern. Sighting was usually done from the leeward side of the ship. At sea conditions  $\geq$  Beaufort 4 or

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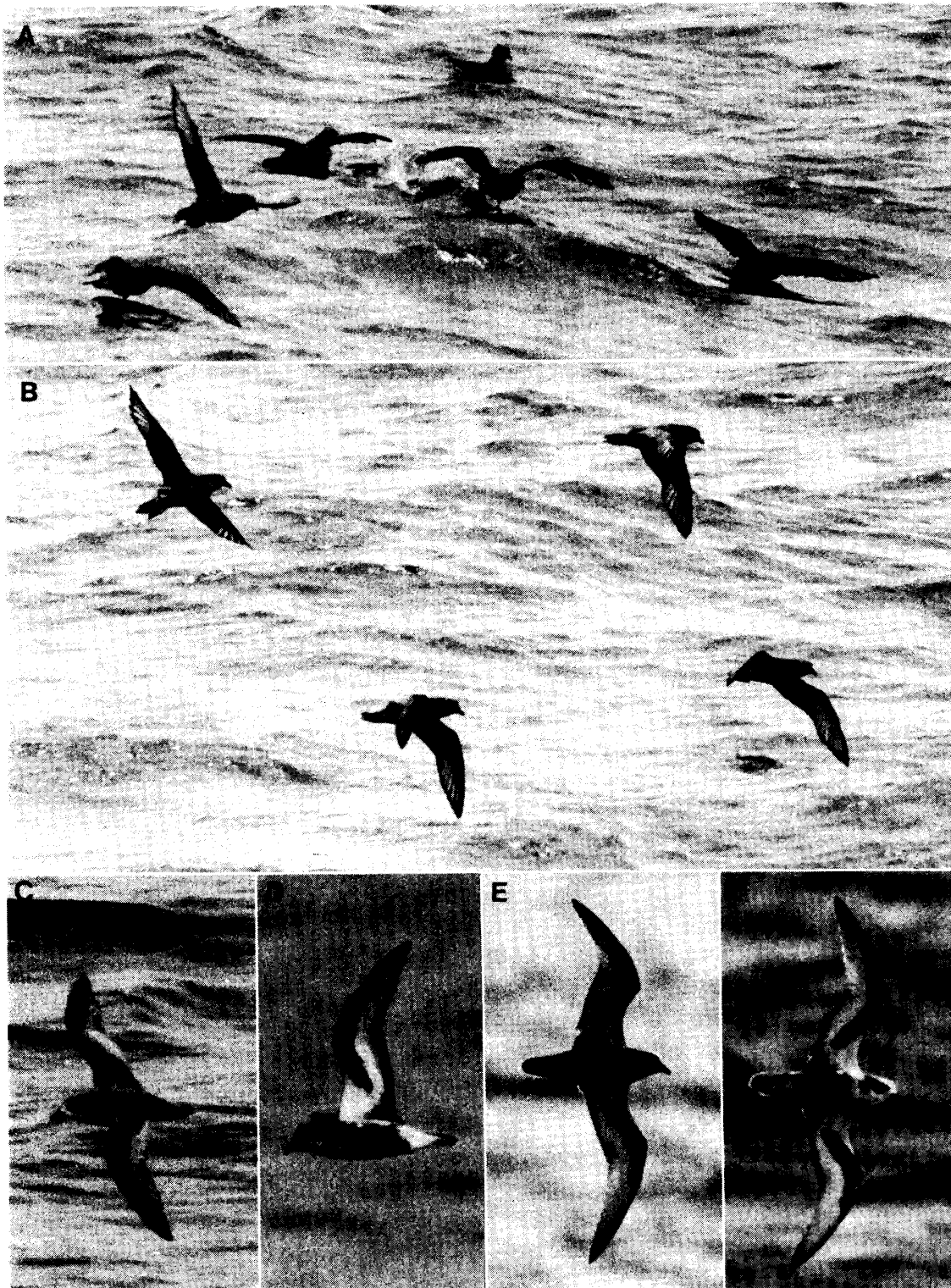


Fig. 1. Mottled Petrels in the Bering Sea. A: taking off; B: flying at low altitude; C: upperwing showing an open M mark; D, E and F: a conspicuous black bar on the underwing and a dark gray belly patch are excellent field marks. (Photos by H. OGI).

visibility  $\leq 100$  m, censuses were not conducted. Observation periods lasted 30 minutes, with 30 minutes recesses between each.

Observation periods were carried out on a straight course; if the ship changed course, a new period was started. For each census period, we calculated the total number of birds by species per distance traveled and per area (km<sup>2</sup>) surveyed.

The census area consisted mainly of the central Aleutian Basin (Figs. 2 and 3). In 1985, however, our research extended further onto the northeastern Bering Sea shelf. In this paper, the central Aleutian Basin and the northeastern Bering Sea shelf refer to the "pelagic area" and "shelf area", of the Bering Sea, respectively.

### 3. Results and Discussion

In general, the influx of Mottled Petrels into the Bering Sea begins during early to mid-July, with numbers increasing until mid-August. In fact, from mid-August to early September 1985, Mottled Petrels accounted for 11.4% of the total seabirds censused and ranked fourth in abundance among all species seen. Thus, it was a principal species in the pelagic area of the Bering Sea from mid-summer to mid-autumn.

Dates of first sighting for Mottled Petrels were as follows: 6 July 1979 (54°59'N, 174°38'E), 16 July 1980 (56°00'N, 179°19'W), and 9 July 1981 (53°06'N, 172°20'E). WAHL (1978) reported them at 55°N, 180° on 25 June 1975. In 1983, the species was completely absent in the pelagic waters from late June to early July (Fig. 2D).

In the years 1979 to 1981, areas and periods covered were almost identical and the data gathered allow us to describe the species' distribution, especially during July. In 1979, Mottled Petrels were observed in 40 of 78 transects (Fig. 2A) and 10 or more birds were found in 10 transects at the eastern corner of the survey area along the continental slope. In 1980, Mottled Petrels were observed in 32 of 166 transects (Fig. 2B) and in 1981, 21 of 162 transects, with fewer than 5 individuals in any transect (Fig. 2C). In 1985, only one Mottled Petrel was seen on 74 transects over the shelf, but in the pelagic area, they were observed on 133 of 204 transects (Fig. 3). During three days from 30 August to 1 September in the pelagic area, Mottled Petrels were seen in all transects. A total of 1232 individuals, or 75.2% of all petrels in the pelagic area were seen on these three days. On 30 August, densities ranged from 1.5 to 115.9 birds/km<sup>2</sup>, and averaged 24.6 birds. Obviously, Mottled Petrels in the Bering Sea prefer the deep oceanic waters off the continental slope.

In the Bering Sea, Mottled Petrels occurred where water temperatures ranged 5.0–10.9°C (Table 1), but highest numbers occurred at 8.3–9.1°C (Fig. 4). In the northwestern North Pacific off the Kuril Islands, 1–7 September 1983, the Mottled Petrel accounted for 21.5% of all seabirds observed (OGI, unpubl. data); surface temperatures ranged 11.7–13.8°C, having a prominent dichothermal layer beneath the sea surface. This temperature range is slightly higher than that measured where Mottled Petrels occur at high density in the Bering Sea and North Pacific Ocean (HAMILTON, 1958; KURODA, 1960; NAKAMURA and TANAKA, 1977; AINLEY and MANOLIS, 1979; this study). The birds observed off the Kurils were probably southward migrants.

As described above, the Mottled Petrel is one of the important seabird species during late summer in the Bering Sea. Regional density, mid-August to early September 1985,

Table 1. Results of Mottled Petrel observations, 1979 to 1985.

Period (Ships name)	Sighting area	Total sighting time (h: min)	Total sighting distance (km)	Total sighting area (km <sup>2</sup> )	(A) Total birds observed	(B) Mottled Petrels observed	Percent Mottled Petrels [(B)/(A)] × 100	Total No. birds/km <sup>2</sup>	No. Mottled Petrel/km <sup>2</sup>	Sea surface temperature (°C)
6-31 July 1979 (R.V. HOYO MARU No. 67)	Pelagic	68 : 20	1128.42	208.94	4977	244	4.90	23.820	1.167	6.1-8.6
9 July-2 August 1980 (R.V. HOYO MARU No. 81)	Pelagic	87 : 10	1535.12	257.64	5251	61	1.16	20.381	0.237	7.2-10.5
9 July-6 August 1981 (R.V. HOYO MARU)	Pelagic	103 : 22	1850.14	296.65	7681	31	0.40	25.892	0.105	5.0-10.9
24 June-4 July 1983 (C.B. YAE MARU No. 21)	Pelagic	38 : 41	988.58	142.96	1916	0	0	13.402	0	5.1-7.6
13-15 August and 22 August-4 September 1985 (R.V. HOYO MARU No. 12)	Pelagic	126 : 22	2144.64	380.79	14372	1639	11.40	37.743	4.304	8.3-9.6
15-21 August 1985 (R.V. HOYO MARU No. 12)	Shelf & slop	48 : 27	965.69	170.47	18189	1	0.0054	106.699	0.005	8.7-9.2

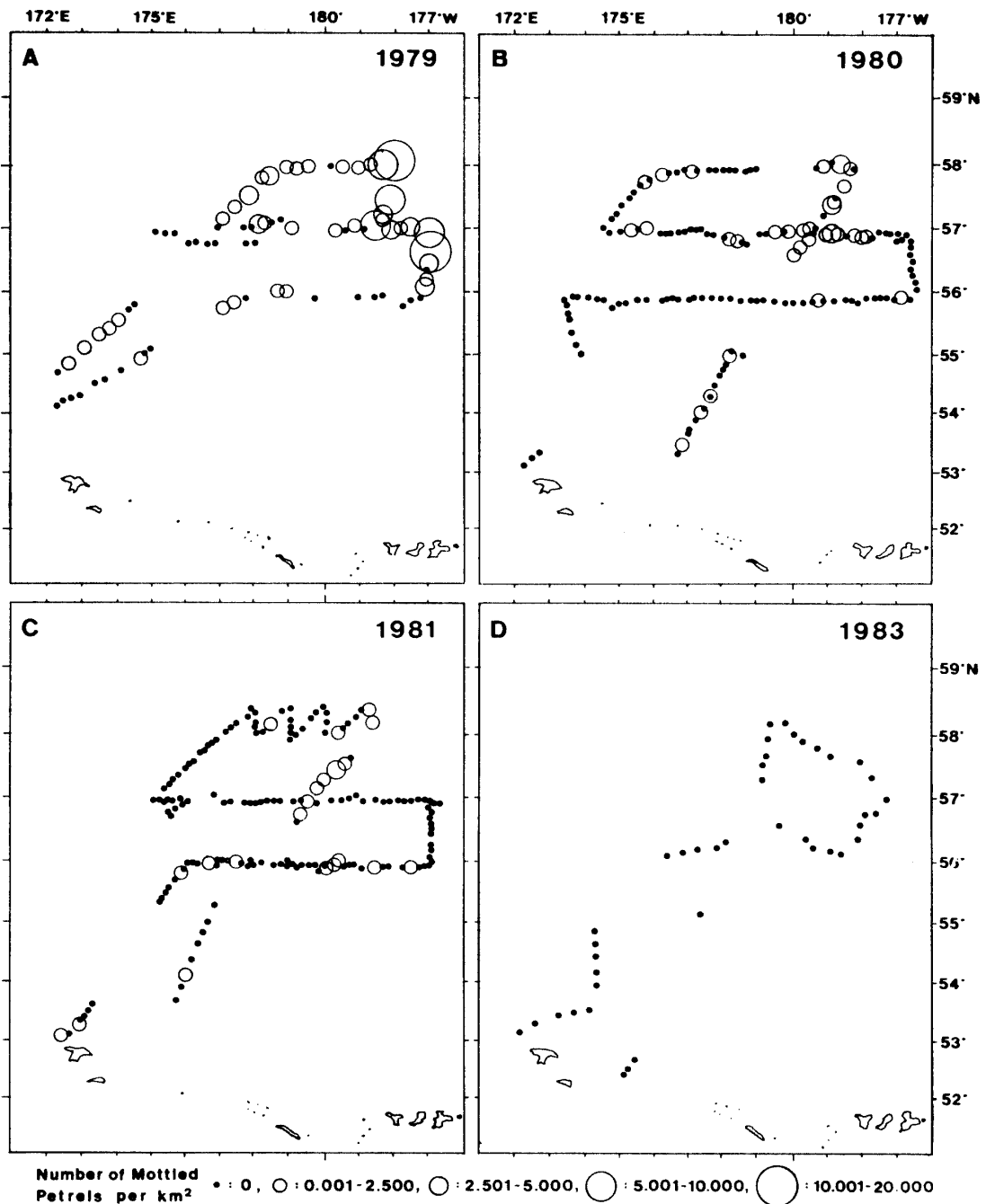


Fig. 2. Densities ( $N/km^2$ ) of Mottled Petrels on transects in the Bering Sea. A: 6-31 July 1979; B: 9 July-2 August 1980; C: 9 July-6 August 1981; D: 24 June-4 July 1983.

is illustrated in Fig. 4. Based on the density values in the grids, we estimated the total number of Mottled Petrels present. Totals on a latitudinal scale were also calculated (Fig. 4). We estimate that 1500000 Mottled Petrels may frequent the Bering Sea during summer.

Based on our at-sea observations, Mottled Petrels were not aggressive toward other species during feeding, resting or flying. In fact, when we held a live, vigorous Mottled

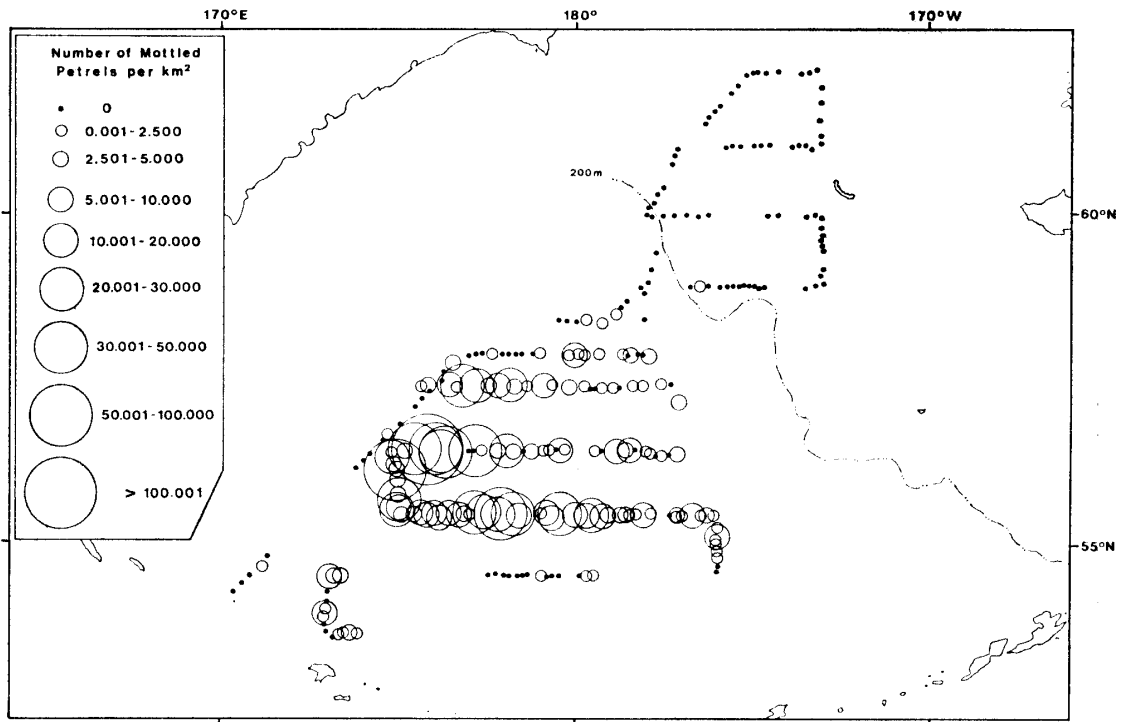


Fig. 3. Densities (N/km<sup>2</sup>) of Mottled Petrels on transects in the Bering Sea, 13 August-4 September 1985.

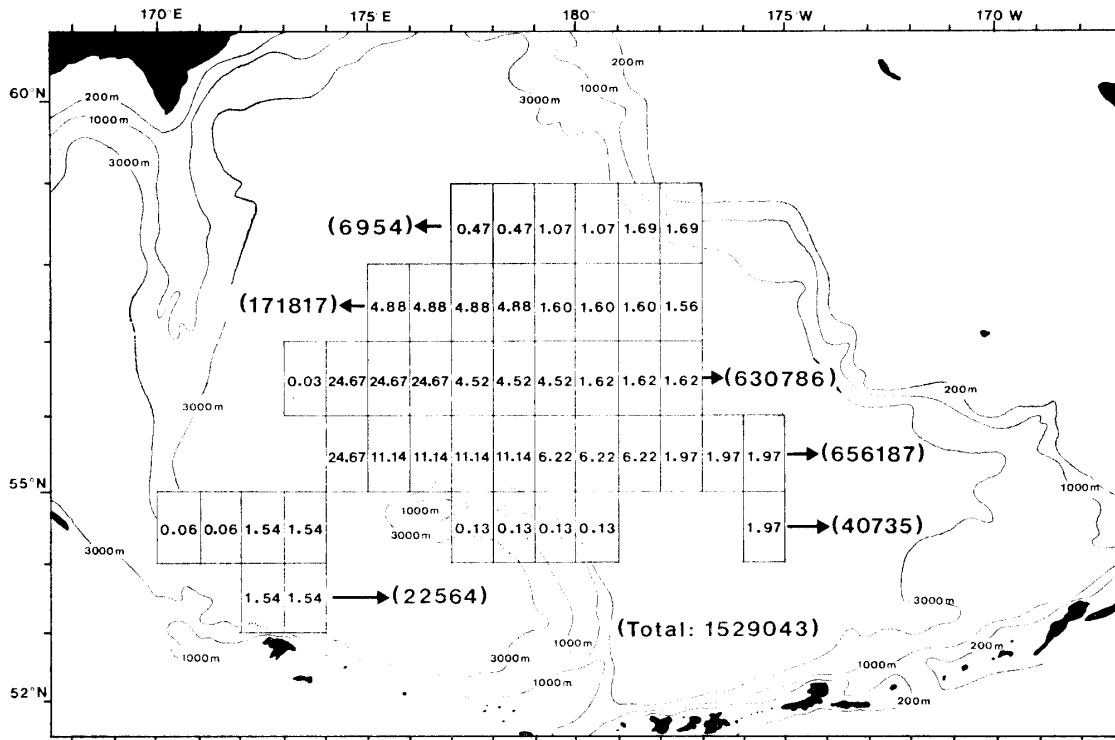


Fig. 4. An estimate of Mottled Petrel numbers during late summer in pelagic waters of the Bering Sea, 1985. Figures are expressed as average densities per km<sup>2</sup> in one degree latitude × longitude blocks; those shown by arrow denote estimates by latitude.

Petrel, the bird's pecking was weak compared to other seabirds we have held. This was, thus, consistent with its behavior, and its apparent tendency to differ from other seabirds. During summer in the Bering Sea, about half of the total seabird population is comprised of breeding birds which frequent shelf and coastal areas near islands (SOWLS *et al.*, 1978). During the reproductive season, the number of seabirds frequenting oceanic waters is minimal. These oceanic waters may thus be ideal for Mottled Petrels; they can exploit available food without much competition from other seabird species.

#### Acknowledgments

We would like to thank to D. G. AINLEY, Point Reyes Bird Observatory, California, and J. P. DOYLE, University of Alaska, for their helpful discussion and criticism of the manuscript.

This work was supported in part by a Grand-in-Aid for Scientific Research from the Ministry of Education, Science and Culture of Japan (Project Nos. 58030053, 59030060 and 60030060).

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(Received June 11, 1986)