

Chapter 2

The Asian Race of the Marbled Murrelet

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Abstract: We present here an overview of the ecology, abundance, and distribution of the subspecies of the Marbled Murrelet inhabiting the coasts of Asia. In most regards, the species is similar to the North American race with respect to its feeding, breeding, molt, and habitat ecology. It is, however, a migratory species, moving into southern parts of its range in the Sea of Okhotsk during the winter. The population has not been censused, but may number in the tens of thousands. Populations in Asia are threatened by logging of breeding habitat, oil pollution, and gill nets.

During the last two decades, the attention of ornithologists has turned to the North American subspecies of the Marbled Murrelet, *Brachyramphus marmoratus marmoratus* (Gmelin), and they have gathered many data on the status and distribution of this poorly-known bird. On the other hand, relatively little information is available on the Asian subspecies of the Marbled Murrelet, *B. m. perdix* (Pallas). Recent work has suggested that this subspecies may actually be a separate species, the Long-billed Murrelet (*B. perdix*) (Friesen and others 1994a, Piatt and others 1994). This paucity of data is due in large part to the difficulty in reaching the remote areas where the species breeds. This information gap could also be partially explained by the sparsity of marine ornithologists working within the large territory of the Far Eastern region of Asia. In virtually all areas where ornithological studies have been conducted, Marbled Murrelets have been recorded.

Most data on the species comes from work on Sakhalin Island, the Kamchatka Peninsula, and the Low Amur River region. In most coastal areas of the Sea of Okhotsk (except for some small areas), ornithological studies have never been carried out.

The broad outline of the breeding range can be designated quite clearly (fig. 1), although the status of the species in the Koryak uplands is not clear. In the north part of its breeding range, most Marbled Murrelet records coincide with the borders of boreal coniferous forest, as established by Kistchinsky (1968b). The Asian subspecies, in contrast to the North American subspecies, is a migratory bird and leaves almost all of its breeding range in winter. It returns in early May to the southern parts of its breeding range (Nechaev 1986) and into northern parts at the end of May (Lobkov 1986).

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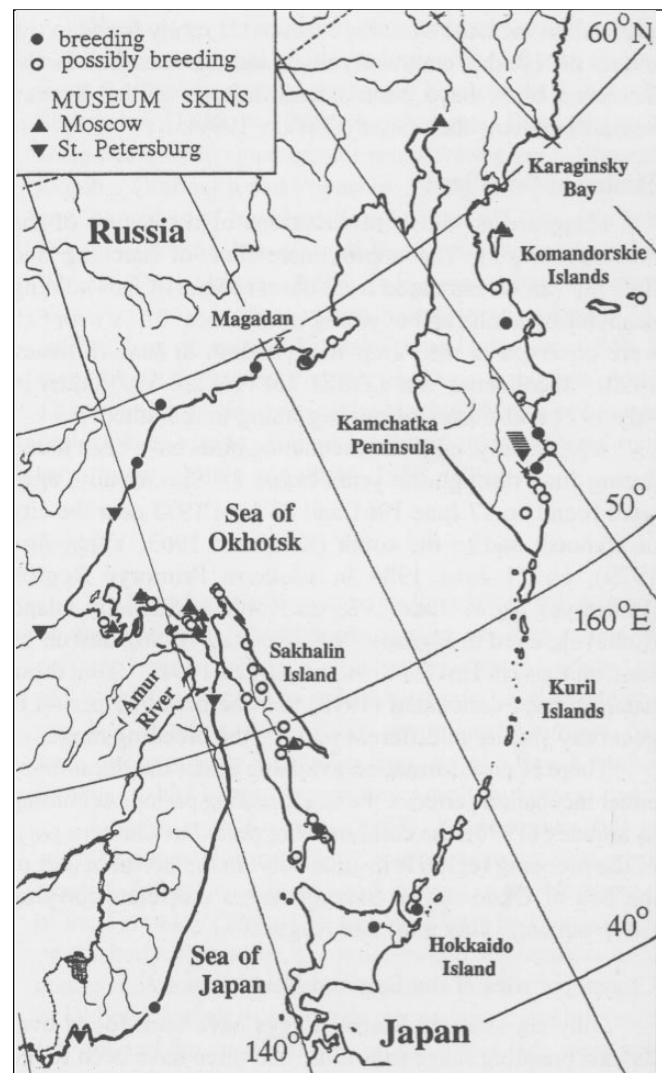


Figure 1—Distribution of the Asian race of the Marbled Murrelet (*Brachyramphus marmoratus perdix*) according to data obtained from literature and museum collections. Triangular symbols indicate collection locales of museum skins now in Moscow and St. Petersburg.

Methods

In order to collect data on the distribution of the Marbled Murrelet in the Russian Far East, the senior author has examined 36 specimens in collections of Zoological Museums, both of Moscow University (ZMMU) and Zoological Institute, St. Petersburg (ZMZI). We also have investigated the biology of this species by examining all available literature, and through field observations in the Sea of Okhotsk.

Breeding Biology

Pre-Laying Period

The wintering grounds of the Asian subspecies are thought to be situated around Hokkaido Island, Japan (excluding the shore of the Okhotsk Sea), and the northern part of Honshu Island (Brazil 1991). Although not identified with certainty as to subspecies, the Marbled Murrelet is rarely found in the waters of Kyushu, central Ryukyu, and the Amami Islands. Scattered birds have been noted inshore of the Korean Peninsula during the winter (Shibaev 1990).

Timing of Breeding

There are no direct observations of the length of the breeding season. The approximate time of hatching and fledging can be estimated from observations of fish-holding behavior by adults and of young birds at sea. Birds with fish were observed in the Amur River mouth in June (Shibaev 1990). A collected bird (ZMZI 168716/220-987) taken in July 1979 had a brood patch beginning to refeather.

Additionally, eggs and incubating birds have been found during June through the years (table 1). Specifically, eggs were found on 17 June 1961 and 23 June 1973 near the city of Okhotsk and to the south (Kuzyakin 1963, Yakhontov 1979), on 21 June 1984 in southern Primorye Region (Primorye), on 19 June 1976 on Northern Sakhalin Island (Labzyuk, cited in Shibaev 1990; Nechaev 1986), and on 15 June on Eastern Hokkaido Island (Brazil 1991). Using these data, Shibaev concluded (1990) that the breeding period is generally similar in different parts of the breeding range.

There is no information available about the duration of either incubation period or the chick-rearing period. According to Shibaev (1990), the chick-rearing period in southern parts of the breeding region is in June-July. In the northern part of the Sea of Okhotsk, we have observed murrelets carrying fish from early July until late August.

Characteristics of the Egg and Nest

Only six Marbled Murrelet eggs have been found over its vast breeding range in Russia, and three have been found on the island of Hokkaido. All of the eggs in Russia were found in the middle of June (table 1). Two of these eggs were taken from oviducts of females. One was collected on the

northwestern coast of the Sea of Okhotsk (58° 30'N, 141° 20'E) on 23 June 1977 (Yakhontov 1979), and the other on Semyachik Spit (54° 08'N, 160° 02'E), Kamchatka Peninsula, on 13 June 1993 (Ladygin, pers. comm.). The ground color of most eggs is bluish-green or greenish-blue. Small markings of pale brown, brown, and dark-cream or brownish-gray, usually less than 2 mm in diameter, congregate near the blunt end of the egg (Kistchinsky 1968b, Nechaev 1986, Yakhontov 1979). The pointed end is free of any marks (Kuzyakin 1963, Nechaev 1986, Yakhontov 1979). Three measured eggs had the following sizes: 63.6 x 39.3 mm and a weight of 48-50 g (Kuzyakin 1963); 63 x 38 (or 39) mm (Yakhontov 1979); 66.2 x 39.0 mm and a weight of 53.7 g (Nechaev 1986). The murrelet lays only one egg (Kistchinsky 1968b).

All four nests in Russia were found in larch trees (*Larix daurica*). The nest in the Okhotsk and Kukuchtui rivers area (in the vicinity of the city of Okhotsk) was 6-7 km from the shore, 7 m up on a branch with a broad base formed by growth of several small limbs (Kuzyakin 1963). The egg was laid on a piece of lichen (*Bryopodon*). The nest in the Olga Bay area was in a tree, in a rocky coastal cliff area, and 2.5 m out on a branch similar to the above nest according to Labzyuk (Shibaev 1990). The nest on Sakhalin Island was 2 km from Chayvo Inlet and 5 m up on the broken top of the tree. The fourth nest was found in the Koni Peninsula near Magadan city. Izmailov observed that the nest was 12 km from the shore and 7 m up in the tree (Kondratyev and Nechaev 1989). In Japan, three murrelet eggs were found on the ground in mixed coniferous/broad-leaved forest on Mt. Mokoto, 24 km inland from the Okhotsk Sea coast on the island of Hokkaido on 15 June 1961 (Brazil 1991).

Nest Attendance

During the breeding season, murrelets often fly over the forest and mountain summits uttering sharp shrill whistles. In the morning, birds call from 0500 until 0700, seldom as late as 0800. In the evening they call less often, beginning about an hour prior to dusk (Nechaev 1986).

From Shibaev's observations (1990), adults visit the nest during the darker periods of the day in these high latitudes. But in the northern part of the Sea of Okhotsk, we have observed Marbled Murrelets carrying fish during both the morning period and at times during the day.

Table 1—Descriptions of Marbled Murrelet eggs found in Russia

Date	Egg			Location found	Height from ground (m)	Distance to sea (km)	Source
	Length (mm)	Breadth (mm)	Weight (g)				
17 June 1961	63.6	39.3	48.0	larch tree	6.8	6–7	Kuzyakin (1963)
23 June 1973	63.0	39.0	—	oviduct	—	—	Yakhontov (1979)
19 June 1976	66.2	39.0	53.7	larch tree	5.0	2	Nechaev (1986)
21 June 1984	—	—	—	larch tree	2.5	0	Labzyuk (1987)
—	—	—	—	larch tree	7.0	12	Kondratyev and Nechaev (1989)
13 June 1993	56.2	39.3	—	oviduct	—	—	Ladygin (pers. comm.)

Young Birds

It is not clear how nestlings depart from the nest. As indicated earlier, nests can be situated close to or on the ground making it difficult for the young to take off. Some investigators believe that the young could use the nearest river or stream to reach the sea (Kistchinsky 1968a, Kuzyakin 1963).

There have been no descriptions of murrelet chicks in Asia. Young birds were found in late July 1976 on the fresh water Ozhabachye Lake on the Kamchatka Peninsula (Vyatkin 1981), in Mordvinov Bay, Sakhalin Island, on 6 August 1972 (Nechaev 1986), and in South Kuril Strait, Kunashir Island, on 8 August 1963 (Nechaev 1969). Two young birds were taken in Avacha Bay, Kamchatka Peninsula, on 9 and 18 August 1920 (Lobkov 1986). There are two skins of young birds in the Zoological Museum in St. Petersburg. These were taken from the Kamchatka Peninsula in the middle of August 1889 and in Aniva Bay, Sakhalin Island, on 23 September 1947. Four fledged young were collected close offshore near the foot of Mt. Mokoto, Hokkaido, in late August of 1982 (Brazil 1991).

Foraging

During the breeding period, the distribution of foraging Marbled Murrelets is linked to the estuarine ecosystems. They usually forage singly or in pairs, and rarely in groups of up to eight individuals. Near the southwest coast of the Sea of Okhotsk, birds fed from between 200-300 m to approximately 2-3 km offshore (Babenko and Poyarkov 1987). In Amur Lagoon they fed up to 5-10 km from the shore in brackish water (Shibaev 1990), the depth of which is 1-10 m. In the Kamchatka Peninsula, birds congregate in bays, especially large ones (Lobkov 1986, Vyatkin 1981). Near the Kuril Islands, they have been observed opposite sandy beaches, very close to the shore (Velizhanin 1977). During observations in Taui Liman area (in low-salinity water), birds foraged in shallow (5-20 m) inshore waters (Kitaysky, unpubl. data).

In addition to feeding at sea, murrelets forage in large freshwater lakes on the Kamchatka Peninsula. On Sakhalin Island, murrelets were found regularly on two brackish lagoons, Kronotskoe Lake (20-30 pairs) and Kurilskoe Lake (15-20 pairs) (Lobkov 1986, Nechaev 1986).

Only the remains of invertebrates were detected in the stomachs of birds collected in late June (the beginning of the breeding season) (Yakhontov 1979). Adult birds feed their chicks on fish (Kistchinsky 1968b, Shibaev 1990), though the exact composition of the diet is not known. We have observed birds feeding on both capelin (*Mallotus villosus*) and sand lance (*Ammodytes hexapterus*) in the northern Sea of Okhotsk.

There are no direct reports on the availability of food resources, but according to indirect sources, they are ephemeral. For instance, near Baydukov Island, birds were absent on 26 July 1985, although during the previous day their density there was about 10 birds per kilometer of travel

along the transect route (Babenko and Poyarkov 1987). High densities of murrelets in these areas are probably connected with aggregations of small fish, which are related to the complex dynamics of the oceanography in estuarine systems.

Migration

There is no information on visible observations of this murrelet's migration along the coastline. Birds disappear from the breeding range along the Kamchatka Peninsula in September (Lobkov 1986). In Ekaterina Bay, where they were common in summer, murrelets were gone by the end of October (Babenko and Poyarkov 1987). It is possible that a small number of birds reside in winter off Sakhalin Island (Nechaev 1986), but most of them migrate south to Japan (Brazil 1991, Shibaev 1990). It is possible that the species also winters in Alaskan waters based on a specimen (ZMZI 5033) taken on or near Kodiak Island in January 1845. It is more likely, however, that this bird was a vagrant. At least 13 specimens of this race of the Marbled Murrelet have been collected at various inland locations in North America in recent years (Sealy and others 1982, 1991).

Molt

We have little information on the molt of the Asian race of the Marbled Murrelet. According to data taken from collected birds, primary and rectrix molt of adults takes place between late July, when all birds have old feathers, and late October, when birds are in new plumage. Some birds, taken in early September from Avacha Bay, Kamchatka Peninsula, had begun their primary molt, but others had not.

According to Koslova (1957), "A complete fall molt starts in cases with some adult murrelets in the first week of August. A female collected on 7 August in the Northern part of the Tatarskiy (Tartar) Strait (Taba Bay) had fresh feathers on the belly. Primaries, secondaries and tail feathers had not changed. Another female collected on 31 August in the Sea of Okhotsk had all its primaries, secondaries, and tail feathers fall out and the small feathers in the lower side were still in the tube [sheath] phase. Other adult individuals are delaying molt and have the full breeding plumage on the last week of August (date of collection: 18 August from the Litke Strait and on 24 August from the Ayan) without any signs of molt".

The sequence of molt is variable, and birds do not lose all their primaries at once. They can possibly fly during early stages of primary molt. The primary molt begins from the inner end of the primaries. It is likely that greater coverts of the primaries are lost earlier than the primaries themselves. Specimens show a variable amount of loss of flight feathers during molt. Individual specimens have lost between three (ZMZI 159931/425-974) and ten old primaries (ZMZI 159933/425-974) during molt. On the other hand, there was a specimen taken in the Sea of Okhotsk on 19 August 1845 which had lost all its primaries and secondaries (ZMZI 5047), and was obviously flightless.

Rectrix molt begins just after the beginning of primary molt. They are lost outwards from the inner pair. Contour feathers likely begin to molt in September. Two birds taken in early September in Avacha Bay had definite alternate plumage, but their throats and cheeks were almost white. A very pale bird in alternate plumage was taken on Sakhalin Island on 20 March 1969. The ground color was almost white, and all dark colors were replaced by yellow-brown.

Shibaev (1990) describes a molting pattern in young birds as follows: “The change of nesting plumage into the first winter plumage takes place during September-October in young birds. The murrelets from the southern parts of the Far Eastern region of Asia, that had been collected in August, had a nesting plumage and had no signs of molt. The birds, collected in southern Primorye in the last week of October and in November, had changed from the nestling plumage into the first winter plumage already (excluding primaries, secondaries and tail feathers).”

Body Measurements

The Asian subspecies of the Marbled Murrelet is larger (*tables 2 and 3*) relative to the nominate race. This includes larger body mass (by about 50-70 g); larger culmen length (by about 5 mm); and larger wing length (by about 5-6 mm). See also Sealy and others (1982) and Piatt and others (1994) for discussion of body size characteristics.

Besides these mensural differences (Sealy and others 1982), these subspecies (or species) have differences in coloring of both their basic and alternate plumages. Jehl and Jehl (1981) noted that the North American Marbled Murrelet has a more rufous and darker alternate plumage than the Asian race, and has more pronounced spots near the eyes. In the basic plumage there is more contrast between the races (*fig. 2*). This can be seen by comparing pictures in field guides, for example Robbins and others (1983) and Wild Bird Society of Japan (1982). As with the basic

Table 2—Measurements of *Brachyramphus marmoratus perdix*, showing mean and range

Characteristic	Shibaev 1990		Stepanjan 1990
	Male	Female	Both sexes
Wing length (mm)	141.2 (136-147)	138.3 (130-145)	143.5 (133-150)
Bill length (mm)	20.2 (18.9-22.2)	19.0 (18-21)	—
Tarsus length (mm)	18.1 (17-18.7)	18.0 (16.8-19.0)	—
Weight (g)	295.8 (258-357)	—	—

Table 3—Measurements of *Brachyramphus marmoratus perdix* from museum specimens

Gender Characteristic	Mean	s.d.	n	Minimum	Maximum
Male					
Wing (mm)	147.2	3.7	5	141.0	150.0
Tarsus (mm)	18.2	-	1	-	-
Bill (mm)	20.0	1.4	6	19.1	22.8
Female					
Wing (mm)	145.0	7.2	10	130.0	156.0
Tarsus (mm)	18.8	0.6	3	18.4	19.5
Bill (mm)	20.3	1.3	7	19.0	22.2
Pooled data					
Weight (g)	287.0	41.7	5	258.0	358.0
Wing (mm)	144.4	7.3	24	126.0	156.0
Tarsus (mm)	18.3	0.6	8	17.4	19.5
Bill (mm)	20.5	1.3	21	18.4	22.8

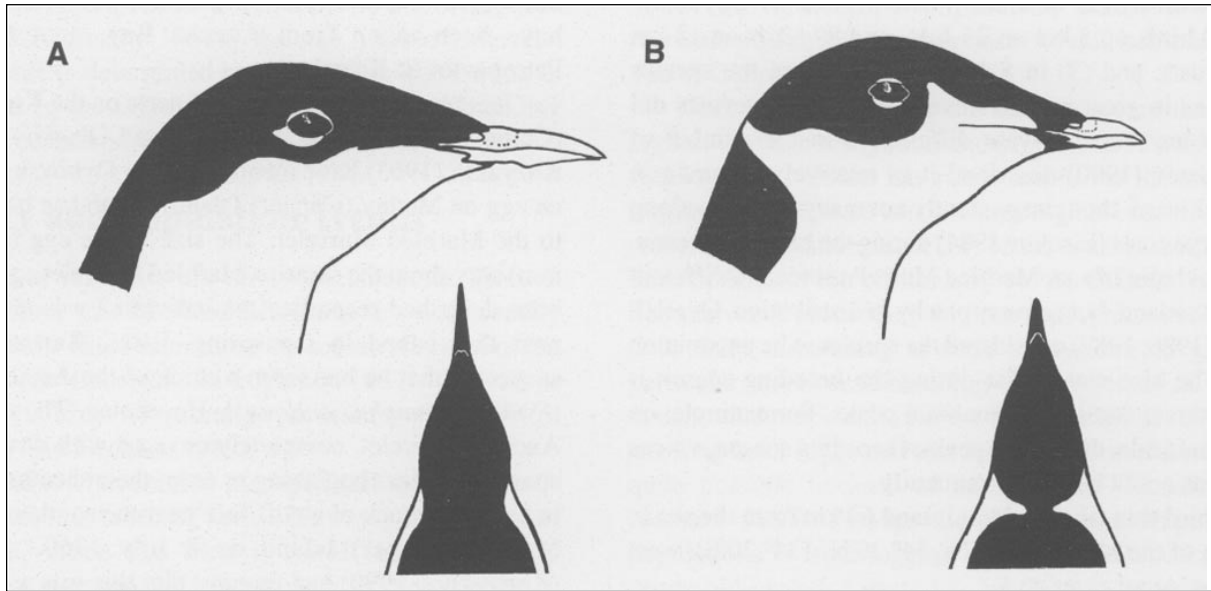


Figure 2—Basic plumage head patterns of the Marbled Murrelet subspecies: (A) Asian (or Long-billed) subspecies and (B) North American subspecies.

plumage, in the alternate plumage, the Asian race has more pronounced white eye spots. Also the border between white and dark brown on the head comes down to about the gape in the Asian race. Its upper mandible is dark and the lower is white. The chin is mainly white, but in some birds it is light gray.

In the North American race, some white is always present on its upper mandible. In different birds, white on the face extends up to before the eye, forming a crescent patch. The chin, in contrast to the Asian race, is always gray and more extensive.

The two races also differ in color of their tail feathers. In the Asian race, the outer vane of the outermost rectrix has a narrow, white marginal stripe. This stripe is especially pronounced in birds in fresh plumage. It might be absent in worn plumage because of abrasion. It is absent in the North American race.

There are also similar differences in the juvenal plumage. In the first winter, the young look like adults, but the border between dark and white coloring is not as sharp, and on the entire ventral side a slight wavy pattern is present (Carter and Stein, this volume).

Breeding Distribution and Abundance

The Asian subspecies is widely distributed around the Sea of Okhotsk, on the Pacific Coast of the Kamchatka Peninsula, and in the Kuril Islands (*fig. 1*). The southern limit for breeding is on the island of Hokkaido in northern Japan. It is rare in eastern Hokkaido during summer, and more common on the Sea of Okhotsk coast, especially near

the Shiretoko Peninsula (Brazil 1991). Observations of the murrelet from April-August in the area led to the assumption that it breeds in the region. This was confirmed when an incubating female and three eggs were collected on Mt. Mokoto in 1961. In late August 1982, four fledged young were collected close to shore near the foot of Mt. Mokoto (Brazil 1991).

The southern limit of this species in Russia is in the southern Primorye Region where a bird was taken in Peter the Great Bay during the breeding period at the end of May (ZMZI 157639/6-971). Another location where murrelets have been taken at least twice is the middle reaches of the Bikin River (Gluschenko and others 1986). In the Primorye Region, a nest has been found in the forest on the shore of Olda Bay (Labzyuk 1987), and murrelets have been observed on the water there over many years. Birds, both single and in pairs, are found at sea there until the middle of June (Labzyuk 1975). According to these authors, the Marbled Murrelet is quite uncommon near the southern limit of its distribution.

At present, there are only a few areas where the Marbled Murrelet is considered common. One area is the lower Amur River area, on the southwestern coast of the Sea of Okhotsk. This coastline from Cape Lazarev to Aleksandra Bay was inventoried for seabirds in the summer months of 1980-1982 and 1984-1986 (Babenko and Poyarkov 1987; Poyarkov, pers. comm.; Poyarkov and Budris 1991). Densities of murrelets averaged 0.5-2.0 birds per km of transect. Highest densities occurred between Baydukov Island and Aleksandra Bay. Lower densities were detected at the mouth of the Amur River and in Tatar Strait. The highest densities were found: (1) in Reynike Strait (300 birds on 2 km of transect)

on 3 September; (2) near the western point of Baydukov Island (50 birds on 5 km on 25 July, and 89 birds on 18 km on 1 August); and (3) in Schastye Bay, where the species congregates in great numbers every fall. The observers did not detect any between-year differences in the number of birds. Shibaev (1990) described it as relatively common in the Amur Liman, though apparently not many birds are along the Primorye coast (Elsukov 1984) during the breeding season.

On Sakhalin Island, Marbled Murrelets breed in different areas of the island, but are very patchy in distribution. Overall, Nechaev (1986, 1987) considered the species to be uncommon here, but he also stated that during the breeding season it often flies over forest and mountain peaks. For example, on Shmidt Peninsula, during the peak of breeding season, voices of 1-2 birds could be heard frequently.

One bird was taken at least inland 60 km from the sea in the mouth of the Maya River (ca. 54° 30'N, 134° 20'E), west of the Low Amur river area.

Despite the fact that Gizenko (1955) and Nechaev (1969) wrote that the murrelet is rare in the Kurils, later publications indicate differently. Marbled Murrelets at least breed on all of the forested Kuril Islands: Shikotan, Kunashir, Iturup, and Urup (Velizhanin 1977). Nechaev and Kurenkov (1986) said that calls have been heard from time to time all over Kunashir Island in June and July. Several pairs and separate birds were detected over the forest near Korotky Stream at dawn on Kunashir Island on 17 July 1983 (Gluschenko 1988). The species has not been recorded in the northern Kuril Islands (Podkovyrkin 1955). Since it also can nest in treeless areas (Hirsch and others 1981, Johnston and Carter 1985, Simons 1980), and breeds both on the southern Kurils and on Kamchatka Peninsula where it is common, we think that murrelets may nest on all the larger islands through the Kuril chain (fig. 1).

Near Magadan, this species is quite common in waters of Khmitievsky Peninsula, Tauyskaya Bay (Kondratyev and others 1992; Konyukhov, unpubl. data), and the Koni Peninsula (Leito and others 1991). The murrelet also is very common in Tauyskaya Bay in June through August. There we have found about 4 pairs per kilometer of coastline in June-July of 1991-1992. More than 200 birds were recorded in Nagaeva Bay (near Magadan) in June 1992 during a one-hour vessel trip along shore. In contrast, their abundance is very low along the northern coast of the Sea of Okhotsk (Kistchinsky 1968a, Yakhontov 1979).

On the Kamchatka Peninsula the murrelets are quite common. It has been recorded within the inshore waters of the eastern coast, north to Karaginsky Bay, where they were more numerous in the larger bays. Eleven pairs were observed during a 50-km transect from Zhupanovo village to the Zhupanovo River, at a distance of 1-2 km from shore, on 27 June 1973 (Lobkov 1986). Additional records are as follows: two in Asache Bay on 10 August 1972, four birds in Russian Bay on 13 August 1972; 52 birds in the southern half of Kronotsky Bay, from a ship over a 40-km transect on 16 June 1974; and two pairs were seen daily in Ukinskaya Bay

during May and early June (Vyatkin 1981). Many specimens have been taken from Avacha Bay, near the city of Petropavlovsk-Kamchatskiy.

It is possible that the species nests on the Komandorskie (Commander) Islands. Dementiev and Glagkov (1951) and Kuzyakin (1963) have mentioned that Dybovsky had found an egg on Medny (Copper) Island, which has been ascribed to the Marbled Murrelet. The size of the egg (62.5 x 41.2 mm) was about the same as Marbled Murrelet eggs that have been described recently. One individual was also collected near that island in the spring. Later, Kartashev (1979) suspected that he had there a chick of the Ancient Murrelet (*Synthliboramphus antiquus*). He wrote: "The chick of the Ancient Murrelet, completely covered with down and with contour feathers beginning to erupt their sheaths, was found in a narrow crack of a cliff face near the southernmost tip of Medny (Copper) Island on 8 July 1960." One of us (Konyukhov 1990) had thought that this was a chick of the Kittlitz's Murrelet (*Brachyramphus brevirostris*), but because of the possibility of nesting Marbled Murrelets on land in crevices (Johnston and Carter 1985), and absence of records of enclosed Kittlitz's Murrelet nests, the senior author now thinks that the chick found by Kartashev was that of a Marbled Murrelet. Recent studies have shown presence of this species in that area during the breeding season. One bird was observed in Lisinskaya Bay, Bering Island, about 300 m from the shoreline on 17 June 1993 (Artyukhin, pers. comm.).

Besides the nests noted previously, a breeding male was collected in Tayozhneya Bay in northern Primorye (Elsukov 1984) and a female with a developing egg was collected 200 km to the southwest of Okhotsk City (Yakhontov 1979). Adult birds carrying fish were recorded in the Amur Liman by Shibaev (1990), in the Tauyskaya Bay, and in the Tauy Liman (Kitaysky, unpubl. data). A fledgling with remains of downy feathers on its back was also observed by Kitaysky (unpubl. data) inshore of Zavyalova Island, in the northern part of the Sea of Okhotsk. An unidentified murrelet fledgling (perhaps *B. m. perdix*) was observed near Talan Island (Kondratyev, pers. comm.).

Forest Habitat

On Sakhalin Island, the species breeds in coniferous and mixed forests, both on the plains and in the mountains as follows: in the interior of the island, Nechaev (1986) recorded birds in flocks of 2-3, and sometimes four, in the upper reaches of the Onor River (30 km from the Sea of Japan) on 29 June 1977; near the foot of Lapatin Mountain (30-40 km from the Sea of Okhotsk, at 600-700 m elevation) on 16-17 July 1977; near the top of Krasnov Mountain (20-30 km from the Sea of Japan, at 500 m elevation) on 21-22 July 1987; and on the northern slopes of Nabil Mountain in the Shmidt Peninsula on 4-7 August.

In the lower Amur River area, where Marbled Murrelets are numerous, the seaward slopes of the mountains are covered with coniferous forests, while the boggy level shore is covered

with larch forest (Babenko and Poyarkov 1987). It has been suggested (Kistchinsky 1968b) that the Marbled Murrelet breeding range is determined by taiga forest distribution in coastal areas of the region. Indeed, all nests and breeding birds observed to date have been in forested areas.

Mortality and Population Trends

Sources of mortality are rarely documented. There is one observation that Marbled Murrelets are occasionally shot by hunters. This occurred on the southwest coast of the Sea of Okhotsk (Babenko and Poyarkov 1987). There have also been records of plumage contamination by oil (Kondratyev and Nechaev 1989).

Most authors have noted that the Marbled Murrelet is rare throughout its breeding areas. This may be a result of perspective, since the bird is small and relatively inconspicuous, as compared to other seabirds. No quantitative data exist, other than in small areas. Total population size is probably in the range of tens of thousands. No information exists to assess population trends.

Conclusions

Although Marbled Murrelets are widely distributed and relatively common in the Far Eastern region of Russia, to date we know little about the abundance, status, or main characteristics of the ecology of the Asian race of the species. Under these circumstances, it is impossible to say much

about the murrelet's population status or to make recommendations for management of this subspecies in the Sea of Okhotsk.

Unfortunately, during the last few years the situation regarding the investigation and protection of wildlife in the former Soviet Union has taken a turn for the worse. It is important that Russia establish ecological control of natural resource exploitation, especially on the oceanic shelf. Intensive development of the oil industry on the Okhotsk and Bering Sea shelves is proceeding without appropriate control and is potentially threatening to shelf ecosystems in general. In particular, the overall breeding distribution of *B. m. perdix* matches the proposed areas for intensive oil development. It has long been suggested that increased murrelet mortality is quite possible because of oil pollution (Kondratyev and Nechaev 1989). Perhaps the greatest immediate threat to populations is from logging of forest habitats. Logging of prime old-growth forests has accelerated in recent years - particularly on Sakhalin Island and the Kamchatka Peninsula, where companies have recently been granted logging rights over large tracts of virgin forest. This logging activity is apparently without regard to wildlife considerations. Ecological impacts of this industry are in need of investigation.

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P A R T II

Nesting Ecology, Biology, and Behavior



