

Biological notes on the Emperor Goose in north-east Siberia

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Introduction

The Emperor Goose *Anser canigicus* is one of the rarest and least known waterfowl species in the U.S.S.R. Its breeding range is very restricted, and total numbers are low. Further, the ecological peculiarities of the Emperor—one of the most maritime of geese—are interesting and too little known. Some biological observations on the Emperor Goose in the Asiatic part of its area were made by Palmén (1887), Portenko (1939), etc. All data known up to recent times on its distribution and breeding on the Chukotsky Peninsula, are summarized by L. A. Portenko in the monograph *The Birds of the Chukotsky Peninsula and Wrangel Island*, now in press. Considerably more biological information was obtained in Alaska and on St. Lawrence Island (Bailey 1925, 1943, 1948; Conover 1926; Brandt 1943; Murie 1959; Gabrielson and Lincoln 1959; Fay and Cade 1959; Fay 1961), and in recent years there have been many new observations in Alaska,

unfortunately still unpublished (P. Lent, C. J. Lensink, pers. com.).

In summer 1970, we had an opportunity to see Emperor Geese and to collect new biological data near the northern limit of the species' range—on the northern coast of the Chukotsk Peninsula between the mouth of the Anguema river and Wankarem. These data are presented in this paper.

Distribution (see map, Figure 1)

The Emperor Goose breeds in the U.S.S.R. along the shores of the Anadyr Gulf and Chukotsk Peninsula westwards up to Anguema lagoon, but we do not know of any areas where its numbers are high. On the Yukon-Kuskokwim Delta (west coast of Alaska), where Emperors are most numerous, breeds the majority of not only the North American (C. J. Lensink, pers. com.) but probably of the world population of the species.

We have discovered breeding places of the Emperor Goose and considerable

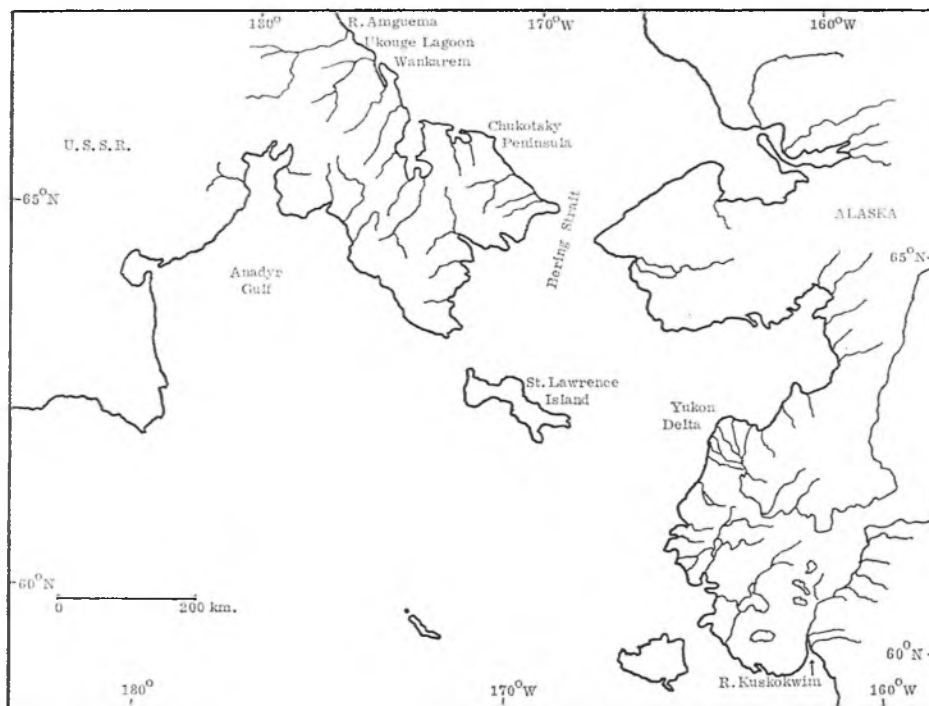


Figure 1. Map of Emperor Goose breeding areas in U.S.S.R. and Alaska.

concentrations of pre-moult non-breeders on the shores of Ukouge lagoon (25 km. eastwards from the Amguema mouth). Flocks of non-breeders were met with along the entire coast surveyed. Further to the west, Emperors probably do not occur. However, Spangenberg (1960) mentioned several pairs observed in the mouth of the Kolyma river. Whether the species breeds there, and if so how regularly, is not known.

Habitats

In the flat tundra of northern Chukotsk, one may distinguish two main types of habitats important for the Emperor Goose.

Low shores of coastal lagoons are bordered with a strip of grassy tundra (salt meadow) from several metres to one or two km. wide. This is distributed as far as tidal waters can flood into the ponds connected with the lagoon. Due to the constant influence of tidal water, soils are more or less salty here. This terrain is covered by wet, short-grass tundra dominated by *DuPontia psilosantha*, in some places also by *Carex subspathacea*; besides, there grow in lesser quantities *Cochlearia arctica* and *Stellaria humifusa*. There are many small and large brackish ponds. This meadow 'lagoon' tundra is practically the only habitat of Emperors (as well as Black Brants *Branta bernicla orientalis*) out of the breeding period.

Further from the sea, beyond the tidal influence, this tundra is replaced by rolling inland moss-sedge tundra with freshwater ponds and lakes. Plants typical of the former habitat are absent here, and sedge *Carex stans* predominates—the most important food of the geese. In this inland tundra Emperors nest, and these breeders feed on the spot.

As far as we know, these two types of habitat are used by Emperors throughout their summer range. In its southern parts (Yukon-Kuskokwim Delta) geese nest in the lagoon tundra as well but inland tundra between the tidal meadows and the upland is preferred (Conover 1926; Lensink, pers. com.). In the extreme north of the area, nesting in lagoon tundra is practically impossible because during the egg-laying period it is too wet, and large portions of it are still under ice and snow.

Ecological notes

Arrival

On the shores of the Anadyr Gulf, Emperors arrive in the middle of May (Portenko 1939), and in the Bering Strait

area and in Chukotsk at the end of May and early in June (Belopolski 1934; Bailey 1943; Portenko in press). In 1879 members of the *Vega* Expedition first noted Emperors near Kolyuchinskaya Bay on 13th-17th June (Palmén 1887). We saw our first geese on 7th June and on 8th-12th June couples and small groups were met with regularly. No marked migration occurred here, near the northern range limit.

According to Bailey (1943) and May and Cade (1959), for a few days on arrival (before lakes become free of ice) the Emperors stay along the shore-ice where they forage among the kelp thrown up by the waves. There was no such thing on the heavily iced Chukotsk Sea.

For the first five days, Emperors occurred in the wet lagoon tundra in small flocks (four to five birds) in which one could easily distinguish pair bonds already formed. The flocks fed together and rested, swimming on lakes or roosting on large tidal mudflats.

Breeding

We did not see any forms of courtship behaviour; they probably took place during migration. Having arrived, Emperors began to breed. Already on 8th June we took a female which had laid two eggs and had two other large follicles in the ovary. Two incomplete clutches were found on 17th June; next day both of them were finished containing two and nine eggs. Hence, egg-laying in the comparatively early spring of 1970, began on 6th-16th June, that is on the whole several days after that of White-fronted Geese *Anser a. albifrons*. The *Vega* expedition found clutches (three to six eggs) eastwards of the Kolyuchinskaya Bay on 30th June - 9th July (Palmén 1887), and Kuzyakin (1965) near Uelen on 29th June. Further south, in the Yukon-Kuskokwim Delta, nesting begins earlier, at the end of May and in the first days of June (Conover 1926; Brandt 1943; Headley 1967, etc.).

Breeding pairs were observed not further than five to six km. from sea or lagoons, that is only in the zone where short-grass lagoon tundra occurred. However, nests were not made there but in the wet inland moss-sedge tundra rich in ponds. On the typical area of 40 sq. km. studied in detail (near Ukouge lagoon) there were three pairs. In this inland tundra White-fronted Geese bred as well (with density five to six times as high) but there were no Brants.

In the eastern part of the Chukotsk Peninsula, Emperors with downy young were seen by Portenko (in press) on the Uttaweyem river among the foothills but not too far (20-30 km.) off the sea.

Two nests we studied were made two and a half kilometres from the lagoon and 600 m. apart. The first nest (nine eggs) was located 20 m. from a lake, on a tussock among wet moss-sedge tundra; the other one was on a rather dry edge just beside a pond. Within 100 m. of the first nest, in the same wet tundra near the lake, there was an Emperor's nest of the previous year containing old feathers and egg-membranes. Within 125 m. of the second nest there was a nest of a White-fronted Goose.

The nests were lined with dry sedges, cotton-grass, feathers and down; although they were made in a very wet tundra, the bottoms of the nests were dry. Nest sites and pattern of building were the same as usually described (Conover 1926; Brandt 1943; Bailey 1943; Gabrielson and Lincoln 1959; etc.). Nests were located in wetter places than those of White-fronted Geese. Feathers and down at the end of egg-laying were scarce but during the time of incubation geese continued to pick them and to improve the nest bed. Similar data were obtained in Alaska (Brandt 1943). Nevertheless, even by the end of incubation, the downy 'pillow' under the eggs was not so thick and soft as that of Whitefront or Brant nests.

Both the adults spent most time at and near the nest. The female incubated eggs and the male as a rule stood or fed in the grass within 10-100 m. of the nest. However, sometimes the male was absent from sight but if the incubating bird was disturbed he appeared shortly after this. During all the incubation time a pair bond keeps its entity, although a male can fly rather far to the feeding grounds, join flocks of non-breeding birds for some time or, according to Bailey (1943), congregate with other breeding geese.

The female on leaving the nest without alarm pulls the mantle of down and grass over the eggs. The reaction of geese to an observer's approach is interesting. The brooding bird presses close to the nest with neck outstretched forward or sideways like a stick; her head is perfectly concealed among sedges. One can approach to within 10-20 m. more often 50-300 m. (the limit is influenced by weather, time, stage of incubation, observer's caution, etc.). After this the female leaves the nest and silently, bending to the ground with head

stretched, goes across the sedges to the water. Not being disturbed further, the bird and the gander if he is not too far, swim or go away 100-150 m. from the nest and begin to walk to and fro nibbling sedges. When quietening, the geese little by little approach the nest, but often stop and start to feed again. Finally, after half an hour to an hour, they come to the nest. The female turns the eggs, sits down and stretches her head, while the male stays nearby.

If the geese are heavily disturbed, they move a few metres after leaving the nest, then flush and go away out of sight, flying low over the ground. After 20-40 minutes, they return just as low as before, land several hundred metres from the nest, start to feed and, if the cause of alarm is no longer present, perform the same pattern of approach to the nest. If geese are disturbed during the 'walk-feed' stage or while returning to the nest, they retreat or fly away again.

Once we observed, after geese were frightened from the nest, a neighbouring pair of Emperors were also uneasy around their nest. Brandt (1943) reports similar facts. Nests are sometimes separated by only hundreds of metres or even only tens of metres (see also Conover 1926; Headley 1967). It seems that although the Emperor cannot be considered as a 'colonial' bird, a degree of gregariousness is not alien to it.

In our nests young began to hatch on 11th-12th July, and on 13th July hatching was finished. Thus, incubation time was 25 days.

On the days of hatching, the weather was usual for the time, cold (2° to 5°C.) and stormy. During the last two days, the Emperors incubated especially strongly and after leaving the nest, returned in a few minutes. Hatching eggs usually had the holes facing the downy 'pillow'. Nevertheless, nesting success was very low. Embryos did not develop in three eggs out of eleven, and five goslings died of cold in the first hours of life or even during hatching. At the same time, however, young of Whitefronts successfully hatched. We did not find their downy young dead, and the mean sizes of clutches and broods observed were equal. It seems that poor resistance of the young to cold and the restricted heat-insulating properties of the nest limit further penetration of Emperor Geese to the north.

The time of hatching in the studied area was probably the latest. In the eastern part of the Chukotsky Peninsula

and on the shores of Kotzebue Sound, downy goslings were observed 7th-11th July (Bailey 1948; Portenko, in press), and on the Yukon-Kuskokwim Delta the young were produced at the end of June and early in July (Conover 1926; Brandt 1943; Gabrielson and Lincoln 1959; Headley 1967).

Just after hatching, both the adults led downy young to the water, a fact noted by all researchers. Emperors from one pair during one day after hatching kept their gosling within 100-300 m. of the nest, walking across the tundra or swimming on lakes. Sometimes, one or both adults left their young and fed 100-150 m. away. The goslings lay hidden in the grass or swam on a pond together with two Long-tailed Duck *Clangula hyemalis*. Later, the family gathered again. When an observer approached, one goose flew around while the other led the goslings away. According to Portenko (in press) who met goose families on the river, neither parent tried to fly but ran or swam away, together with their downies.

Breeding birds fed in the nesting habitat—as a rule, in the vicinity of the nest. The only plant that proved to be a mass Emperor food was *Carex stans*. Emperors bit the top parts of its fresh green leaves off (the same way as Whitefronts). Sometimes, Emperor and Whitefronted Geese foraged together. The sedges within several dozens of metres of the nests were noticeably damaged. Preliminary calculations showed that supplies of this food are not a limiting factor. The Emperors drank water from fresh ponds.

Eleven Emperor Geese taken by Portenko (in press) in the eastern part of the Chukotsky Peninsula at the breeding time, did not have subcutaneous fat while nearly all the geese shot just on arrival were very fat (as they were in the present study).

Ecology of non-breeding stock

In the second half of June, non-breeding Emperor Geese started their moulting movements. We have discovered considerable numbers of them in the lagoon tundras around the Ukouge lagoon. From 20th June we saw flocks (6-30 birds) flying every day towards the lagoon from the south-east. On 22nd June there were hundreds of birds near the lagoon, and the peak number counted, on 25th-27th June, reached 2,000. Such concentrations were only observed for about ten days, and in the first ten days of July most geese left this area. Out of

four males taken on 25th-28th June, two were adult non-breeders and two immatures (probably second or third year) in the transitional plumage containing old and recently changed feathers. All the four birds had begun to moult (replacement of feathers on the breast, sides, and back). Up to 19th July all the observed Emperors were able to fly. We do not know yet where they moult their wing feathers.

Non-breeders moulting near Ukouge lagoon occurred in flocks of from 10-20 to 200-300 individuals; the largest flock had more than 650 birds. Only a few groups (5-11 birds) were met with on 28th June along the Ekugwaam river, 5-10 km. from its mouth. Emperors sat on the dry shore edges, sometimes together with Whitefronts, and fed on the tops of leaves of *Poa arctica* and *Carex stans*. Emperors kept almost exclusively to the wet brackish lagoon tundra. They fed on the most common grass *Dupontia psilosantha* and, to a lesser extent, on *C. subspathacea*. Geese ate fresh shoots of these plants or bit the top 10-15 mm. of the leaves off when the whole plant did not exceed 4-6 cm. high. As the vegetation in different places in the lagoon tundra commences growing at different times, geese can always find a suitable feeding place. Emperors do not eat the old and, especially not, the flowering specimens. Black Brant use the same food items and the same parts of plants as Emperors; Whitefronts sometimes also eat *Dupontia*, but at older stages (just before flowering) when the leaves are 10-12 cm. high and coarser. We did not find any other plants in the digestive tracts nor among grazing debris on the feeding grounds. Animal food remains were likewise absent. In the gizzards of Emperors shot in June-July more to the east (Palmén 1887; Portenko in press) there were also only remnants of grass, among them (in one downy young) a shoot of *Equisetum*. It is known that at other times Emperors eat shoots and roots of *Elymus mollis*, rootstocks of *Equisetum*, crowberries, algae, and marine invertebrates (Murie 1959; Gabrielson and Lincoln 1959; Headley 1967).

The males killed were well fed and had a layer of fat 1-2 mm. thick, essentially thinner than on arrival. They weighed 2,500-2,700 gm. (adults) and 2,000-2,500 gm. (immatures).

Emperors in flocks feed intensively; after this, they stand and carefully look around, or lie down and rest, curving the neck and keeping the head under the



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Plate III. (a) Male Cape Shelduck *Tadorna cana* in the upright posture of mild alarm. (b) A pair of New Zealand Shelduck *Tadorna variegata*. The white-headed female is making the sideways 'inciting' movement of the head. The male has adopted the aggressive head forward low position.

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Philippa Sc

Plate IV. (a) The rocky coast of the Auckland Islands, fringed with kelp beds.
(b) A male Auckland Islands Flightless Teal *Anas a. aucklandica* blends
into its background of floating kelp. The shortness of his wings is obvious
(see pp. 44-45).

Philippa Sc



wing. In a large flock some birds are always on the alert. If not disturbed geese feed on the same place for several hours. Emperors moulting near the Ukouge lagoon made some local movements but, in general, did not leave its shores. On the same plots there were also flocks of Black Brants up to several dozens which often fed together with Emperors.

On the feeding grounds, moulting flocks leave many droppings—in the middle of July, up to 3-5 per sq. m. Geese must add dozens of kg. of faeces per hectare of lagoon tundra. Using the calculations and chemical analyses given by Kear (1963) for other geese, we conclude that Emperors may return into the soil about 0.5-0.9 kg. N_2 , 0.25-0.4 kg. P_2O_5 , and 0.5-0.8 kg. K_2O per hectare. Thus, they promote acceleration of organic rotation in the ecosystem.

We have cut off the tops of *D. psilosantha* and *C. subspathacea* 10-15 mm. long (the same size as we found in oesophagus) on sample plots in a typical habitat and calculated that there are nearly 1,500 kg. of accessible food per hectare. Besides Emperors, these plants are eaten only by scattered Black Brants and probably to a small extent by Pintail *Anas acuta* moulting there. Using the standards accepted in poultry farming, we estimate that the lagoon tundras bordering Ukouge lagoon can support several thousand geese for a month or even longer. Thus, food supply is quite sufficient. Judging by the abundance of droppings, geese concentrate here every year.

Brackish lagoon tundra with *Dupontia* and *Carex*—practically the sole habitat of non-breeders—occurs only as narrow strips fringing shores and islands of coastal lagoons. Its total area is not large.

Flocks of up to several dozen non-breeders have been observed in summer by various investigators in different parts of the species' range from the Anadyr Gulf to Wankarem. We saw such flocks on 5th-20th July on the shores of lagoons between Wankarem and Amguema estuary—in all not more than 200 birds. We do not know as yet of any other large concentrations (such as those near Ukouge lagoon) in the Asiatic part of the range. The lack of such data, the generally low numbers of the breeding population, and the pattern of summer movements allow us to suppose that non-breeding Emperors from a considerable part of Chukotsk coasts gather for moulting around this lagoon.

Still greater numbers of non-breeding Emperors—10-20,000—moult in similar coastal tundras on St. Lawrence Island (Fay 1961). On the whole, non-breeders make up a sizeable portion of the total population.

Peculiarities of the digestive system

In all gizzards we found much fine sand but no large gastrolithes. The caecum is well developed. In two males, the total intestine length was 364 and 420 cm., and length of caeci (both) 84 and 95 cm., i.e. 23% of the intestine length. The relative lengths of caeci in Whitefront and Black Brant were 11-15% ($n = 3$).

Parasites

In the intestines of two Emperors studied for this purpose, we have found many cestodes of two species: *Aploparaksis larina* (Fuhrman 1921) and *Drepanido-taenia* sp.

Voice

The cry uttered in flight is a low metallic 'yang . . . yang . . .'. The same call was made when escorting downies. On the ground, in feeding flocks, Emperors call to one another by a low 'kya kya kya kya' or 'kyi kyi kyi kyi'; this call is lower and less abrupt than, for instance, the cackling of Bean Geese *Anser fabalis*.

At the nest or walking near it Emperors keep silent. Only in the last day of incubation, being greatly excited, a female which had left the nest uttered an anxious call—a low recurring 'kyur . . . kyur . . . kyur . . .'

Acknowledgements

We are indebted to Dr. V. V. Petrovski (Botanic Institute, U.S.S.R. Academy of Sciences) and Miss Y. G. Zharkova (Central Laboratory on Nature Conservation, U.S.S.R.) for identification of plants, and to Dr. N. M. Shalayeva (Moscow State University) for parasitological identifications, and to Mr. N. I. Makurin and Mr. N. F. Kovriga for field assistance. Special thanks are due to Prof. L. A. Portenko (Zoological Institute, U.S.S.R. Academy of Sciences) who has kindly permitted us to read the essay on the Emperor Goose in his unpublished monograph and to mention some original data. We also express our gratitude to Dr. Peter C. Lent (University of Alaska, U.S.A.) and Dr. Calvin J. Lensink (Clarence Rhode National Wildlife Range, Alaska, U.S.A.)

for sending us results of unpublished studies on the Emperor Goose in Alaska and for kind permission to cite some of these results. Prof. Portenko, Dr. Lent, and Dr. Lensink have read the manuscript and made valuable comments.

Summary

Observations were made in 1970 on Emperor Geese *Anser canagicus* on the northern coast of the Chukotsky Peninsula. The first geese were seen on 7th June. Nesting began immediately on arrival on the narrow coastal strip, in the wet moss-sedge tundra rich in freshwater ponds. The breeding density was three pairs on 40 sq. km. Two nests (two and nine eggs) are described. Nest bedding of grass, goose's feathers and down was added during egg-laying and incubation, but was never so thick and soft as that of White-fronted *Anser a. albifrons* or Brant Geese *Branta bernicla orientalis*. Eggs were laid from 6th to 18th June, incubation time being 25 days. During incubation the pair bond is maintained, although the male may fly quite far for feeding and join other birds for a while. Hatching took place on 11th-13th July; the weather was very severe at the time, and mortality was high (eight eggs and young of eleven). It is thought that poor resistance of goslings to cold and low heat-insulation properties of nests limit further extension of the species to the north. Breeding geese feed in the nesting habitat on the sedge *Carex stans*.

In the second half of June non-breeding Emperors began their moult movements. Large concentrations of non-breeders (up to 2,000) were found near Ukouge lagoon but remained there only up to the first ten days of July. We believe that a sizeable part of the Asiatic population gathered there. Flocks of non-breeders kept to the wet brackish grassy tundra around the lagoon consisting of *Dupontia psilosantha*, *Carex subspathacea*, *Cochlearia arctica* and *Stellaria humifusa*. Geese ate shoots and terminal parts of the young leaves of *D. psilosantha* and *C. subspathacea*. This food is unlimited. Moulting flocks leave dozens of kilograms of droppings per hectare; thus, they return to the soil considerable quantities of nitrogen, P₂O₅ and K₂O. A massive development of the caecum is noted. The behaviour when breeding and in moulting flocks, and the calls, are described.

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