On the biology of the Spectacled Eider

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The range of the Spectacled Eider *Somateria fischeri* is rather restricted, and its biology is poorly known. Some biological observations have been made in the Siberian tundras between the Yana and Kolyma rivers (Birula, 1907; Mikhel, 1935; Uspenski *et al.*, 1962; Vorobyev, 1963) and in Alaska (Nelson, 1887; Conover, 1926; Brandt, 1943; Bailey, 1948; Johnsgard, 1964a). In the summer of 1971, we obtained new ecological information in the delta of the Indigirka (*c.* 71°N, 150°E) where this eider is the most common duck species. Our work proceeded from 3 June to 6 August, and we were able to visit both inner and maritime parts of the delta where life conditions for Spectacled Eider are different.

Breeding habitats and numbers

The Spectacled Eider is the most common duck in the delta of the Indigirka river; the fact having been recorded by Mikhel (1935). It is most numerous in the maritime half of the delta, up to 40–50 km from the sea. Eiders live here in the moist low tundra with numerous shallow ponds bordered by coastal flooded growth of *Arctophila fulva*, with underwater beds of *Hippurus* sp., and with small islets. The so-called 'laydas'—vast depressions (2–5 km in diameter) that are flooded in June, after snow-melting, and overgrown by *A. fulva* and sedges—are especially characteristic as a habitat of Spectacled Eider. Usually, in the middle of a 'layda' there are deeper patches of open water, and among grass-sedge thickets and these patches, small islets and the dry tussocks are scattered. By the end of the summer the water level falls and most of the area of 'laydas' dries; nevertheless, they remain hardly passable. On such lakes Spectacled Eider is the most numerous duck (besides, there live a few Long-tailed Duck, *Clangula hyemalis*).

Spectacled Eider needs large areas of coastal shallows (0–10 cm deep) for summer living, most of which is a temporarily flooded moss-sedge bog. This bog is inhabited by great numbers of hydrophilous larvae of crane-flies *Prionocera* spp. (Tipulidae) and those of various caddisflies which make together the bulk of the summer diet of this eider.

Farther from the sea, in the inner parts of the delta, favourite eider habitats are less extensive, and accordingly, eider numbers

Table 1. Population density and total numbers of the Spectacled Eider in the delta of the Indigirka river

Territory within the delta	Number of census plots	Total area of census plots (km²)	Pairs (June) or females (July) per 10 km²		Total area of the territory	Total spring numbers (pairs)
			Limits	Mean		
Maritime parts, south-westwards to the settlements Yar and Tabor	5	66	33–60	47	3,100	14,570
Central parts from Yar and Tabor south-westwards to the settlement Polyarni and mouth of the Keremesit river	3	39	8–12·5	10	1,800	1,800
Innermost parts and the tundras southwards of the Kolymskaya channel	4	41	0–5	2·5	4,300	1,075
Total	12	146			9,200	17,445

are lower. Southwards of the Kolymski channel, near the Keremesit river, Spectacled Eiders were rare; they lived there near shallow lakes 10–200 m in diameter bordered by polygonal bogs flooded by melt-water in June.

In July, a good number of females were also observed in the narrow strip of maritime meadows dominated by *Dupontia psilosantha*, sedges and cotton-grass, rich in brackish potholes devoid of *Arctophila* and dotted with small islets.

We have determined the numbers of Spectacled Eiders on census plots 6–30 km^2 by surveying all the lakes and ponds on them during one or more days. At courtship time, pairs on lakes are easily visible. In July, males are nearly absent in the tundra; non-breeding females and those which have lost their clutches gather in flocks and sit for hours on the favourite resting spots situated on dry lakeside tussocks or islets where they can easily be counted. Incubating females in July could be either identified by their behaviour when feeding on channels and lakes or frightened from the nests. Of course, some females were missed. Nevertheless, we consider our estimates to be reliable enough—especially because in July of 1971 successful females made up quite a small part of the population (see below). When calculating we equated the number of females in July to the number of pairs in June (the spring sex ratio being 1:1).

In order to estimate total numbers, we have divided the delta into three zones with different population densities of Spectacled Eider (Table 1). Calculations have shown that, in spring, the numbers of the eider in the delta and tundras adjacent to it in the south are close to 17,000–18,000 pairs, of which 15,000 are in the maritime half of the delta.

According to local people, the numbers of Spectacled Eider in the delta fluctuate in different years, but the species is always common here. In 1971, the numbers were said to be slightly lower than usual.

Arrival

Eiders arrive at the breeding grounds at the beginning of June. In 1971, they appeared on 8 June; an intensive passage took place on 9–10 June and ended on 13 June. Eiders flew directly from the east, in flocks of seven to thirty birds, very low—usually 2–3 m above the ground. Probably eiders flew great distances without landing—from the resting grounds on marine bays to the breeding lake.

The sex ratio in the arriving flocks was near to 1:1. From 9 to 13 June 1971, seventy-two males and sixty-nine females were counted. Pairs were easily visible in the flocks.

Breeding

Spectacled Eiders arrive in pairs. We were not able to see courtship behaviour at the breeding grounds; only on 19 June were residual displays of this type observed. Males performed a display close to 'Head-forward-lifting', and females—'Chin-lifting' (in terms of Johnsgard, 1964b) (Figure 1).

Eiders were in pairs up to 24 June. On 25, 29 June and 4 July we saw and collected females which had just finished egg-laying. (In 1960, in the mouth of the river Bogdashkina, north of the delta, a nest with two eggs was found on 15 June, and a full clutch with five eggs on 24 June (Uspenski *et al.*, 1962).) At the end of June, pairs were broken, and the males disappeared. In 1960, an eastward passage of males along the sea shore north of the delta was observed at the end of June (Uspenski *et al.*, 1962). However, we saw single drakes from time to time in the flocks of non-breeding females up to 15 July. According to Brandt (1943),

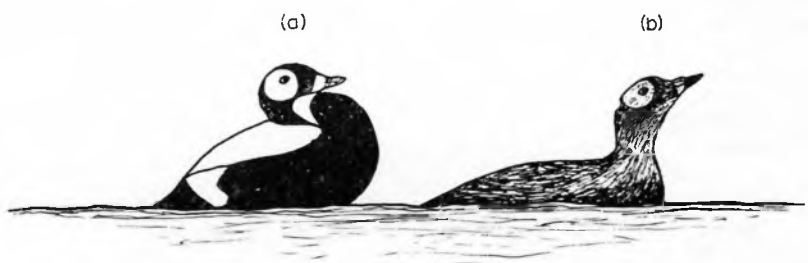

Figure 1. 'Residual' courtship displays in *Somateria fischeri*. (a) Male performing 'Head-forward-rearing'; (b) female performing 'Chin-lifting' (according to Johnsgard, 1964a).

sometimes a male remains near the nest even up to the end of the incubation.

As in other eiders, two types of nesting occur in the Spectacled Eider: (1) scattered in the uniform tundra rich in lakes, and (2) on islets in lakes or 'laydas' with, as a rule, several females close to each other. At courtship time, we saw up to six to fifteen pairs on one lake. No territorial aggressive displays were observed between them. Frequently two or three pairs swam and fed together, and rested alongside each other on tussocks or islets. Johnsgard (1964a) reports a similar lack of interaction in Alaska.

On islets, Spectacled Eiders nested in colonies of gulls and terns—Herring Gull *Larus argentatus*, Glaucous Gull *L. hyperboreus*, Sabine's Gull *Xema sabini*, Ross's Gull *Rhodostethia rosea*, Arctic Tern *Sterna paradisaea*—close to the gull nests. On 9 July, we surveyed such a colony on a large 'layda' with a lot of islets and open water patches. In this colony, nine pairs of Herring Gulls, seven pairs of Glaucous Gulls, two or more pairs of Black-throated Divers *Gavia arctica*, and fourteen Spectacled Eider pairs bred (Figure 2). The eider nests were within 0·5 m (1), 1·0 m (3), 1·5 m (2), 2·0 m (1), 2·5 m (2), 3 m (1), 4 m (1), 5 m (2) and 7 m (1) of the gull's nest. On the same lake, there were about fifty eider females which have not bred or have lost their clutches.

Similar 'mixed colonies' were met with in other places. Near the Keremesit river, six pairs of eiders were found on 15–20 June on the lake where four pairs of Ross' Gulls, a pair of Arctic Terns, and a pair of Herring Gulls had nests. Eiders did not then have clutches but seemed to have settled here for breeding. On 17 July, we found a nest of eider with four eggs on the eve of hatching. It was on an islet, about 15 m from another islet where a pair of Ross' Gulls has bred; within 50–70 m, on other islets, three pairs of Arctic Terns nested. On the same lake, two eider nests (without eggs but which seemed not to have been destroyed, having a large amount of down) were found on an island where two pairs of Sabine Gulls bred; nests of eiders were within 40–50 m from gull's nests, within gull's territories which were violently defended.

Large gulls (*L. argentatus*, *L. hyperboreus*) made nests on the highest and driest tops of islets. They laid eggs in the first half of June, while fresh eggs of Terns and Ross' Gulls appeared on 17–20 June. Eiders' laying began later—judging from examination of collected birds, after 20 June. Undoubtedly, the eiders actively chose the neighbourhood of gulls, and joined their already formed colonies.

Nests of Spectacled Eiders on islets 3–15 m in diameter were made near their edge, among dense growth of *Carex stans*, *Dupontia* and *A. fulva*. Due to manuring by birds, grass is especially luxuriant on such places, and in July its bright green colour was very noticeable. The nest is lined by dry sedges and grasses, as well as by down. The amount of down in nests differs considerably; when laying is repeated, even a nest with one egg or without eggs can contain much down.

Nesting of Spectacled Eiders on lake islets was mentioned by Birula (1907) and Brandt (1943). In the Yukon–Kuskokwim delta, Johnsgard (1964a) has found only one nest on an islet, while eleven were seen along the shores of lakes (average distance 1 m from water), and one in the tundra, 18 m from water. Nests were often situated a considerable distance from one another. During our observations, in the mixed 'eider-gull' colony, the distance between eider nests was often 40–80 m. Sometimes, two or three nests were made on the same islet; then, they were 2–9 m from each other, and once even within 30 cm (Figure 2). These facts certainly indicate a certain degree of incipient colonialism in the Spectacled Eider.

Nesting of ducks in gulls' and terns' colonies is well known. Gulls and terns defend their rookeries, so providing for the protection of duck nests as well. Of the species which inhabit our delta, Sabine's Gull and Arctic Tern are the most aggressive. The least active are Ross' Gulls, but even they successfully drive away large gulls and skuas at distances up to 50 m of the nest. Nesting near to these three small species which do not destroy duck nests but provide effective protection from large gulls, skuas and probably Arctic fox, seems to be most favourable for eiders. Large gulls keep foxes and skuas out of the colony but destroy eider nests themselves. In their colonies and around them we found a lot of destroyed eggs of eiders. In this connection, the following facts are worth mentioning.

In the mixed colony surveyed on 9 July, the only eiders successfully to incubate their clutches had made nests not farther than 7 m (usually at 1–3 m, once at 50 cm) from a gull's nest (Figure 2), i.e. within territories of gulls. On numerous islets situated over 5–10 m from gull nests, we have found dozens of eider nests, and all of them were destroyed. As was said before, about fifty

females without nests (non-breeders or unsuccessful) remained in flocks on the same lake. Of fourteen clutches, four were well incubated and had four to seven eggs; other ones were fresh and contained one to four eggs (average 2·1, $n = 10$). Apparently, these clutches were repeat ones.

We try to explain these facts in the following way. The pair of gulls do not allow any other gull to penetrate into their defended territory, while in their own behaviour aggressive intentions predominate. Eider clutches noticed by 'host' gulls are certainly destroyed even in the close vicinity of their own nest; we have found up to six destroyed eider nests around some gull nests (Figure 2). However, eiders are threatened here by only one pair of gulls, and some clutches have a chance to survive. At greater distances from the nests (usually over 5 m) gulls do not drive their 'neighbours' away, although foxes and skuas are not tolerated. Therefore, eider nests can be destroyed here by all the gulls of the colony, and their chance is negligible.

Despite heavy losses, nesting in the colonies of large gulls is of advantage for eiders. When surveying islets on numerous lakes without gull colonies, we have found twenty to thirty eider nests altogether. All of them were destroyed—probably, mainly during laying (the amount of down was small).

In normal years, large gulls and skuas feed in the Indigirka tundras mainly on rodents. According to Perfilyev (1967), microtines made more than 30% of their 'average' summer food. Old gull pellets found in the delta consisted, as a rule, of lemmings. In non-lemming years, as in 1971, gulls and skuas are probably especially active in destroying nests. In such years, it is almost hopeless for eiders to attempt to nest on lake islets (where they are open

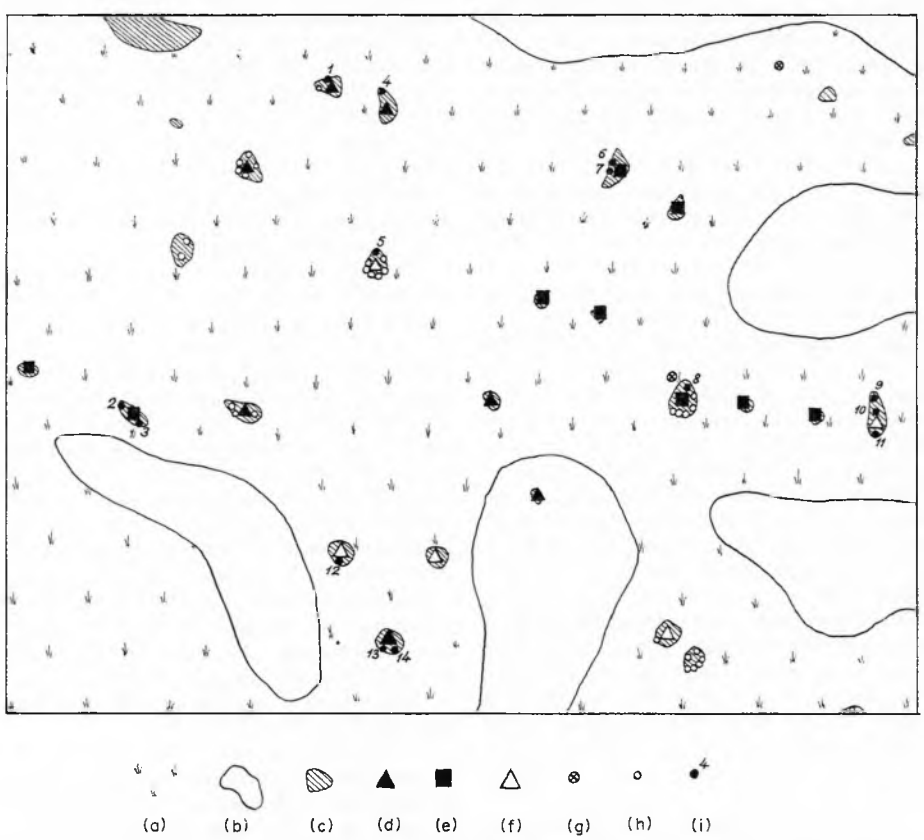

Figure 2. Scheme of the mixed colony of gulls and eiders. Delta of the Indigirka river, 9 July 1971. Scale 1:2.000. (a) Flooded *Carex* and *Arctophila* thickets; (b) pieces of the open water; (c) islets; (d) occupied nest of *Larus hyperboreus*; (e) the same of *L. argentatus*; (f) empty nest of a large gull; (g) nest of *Gavia arctica*; (h) destroyed nest of *S. fischeri*; (i) nest of *S. fischeri* with clutch. Figures point to the number of each occupied nest (see text).

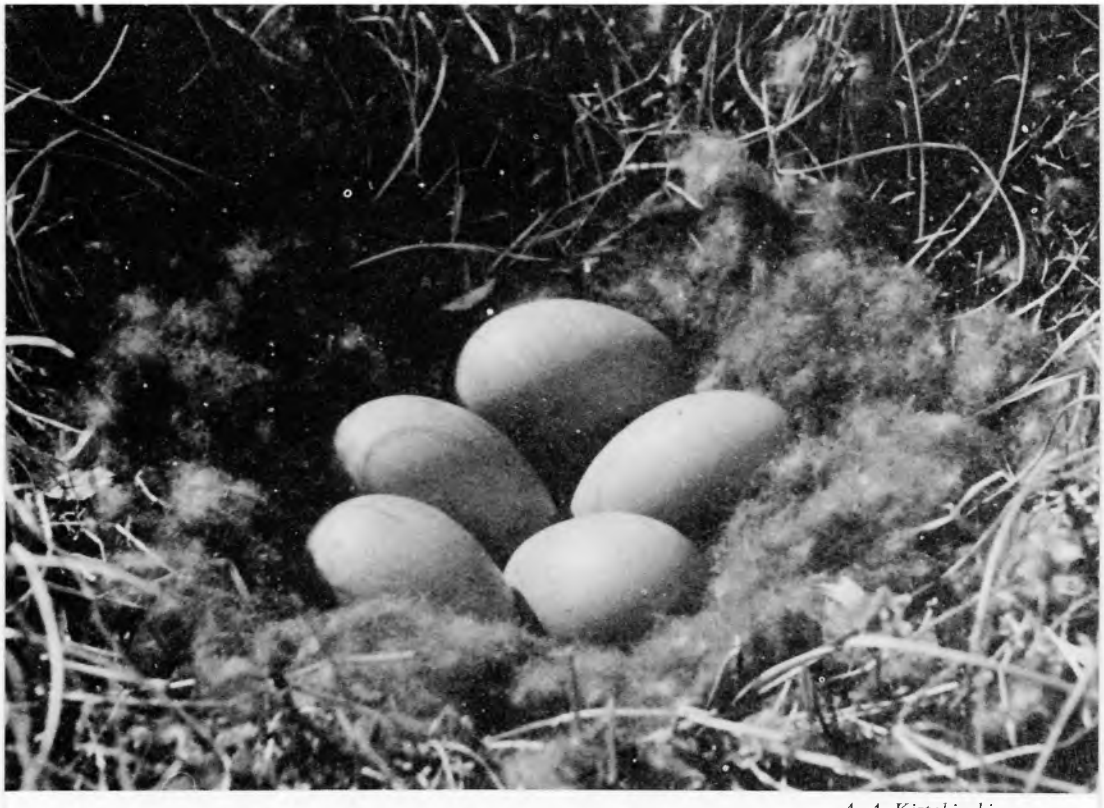

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Figure 3. Clutch of *Somateria fischeri*, mouth of the Keremesit river.

to 'purposeful' searching) without protection by aggressive birds (even if the same large gulls).

Thus, many Spectacled Eiders after arrival at tundra, search for 'laydas' and lakes where gull colonies are forming at the time, and try to nest in the colonies. If Herring or Glaucous Gulls are the main breeders, they destroy most clutches; eiders lay repeat clutches, and their fate is the same—except those birds who made nests in the very vicinity of gulls' nests. In this way the specialized nesting pattern may have evolved through selection.

Another type of nest is found scattered in uniform tundra not far from the ponds. Such a nest with the full clutch (five fresh eggs) was found on 25 June on the low wet moss tussock among the polygonal tundra (Figure 3). It was 5–10 m from small ponds which had become almost dry by the end of July. Similar nests were found by Uspenski *et al.* (1962) Vorobyev (1963) and Johnsgard (1964a). We regularly saw females which, judging by their behaviour, kept near nests of this type. In this case, clutches are unprotected from predators, but due to the absence of any 'guiding-points', such a nest can be found only by accident.

The measurements of twenty-three eggs averaged 67·4 × 45·4 mm, the extremes being 62·0–71·0 mm length and 44·2–46·8 mm width. There was no significant difference in the size of eggs from different clutches. Eggs measured in Alaska were 66·0–71·6 mm long and 43·0–47·4 mm wide (Nelson, 1887; Johnsgard, 1964a); twelve eggs averaged 69·0 × 43·7 mm (Johnsgard, 1964a).

Nesting behaviour of the Spectacled Eider resembles that of the Eider *Somateria mollissima* and King Eider *Somateria spectabilis*. The female incubates strongly and hardly leaves the nest. She allows one to approach to within 1–4 m, then she flies, staining the eggs with excreta. Afterwards she swims on the pond 20–30 m away and sometimes begins to 'feed'. While swimming the female performs postures resembling those of King Eider, for instance she tilts her head back and to one side, or rises in the water, so that all the breast is exposed. If the bird is not disturbed, after 10–15 minutes it comes back to the nest and sits on the clutch (Figure 4).

Breeding females feed singly or in groups of two to four. Group-feeding in breeding female King Eiders was also observed in July 1970 (Kistchinski, unpublished).

Females which have not bred or have ceased nesting after the loss of their clutches, remain in July at the breeding grounds. They keep in groups from two to fifty, usually of four to eleven birds (Table 2). They feed

Figure 4. The incubating female of the Spectacled Eider. *A. A. Kistchinski*

together on channels and lakes of the delta, and rest in close clusters on favourite spots—rather high, dry mounds on the lakesides or islets. They can be accompanied by single males which have lingered on the tundra, and, when feeding, by breeding females as well. Thus, on 4 July, we collected simultaneously an incubating and a non-breeding female from a group of three ducks feeding together on a channel. Little by little, these non-breeder groups are joined by new females which have lost their nests and stopped breeding attempts. Such groups were observed up to 30 July.

In 1971, we did not see downy young of the Spectacled Eider. Broods of fledging young have been seen in the Indigirka tundras on 24 July and 5 August (Uspenski *et al.*, 1962), and of poorly flying ones—on 30 and 31 August (Mikhel, 1935).

Table 2. Composition of flocks of non-breeding females of the Spectacled Eider

Size of flocks	2–3	4–7	8–11	13–15	20–50	Total
Number of flocks	8+	33	9	3	3	56+
Total numbers of birds	20+	179	88	42	92	421+

Table 3. The ratio of different colour types in the females of the Spectacled Eider, collected 24 June–26 July

Colour type (see text)	Total number of birds collected	Number breeding
The first type (definitive?)	5	4
Intermediate birds	4	2
The second type (2nd or 3rd year?)	8	2
Total	17	8

Population composition and reproduction

As mentioned above, sex ratio on arrival is near to 1 : 1. Only adult males in full breeding plumage appear in the tundra. Two main types of female plumage occur on the breeding grounds; their ratio (by specimens collected) is shown in Table 3. Birds of the first type have bright 'yellow-rusty' colours of breast and sides, 'rusty' tones on the back and intensive brown-black abdomen with chestnut-coloured bars. The second type has a duller, 'sandy-yellow' breast and sides, and 'rusty-yellowish' (buff) ground colour of the back, rump and scapulars which are also dull compared to the first type. The black streaks marking the upper parts are slightly wider; the blackish (sooty) colour of underparts is less intensive than in the first type, and covers a smaller area.

The differences between the colour types can be obscured because of the various extent of feather wear as well as of moult stage. Some birds have an intermediate plumage (Table 3). The types of birds taken in the field were easily distinguished, but on the same specimens after 6-month storage in the museum, the types were more difficult to discern.

'Spectacles' are well developed in both the types of birds. Coloration of a head as a whole (degree of contrast between 'spectacles' and the rest of the head, intensity of the main colour, width and blackness of streaks) varies strongly between individuals and shows no correlation with the two types outlined.

Age differences in the female plumages of the Spectacled Eider are not too well known (Portenko, 1952). So, we do not know if our types are correlated to the age of the birds. We can only suppose that the first type is definitive while ducks of the second one are 2 or 3 years old, which (contrary to the males of the same age) arrive at the breeding grounds in spring.

Still smaller and lighter females, distinguishable in the field (probably yearlings) were observed and collected as a rarity on the West Alaskan breeding grounds (Conover, 1926; Johnsgard, 1964a). We did not see such birds in the Indigirka tundras.

Some of the females arriving in spring do not breed. Of sixteen ducks taken on 24 June–17 July, eight had undeveloped ovaries and did not attempt to nest. Among them, there were birds of both the colour types, mainly of the second one (Table 3).

Females having just finished egg-laying and collected on 28 June–4 July, weighed 1,750–1,800 g (mean 1,767 g, $n=3$). They had a 3–4 mm layer of fat and were not moulting. Non-breeding ducks, taken on 24 June–11 July, weighed only 1,400–1,550 g (mean 1,485 g, $n=8$). They had almost no fat or were even exhausted; all of them were intensively moulting contour feathers. Participation in the breeding cycle was probably determined by physiological state of females, including their degree of fatness.

As mentioned above, many clutches are lost, and ducks lay repeat ones. Three of five females taken on 9–17 July, had ten or more 'scars' of broken follicles in the ovaries—i.e., they had tried to nest repeatedly, and possibly more than once. The fourth duck had one to two old 'scars' (probably an uncomplete clutch had been destroyed), and the fifth one—seven to eight 'scars' and a belly with down fully stripped; probably only this duck was successful. The birds had almost no fat and weighed 1,400–1,600 g (average 1,440 g, $n=5$).

In order to estimate breeding success we tried to count breeding females (including those who seemed to have nests judging by their behaviour) and, separately, ducks in non-breeding flocks including unsuccessful birds. The ratio obtained was 1 : 6·6 (63 : 415). Two souces of error were probable: (a) scattered-nesting, 'non-colonial' ducks can be rather easily missed during surveys, and (b) incubating females can join non-breeding groups when feeding. However, we are able roughly to assume that in 1971, only 10–15% of the females at the breeding grounds successfully incubated their clutches.

The size of a complete clutch (including data from autopsies of ducks having just finished egg-laying) was four to seven (mean 5·56, $n=9$). The number of eggs in all the clutches including repeat ones was one to seven (mean 3·74, $n=19$). Assuming that in spring there were forty-nine females per 100 adult birds (see sex ratio, p. 6), and five to seven (10–15%) of them were successful, the total number of eggs in clutches in 1971 would be nineteen to twenty-six per 100 adults in spring. Duckling survival rate was unknown, but population gain this summer could hardly exceed 15–25% of the spring population.

Large numbers of non-breeding Spectacled Eiders were also observed in Alaskan tundras (Johnsgard, 1964a).

Voice

As it was already mentioned by Nelson (1887) and Johnsgard (1964a), the Spectacled

Eider is a very silent bird. We never heard any male call. A female's call, which can be only rarely heard, is a hoarse 'krro', resembling a remote Raven's croaking. When swimming in flocks, ducks communicate by a quiet 'cro cro ko ko . . . cro cro ko ko . . .'; similar calls are uttered by a duck replying to the courtship display of a drake.

Food

Data were obtained through the analysis of the oesophagi and stomachs of the birds collected (Table 4) and by visual observations (Table 5). In the first case, we roughly estimated the percent of the total volume of a sample occupied by each sort of food. Finally, average volume per cent of each food was calculated. Contents of the stomach and of the oesophagus of one bird were usually considered as one sample but in some cases they were treated as separate samples (if the foods contained were quite different, i.e. reflected different feeding bouts).

From arrival at breeding grounds to the end of June, eiders fed on temporary ponds and the shallows of lakes—on the places where moss-sedge bog was flooded by 10–30 cm of melt-water. In the stomachs of eiders collected on 5–8 June 1960, there were mainly seeds of *Ranunculus pallasii*, and, in small numbers, insects washed by thawed waters out of the bog or from its surface (larvae of flies Rhagionidae, beetles *Elaphrus* sp., Carabidae sp.), as well as remnants of shells of marine gastropods (Uspenski *et al.*, 1962). After thawing of the bog to the depth of 5–7 cm, usually about 10 June, there appear a large amount of the hydrophilous larvae of crane-flies *Prionocera* spp. (Tipu-

Table 4. Contents of digestive tracts of Spectacled Eiders

	Volume % of the total amount of food		
	24 June ($n=4$)	28 June–17 July ($n=16$)	26 July–10 August ($n=4$)*
DIPTERA	99·7	17·12	–
Tipulidae, larvae	99·5	3·06	–
Prionocera spp.	99·5	2·81	–
Tipula sp., hydrophilous forms	–	0·25	–
Chironomidae, larvae	–	13·00	–
Empididae, larvae	0·2	0·13	–
Diptera sp., larvae	–	0·31	–
Dolichopodidae, larvae	–	0·06	–
Tipula sp., imagines	–	0·50	–
Scatophaga sp., imagines	–	0·06	–
TRICHOPTERA spp., larvae	0·2	55·94	53·8
TRICHOPTERA spp., imagines	–	0·31	–
COLEOPTERA, imagines	–	6·63	–
Agabus spp.	–	3·69	–
Carabus spp.	–	0·63	–
Pterostichus costatus	–	0·31	–
Hydroporus sp.	–	0·13	–
Lepyrus sp.	–	1·87	–
CRUSTACEA (Gammaridae)	–	6·75	–
MOLLUSCA (*Sibirenauta elongata* + *Physa arctica*)	–	0·69	–
OLIGOCHAETA (Enchytraeidae)	–	0·06	–
SEEDS			
Ranunculus pallasii	0·1	12·50	46·2
Others	–	+	+
PLANT MATERIAL (remnants of sedges, moss, roots, small twigs etc.)	–	+	+
SHELLS (marine molluscs)	–	+	–
GASTROLITES (gravel)	–	few	few
Total	100·0	100·0	100·0

* Among these, three samples were received from Dr S. M. Uspenski and analysed according to our method.

Table 5. Seasonal changes of feeding habitats in the Spectacled Eider

Type of habitat	Number of feeding eiders observed							
	10–25 June		28 June–7 July		9–17 July		22–30 July	
	Birds	%	Birds	%	Birds	%	Birds	%
Temporary water bodies	4	12·1	–	–	–	–	–	–
Shallows of permanent lakes	29	87·9	38	48·1	128	99·2	66	77·6
Channels of the delta (fresh)	–	–	41	51·9	1	0·8	5	5·9
Estuary of the Kolymskaya channel (slightly brackish)	No data		No data		No data		14	16·5
Total	33	100·0	79	100·0	129	100·0	85	100·0

lidae) which seem to make the bulk of the diet of Spectacled Eiders at courtship time (Table 4). Oesophagi and stomachs of the birds taken in this period contained 100–200 of these larvae. When feeding, eiders dig in a flooded bog with their beak. They swam along the edge of a shore growth or among flooded sedges, submerging their head or dabbling just like Mallard *Anas platyrhynchos*; we did not see them diving that time. Birds fed in pairs or in close groups of two to four pairs together.

In 1960, in the middle of June, many chironomid larvae were found in the eider stomachs (Uspenski *et al.*, 1961). We did not detect them and relate this fact to the peculiarities of the summer season of 1971. We met with extremely few of chironomid larvae in the diet of birds at all, even in ducks so specialized on this food as Steller's Eider and Long-tailed Duck. Moreover, almost no chironomid larvae were seen and collected in lakes and ponds.

At the end of June, a mass of cranefly adults emerged, and the number of their larvae in the bog drastically decreased. From that time till August, caddisfly larvae became the main food of Spectacled Eiders (Table 4). Besides these, eiders consumed in July various invertebrates—mainly aquatic chironomid larvae (Gammaridae, Dytiscidae) but also the terrestrial ones which can be blown onto the water surface (adults of Diptera, Trichoptera, Carabidae, *Lepyrus* sp. etc). At the end of June and beginning of July, eiders fed both on lakes and in delta channels and took their food by diving much deeper than at the courtship time. After 7 July, birds began to feed again almost solely on shallow (20–70 cm) overgrown lakes (Table 5). By the end of the summer, eiders' diet ceased to be diverse, and ducks again ate large quantities of the seeds of *R. pallasii*.

In some stomachs, gastrolites (pieces of gravel 1–5 mm in diameter) were found up to 7 July, i.e. a month after the eiders had been on the sea (there is no gravel in the delta). Seeds of *R. pallasii* which occur intact in many stomachs, may act as gastrolites too.

In general, changes in the diet of the Spectacled Eider during the summer correspond with the seasonal dynamics of abundance of some food items (Figure 5). The larvae of *Prionocera* seem to be probably the most valuable food. Disappearance of males from the breeding grounds as well as decrease in fat of females (including non-breeders) correspond with the seasonal decline of these larvae.

Acknowledgments

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Summary

Data on the numbers, breeding, and diet of the Spectacled Eider *Somateria fischeri* were obtained in 1971 in the delta of the Indigirka river. This eider breeds in the low tundra with numerous shallow lakes and flooded depressions, most abundantly in the maritime half of the delta (thirty-three to sixty pairs per 10 km^2) and rarely in the inland tundras. There are about 17,000 pairs in spring with a 1:1 sex ratio. Eiders nest scattered in the uniform wet tundra or several near one another on lake islets. Nesting in colonies of gulls and terns provides a protection from predators. However, large gulls themselves destroy many eider nests; therefore, only nests within the

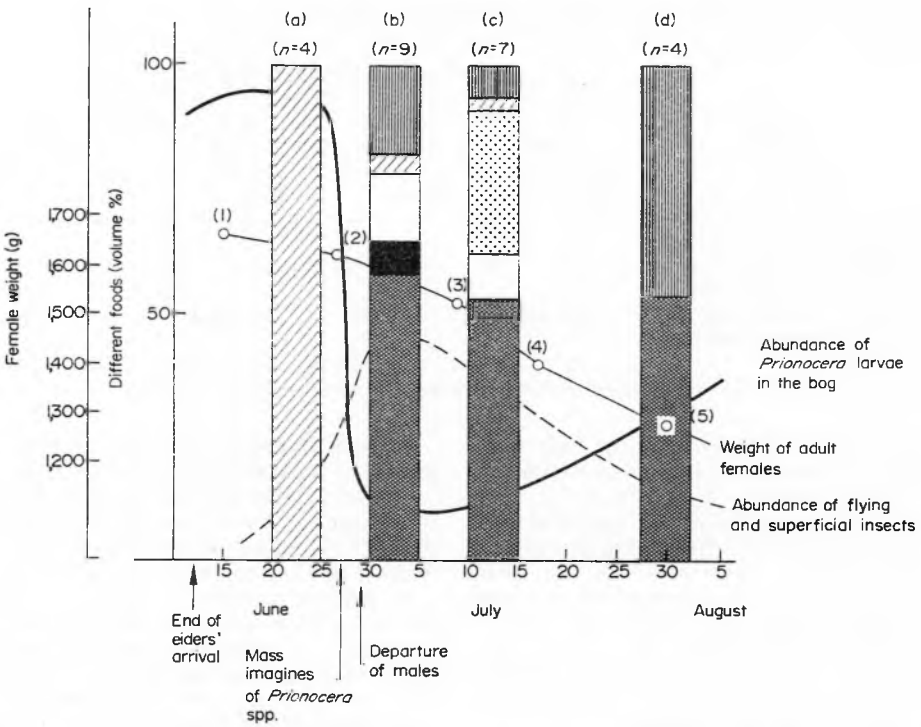

Figure 5. Seasonal changes in the diet of Spectacled Eiders and in abundance of some food items. Volume per cent of the main foods: (a) 24 June; (b) 28 June–7 July; (c) 26 July–25 August. Slant-hatched, larvae of craneflies *Prinocera* spp.; cross-hatched, caddisfly larvae; stippled, chironomid larvae; open, other aquatic invertebrates; solid, non-aquatic insects; vertically hatched, seeds of *Ranunculus pallasii*. 0—0, Curve of female weights: (1) 5–18 June, according to Uspenski *et al.*, 1962; (2) 24–29 June ($n=4$); (3) 4–12 July ($n=10$); (4) 17 July ($n=10$); (5) 26 July–5 August ($n=3$, including data by Uspenski *et al.*, 1962). ——, Relative abundance of *Prionocera* larvae in the bog. – – –, Relative abundance of flying and superficial insects.

defended territories of gull pairs have a chance of surviving.

Only drakes in full plumage appear at the breeding grounds. Variations in female plumage (possibly correlated with age) are described. In 1971, nearly 50% of females did not start to breed. There was a great loss of clutches from gull predation. Many ducks had repeat nests but not more than 10–15% seemed to be successful. The first clutches averaged 5·56 eggs; all clutches, including repeated, 3·74. Population increase by the end of summer was unlikely to be more than 15–25%. Non-breeding and unsuccessful females remained during the whole of July. The bulk of the food at courtship time was larvae of crane-flies *Prionocera* spp., and from the end of June till the beginning of August larvae of caddisflies. Many kinds of other invertebrates were consumed in July, and many seeds of *Ranunculus pallasii* on first arrival in June as well as at the end of July and beginning of August. Seasonal changes in eider's diet are probably correlated with the dynamics of abundance of food items.

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Figure 6. The female Spectacled Eider returning to her nest. *A. A. Kistchinski*