

## XXV. THE IMPORTANCE OF KOPAČKI RIT

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In Yugoslavia, at the junction of the Rivers Drava and Danube, exists at this moment about 50 000 ha of area preserved of harmful anthropogenous influence.

There are 6234 ha strictly protected, 10 000 ha are a Nature park, and further 23 000 ha is proposed for conservation.

Kopački rit is situated in southeastern part of Baranja, between Rivers Drava and Danube. The entire area of 6234 ha is inundational area. The climate is intermediate between middle-european and continental type of Panon valley. The average monthly temperature in January is  $-0,8$  °C, in July  $21,6$  °C, while the average yearly temperature is  $10,7$  °C. Annual precipitations amount is 500 – 700 mm. The altitude of Kopački rit is 80 – 84 m. a. s. The lowest area is the central part with the Kopač Lake. The lake is connected with Rivers Drava and Danube and with other swamps in Reserve by several natural channels. The Reserve is inundated in average 99 days yearly, including 48 days entirely. The rest of year it is dry, but during the most severe drought there is still about 282 ha inundated area in lakes and channels.

The floods may appear in every season, but they are the most frequent in spring and early summer.

The flora of Reserve is a typical wetland flora with reedbeds, sedges and willow woods.

The fauna of Kopački rit and surrounding is very rich. In spite of the fact that evertbrates are not investigated the special shell form *Unio tumidus kopaciensis* and 16 species of leeches confirm it.

In addition to 41 fish species, 10 amphibies, 10 reptils and 51 mammals, the fauna of birds is the reachest with the 270 recordered species.

For the fauna of birds in Kopački rit they are characteristic decimated species which breed there such is: Great White Heron (*Casmerodius albus*), Black Stork (*Ciconia nigra*), White-tailed Eagle (*Haliaetus albicilla*), Saker Falcon (*Falco cherrug*) etc.

There occur also great colonies of birds and a huge concentration of birds during migration.

The intention is to present here only those characteristics of bird's world in Kopački rit which are interesting for IWRB and causing this area is of the international importance.

Cormorant (*Phalacrocorax carbo*) breeds on this area. Formely it bred nonregularly or in a small number. Recently, it breeds regularly and the number of breeding pairs increases due to conservations and some convenient

Table XXV/1.

Numbers of breeding  
pairs of the cormorant  
in Kopački rit

Year	Number of breeding pairs
1969	0
1970	133
1971	0
1972	78
1973	27
1974	100
1975	100
1976	50
1977	142
1978	366
1979	334
1980	534

ecological factors (Table 1). For the IWRB it is interesting that there are more than 500 breeding pairs and concentrations of several thousand birds.

Kopački rit offers excellent conditions for herons. Investigations of breeding of these birds from 1954 show that 1021 pairs breed here in average (Table 2). Night Heron (*Nycticorax nycticorax*) has in average 389 pairs, Squacco Heron (*Ardeola ralloides*) 195 pairs, Purple Heron (*Ardea purpurea*) 179 pairs, Little Egret (*Egretta garzetta*) 133 pairs and Grey Heron (*Ardea cinerea*) 106 pairs. Now, after ten years pause, Great White Heron (*Casmerodius albus*) breeds again. There are even to 1000 specimens in winter.

Although not yet breeding Spoonbill (*Platalea leucorodia*) is very numerous in migration. The concentration of these birds often amounts 500 to 1000 specimens.

Kopački rit is the only locality in Yugoslavia where a Greylag Goose breeds with a significant number, in average 20–40 pairs, Bean Goose (*Anser fabalis*) where arrive abundantly in autumn, and White-fronted Goose (*Anser albifrons*) in spring.

Kopački rit has a particular role in the life of different duck species. So far, here are noted 22 species, of which 7 species (*Anas strepera*, *A. platyrhynchos*, *A. acuta*, *A. querquedula*, *A. clypeata*, *Aythya ferina*, *A. nyroca*) are breeding. The concentration of ten or more thousand of ducks belonging to different species is not rare during migration.

Kopački rit is also interesting for waters. When water level is low, these birds arrive in great flocks. The dominant species are Black-tailed Godwit (*Limosa limosa*), Ruff (*Philomachus pugnax*), Spotted Redshank (*Tringa erythropus*), Greenshank (*Tringa nebularia*) and others.

Table XXV/2.

## Number of breeding pairs of Herons in the Kopački rit

Year	<i>Ardea cinerea</i>	<i>Ardea purpurea</i>	<i>Casmerodius albus</i>	<i>Egretta garzetta</i>	<i>Ardeola ralloides</i>	<i>Nycticorax nycticorax</i>	<i>Platalea leucorodia</i>	<i>Plegadis falcinellus</i>	Total
1954	93	193	73	235	478	769	11	27	1852
1955	99	98	51	135	249	393			1125
1956	39	91	36	88	315	358			927
1957	9	145	33	110	215	460			972
1958		209	35	92	380	450			1166
1959		180	30	115	272	270			876
1960		223	38	243	265	417			1186
1961		163	20	205	227	247			862
1962		209	27	117	180	305			838
1963		175	23	110	279	400			977
1964		287	22	88	398	690			1485
1965		271	22	212	407	489			1401
1966		219	9	119	268	370			985
1967		215	5	113	256	339			928
1968		115		100	139	270		4	628
1969	4	130		200	157	225			716
1970	35	198		150	190	330			903
1971	100	250	?	100	50	800			1300
1972	100	300	?	200	50	800			1450
1973	50	200	?	100	50	400			800
1974	150	250	?	100	80	300			880
1975	200	200	?	100	100	100			700
1976	250	200	?	120	100	300			970
1977	350	200	?	150	100	400			1200
1978	400	150	?	100	60	600			1310
1979	400	104	5	100	80	200			889
1980	350	50	5	30	10	100			545
1981	350	50	5	200	15	100			720
Average	106	179	16	133	195	389			1021

Because of limited place, here is presented only a little part of richness of bird's world in Kopački rit. Nevertheless, I hope this is enough to confirm the international importance of Kopački rit with respect to waterfowl.

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## XXVI. DISTRIBUTION, NUMBERS AND STATUS OF GEESE IN JAPAN

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### Introduction

Ornithological studies of geese in Japan date back to the writings of *Temminck*, *Blakiston*, *Seebohm*, *Stejneger*, and others in the latter half of the 19th century. *Nagamichi Kuroda*, 1912–1978, an eminent Japanese ornithologist who laid the foundation for Japanese ornithology during the, pre-war period, has added much to the knowledge on the taxonomy, distribution, status of geese in our country. *Austin and Kuroda* (1953) summarized all the distributional information of Japanese birds up to their time. Since then, however, there had been a very few observations on our geese until the Forestry Agency of the Japanese Government and the Japanese Association for Wild Geese Protection (JAWGP) almost simultaneously organized waterfowl and geese counts around 1970. The capacity of recent observations of wild geese in Japan is probably due to the difficulty of observing them as they have so drastically decreased in numbers.

In the winter of 1969–70, on the advice of IWRB, the Forestry Agency initiated a survey of wild geese in Japan as a part of the “National Waterfowl Survey”. This survey is still continued as a government project of the Environment Agency, to which the organization of the survey of was transferred from the Forestry Agency in 1971.

The Japanese Association for Wild Geese Protection was established in 1970. The chief objects of the association are the study of geese populations and their preservation in Japan. The present report outlines the current status of geese in Japan, although the data are still insufficient since our research has been carried out for only 10 years.

### Organizations and methods of survey

The following two organizations are entirely responsible for the data used in the present report:

— Environment Agency of the Japanese Government. The Environment Agency conducts the survey of the numbers of waterfowl in the middle of January every year. The project has continued since 1970 and the results are published annually. The observers for the survey are forestry and agricultural officers of prefectural governments and officially entrusted wildlife rangers. They count the numbers of geese and ducks both in roosts and in feeding places at many localities ranging throughout the country. The time for counting is from 900 hours until 1200 hours noon; an average of the total numbers of observers is 114 persons.

—Japanese Association for Wild Geese Protection (JAWGP). This association is a private organization founded in 1980 and the authors are among its 40 members. The headquarters of the association is located in Sendai City, about 60 km south of Lake Izunuma, the largest and main wintering ground of wild geese in Japan today. The numbers of geese at Izunuma have been counted by the members of JAWGP at least twice or three times a month since 1971 (Yokota *et al.*, 1979 and 1980). Methods of counting differ for different species. *Anser albifrons* are counted at their morning flight when they move from the roosts to the feeding places. *Anser fabalis* is counted both at the morning flight and while feeding during the daytime, *Branta bernicla* on the other hand, are counted on the sea in the daytime. They are observed either from the sea coast or using a boat.

Since 1976, in addition to the geese counts at Izunuma, we have carried out the counts and observations on geese wintering in other areas of Japan. The subspecies of *Anser fabalis* are identified in the field since 1979.

### Species and subspecies of geese wintering in Japan

In goose surveys for 10 seasons from 1971 to 1980, the following four species are recorded every year: *Anser albifrons*, *Anser fabalis*, *Branta bernicla* and *Branta canadensis*. *Anser erythropus* has been observed every year since 1976, the number of birds seen in a season being one to seven individuals. *Anser caerulescens*, *Anser cygnoides* and *Anser anser*, on the other hand, winter in our country only once every two or three seasons and the number of birds seen was one to three a season. *Anser canagicus* was recorded only once (one individual). Altogether nine species of geese have been known to occur in Japan, of which three species (*A. albifrons*, *A. fabalis* and *B. bernicla*) are regular winter visitors today. Two species (*B. canadensis* and *A. erythropus*) are also regular winter visitors but few in number. The other four species are either irregular winter visitors in very small numbers (*A. caerulescens*, *A. cygnoides* and *A. anser*) or a straggler (*A. canaginus*) although at least two of them (*A. caerulescens* and *A. cygnoides*) were regular visitors in early times (Kuroda, 1939; Austin and Kuroda, 1953).

The subspecies of geese wintering in Japan are as follows: *Anser albifrons frontalis*, *Anser fabalis serrirostris* and *A. f. middendorffii*, *Branta bernicla orientalis*, and *Branta canadensis leucopareia* and *B. c. minima*.

*B. c. leucopareia* have been observed every year since 1970 and the number of birds recorded was one to three in each season. A single specimen of *B. c. minima* was taken in Tokyo Bay before 1894 (Kuroda, 1952); one individual was seen again at Lakes Izunuma and Uchinuma in 1979/80 (Kurechi and Hiraizumi, 1981). The chief characteristics of these species and subspecies in the field are shown in Table 1. Among *Anser fabalis* the subspecific intermediates between *serrirostris* and *middendorffii* constitute about 10–20% of the total *A. fabalis* population.

## Winter areas and staging places

In this report "wintering area" denotes the area where geese stay from September/October to March/April. "Staging place" is an area where they rest for less than one month in autumn and/or spring on their migration route.

There are nine such wintering areas in Japan, eight in Honshu and one in Hokkaido. The staging places are thirteen in number, two in Honshu and eleven in Hokkaido. They are shown in Fig. 1.

*A. albifrons* has three wintering areas: Katano-no-Kamoike (2), Sado Island (4) and Lake Izunuma (6). It uses five staging places: Hachiro-gata (10), Lake Ogawara (11), Lake Utonai (12), Ishikari Plain (13) and Seika-ko (14).

*A. fabalis* has five wintering areas and ten staging places. The only known wintering area of *A. f. serrirostris* is Lake Izunuma (6); its staging places are Lake Ogawara (11), Lake Utonai (12), Kushiro Marsh Plain (17), Furen-ko (18) and Notoro-ko (21). *A. f. middendorffii*, on the other hand, uses five wintering areas: Lake Biwa (1), Katano-no-Kamoike (2), Asahi-ike (3), Fukushima-gata (5) and Lake Izunuma (6). There have been four staging places for *A. f. middendorffii*: Hachiro-gata (10), Lake Utonai (12), Ikusotamura (16) and Teshio Plain (22). Furthermore, small flocks of *A. f. middendorffii* have been observed at Ishikari Plain (13), Yueso-numa and Chobushinuma (15), Kushiro Marsh Plain (17) and Furen-ko (18) during migration. The subspecies of *A. fabalis* staging at Tofutsu-ko (20) has not yet been identified.

As far as it is known, *B. bernicla* winters in three areas, each with a population of more than one hundred: Sendai Bay (7), Mutsu Bay (8) and Hakodate Bay (9). Although there may be some unknown wintering areas in Japan, any *B. bernicla* missed would be small in number. Nevertheless it must be admitted that information on the wintering areas and numbers of *B. bernicla* is much less accurate than that on the other species.

The wintering area of *B. c. leucopareia* is Lake Izunuma (6) and their staging places are Hachiro-gata (10) and Ishikari Plain (13). In recent years both *B. c. leucopareia* and *B. c. minima* have always been found mingled in large flocks of *A. albifrons*.

### Numbers of geese

The recent numbers of geese wintering in Japan are shown in Table 2. The total numbers are estimated at between 10 000 and 15 000 birds.

*A. albifrons* constitutes about 60%, *A. fabalis* about 35% (*A. f. serrirostris* 12% and *A. f. middendorffii* 23%) and *B. bernicla* about 5% of the total. The numbers of *B. c. leucopareia* and *A. erythropus* are very small, so far one to seven birds being seen each season.

Table 3 shows the results of the geese survey by the Environment Agency. These figures are considered very valuable information. Nevertheless, as commented by Horiuchi (1974), who said that "these numbers are not necessarily enough to estimate the total numbers of geese wintering in our country", the numbers of geese by the survey of the Environment Agency and those by JAWGP do not always agree. The results of the two surveys at Lake Izunuma are given in Table 4 and Fig. 2 for comparison.

The numbers of geese given by the Environment Agency are approxi-

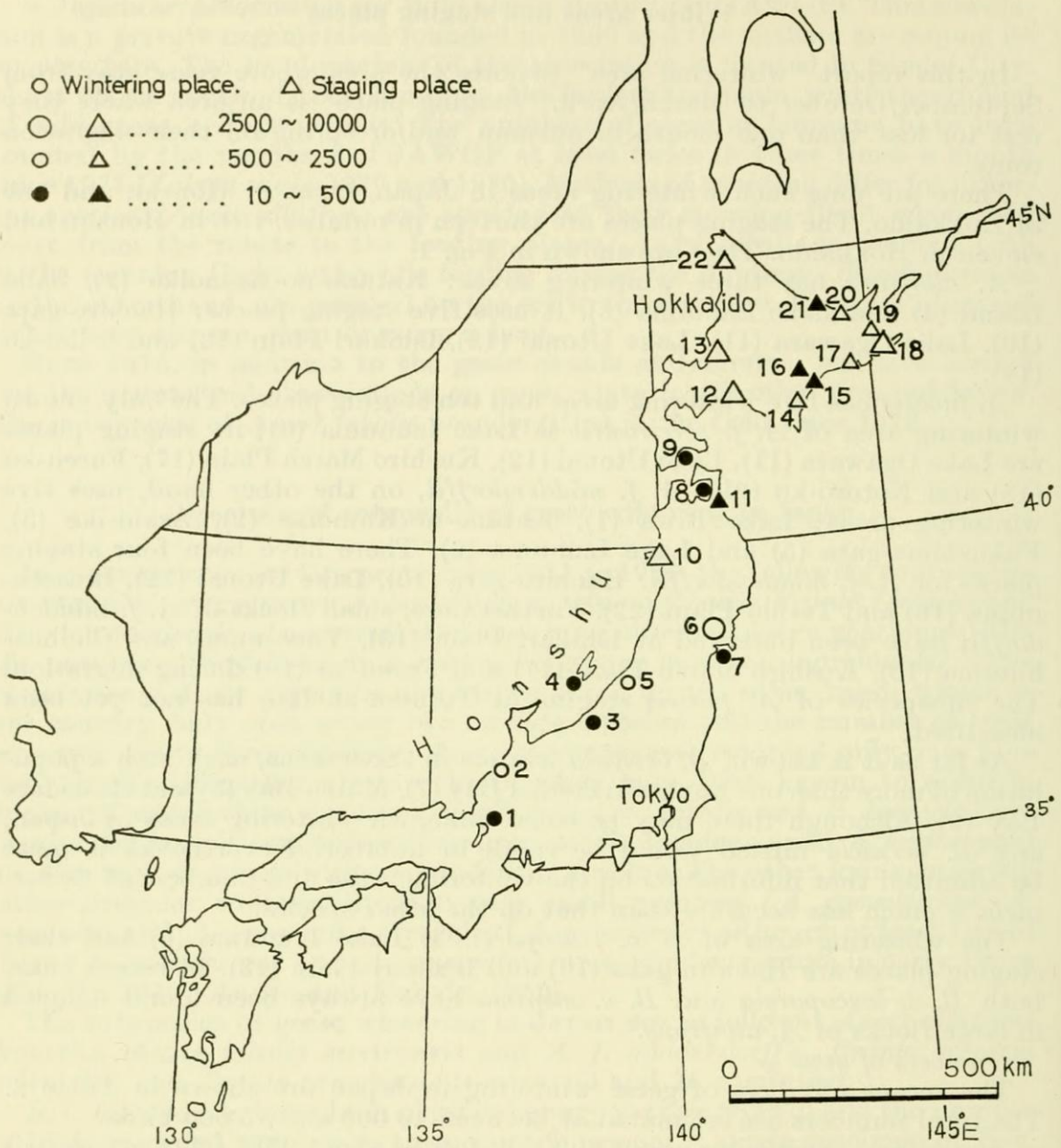


Figure XXVI/1: Wintering and staging places of geese in Japan, 1975-80. Wintering place: 1. Lake Biwa, 2. Katano-no-kamoike, 3. Asahi ike, 4. Sando Island, 5. Fukushima gata, 6. Lake Izunuma, 7. Sendai Bay, 8. Mutsu Bay, 9. Hakodate Bay. - Staging place: 10. Hachiro-gata, 11. Lake Ogawarako, 12. Lake Utonai, 13. Ishikari Plain, 14. Seika-ko, 15. Yudo-numa and Chobushi-numa, 16. Ikusota-numa, 17. Kushiro Marsh, 18. Furen-ko, 19. Odaito, 20. Tofutsu-ko, 21. Notoro-ko, 22. Teshio Plain (JAWGP)

mately 30% less than those of JAWGP. The data and frequency of counts are chiefly responsible for the difference in result. At Lake Izunuma, JAWGP conducts its geese counts at least once or twice a month throughout the wintering period of geese. On the contrary, the Environment Agency's count is made only once a year in the middle of January. The middle of January is almost the coldest time of the year and there is sometimes much snow fall in northern Japan. According to JAWGP observations, the very severe weather and snow at times make the geese at Lake Izunuma disperse and move to the south suddenly, causing under-estimation of the goose populations. The same may be true of the other wintering areas, most of which are located in the northern half of the country (Fig. 1).

It is therefore suggested that early December, or any date just prior to snow fall, is the most suitable time for geese survey in Japan.

### Migration routes in Japan

It is presumed that geese wintering in Japan come from and go back to the north and the northeast, since there is no record or observation of geese migrating to our country through the Korean Peninsula or direct from the Premorski region across the Sea of Japan. To trace the migration routes of geese within Japan, two methods were used.

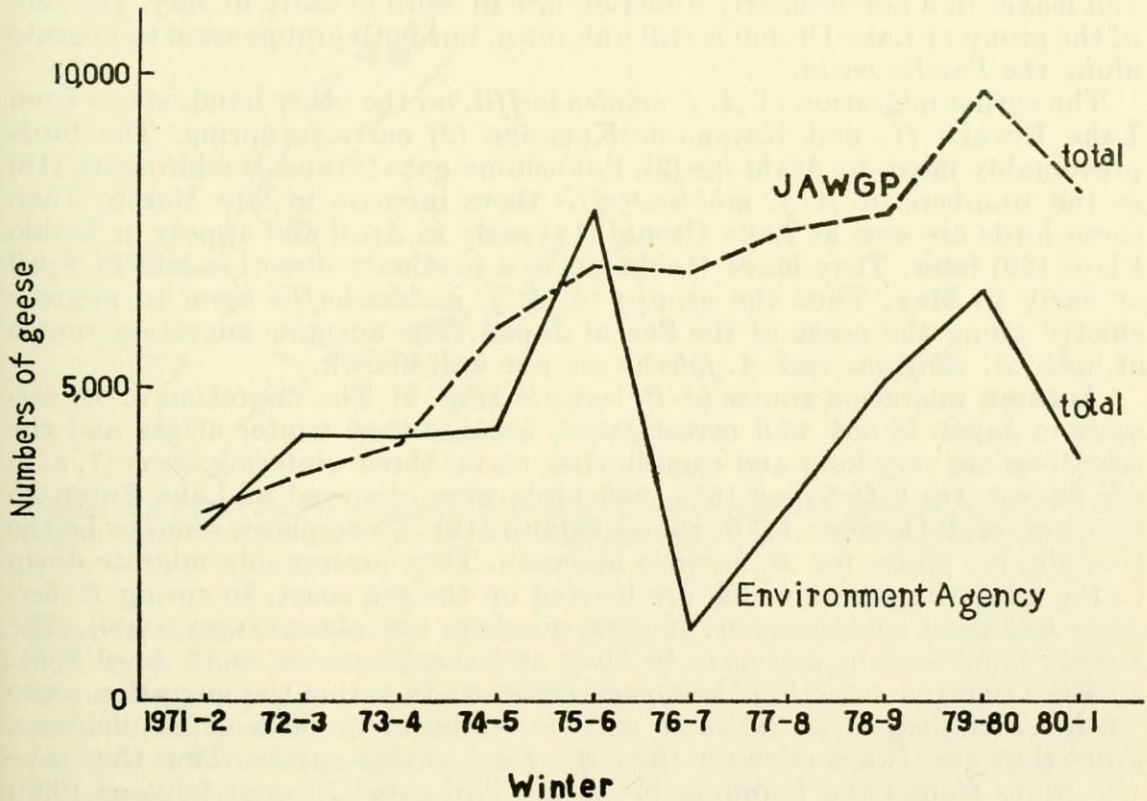


Figure XXVI/2: Numbers of geese wintering in Miyagi Prefecture (Lake Izunuma). Solid line = Environment Agency; dotted line = JAWGP

One method is to infer the movements of geese by counting their numbers at the wintering and staging places and arranging those results in the order of date. The other method is to use rare species or particular individuals as "markers". For example, *Branta canadensis leucopareia*, *Anser caerulescens*, *Anser cygnoides*, and in one case a part albino *Anser fabalis* were used to investigate the migration routes.

These two methods have been found reliable enough in such a country as Japan, where the number of geese are not very large and the country stretches from south to north for a long distance. The banding of geese has not yet been done, but attempts will be made in the very near future. The migration routes thus brought out are outlined below.

Spring migration routes for *A. albifrons* (Fig. 3). The larger flock (5000–6000 birds) starts from Lake Izunuma (6) and migrates through Hichirogata (10) and Ishikari Plain (13); this group leaves the country in a northerly direction late in April or early in May. The smaller flock (1000–2000 birds) of Izunuma birds takes the route to Lake Utonai (12) and then to Seika-ko (14); the group presumably leaves in a northeasterly direction around the end of April. The migration routes of the flocks which winter at Katano-no-Kamoike (2) and on Sado Island (4) are not yet certain.

Spring migration routes of *A. fabalis* (Fig. 4). The group of *A. f. serrirostris* from Izunuma seems to divide into two smaller groups when migrating back to the north. One group takes the route to Lake Utonai (12) and the other to Kushiro Marsh Plain (17). The latter group then moves to Furen-ko (18) and leaves in a northeasterly direction late in April or early in May. The fate of the group at Lake Utonai is still unknown, but both groups seem to migrate along the Pacific coast.

The spring migration of *A. f. middendorffii*, on the other hand, starts from Lake Biwako (1) and Katano-no-Kamoike (2) early in spring. The birds presumably move to Asahi-ike (3), Fukushima-gata (5) and Hachiro-gata (10) as the numbers of *A. f. middendorffii* there increase in late March. Then these birds are seen at Lake Utonai (12) early in April and appear in Teshio Plain (22) later. They leave Hokkaido in a northerly direction late in April or early in May. Thus the groups of *A. f. middendorffii* seem to migrate chiefly along the coast of the Sea of Japan. The autumn migration routes of both *A. albifrons* and *A. fabalis* are not well known.

Autumn migration routes of *B. bernicla* (Fig. 5). The migration of *B. bernicla* in Japan is not well investigated, because they winter at sea and the coastlines are very long and complicated. So far three wintering areas (7, 8, 9) are known. On 9 October 1975, 980 birds were observed at Lake Furen-ko (18), and on 9 October 1976, 900 at Odaito (19). These places seem to be the first staging places for *B. bernicla* in Japan. They presumably migrate down to the wintering areas which are located on the sea coast. In spring *B. bernicla* has been seldom seen; if seen numbers are always very small. The largest flock seen in spring is 40 birds at Lake Furen-ko on 13 April 1981.

Migration routes of *B. c. leucopareia* (Fig. 3). In spring the migration route of *B. c. leucopareia* is the same as that of the main flock of *A. albifrons*, since they are always mixed in the large flock of that species. Thus they take the route from Lake Izunuma (6) to Hachiro-gata (10) and Ishikari Plain (13) and leave in a northerly direction.

As already mentioned, most geese leave Japan late in April or early in

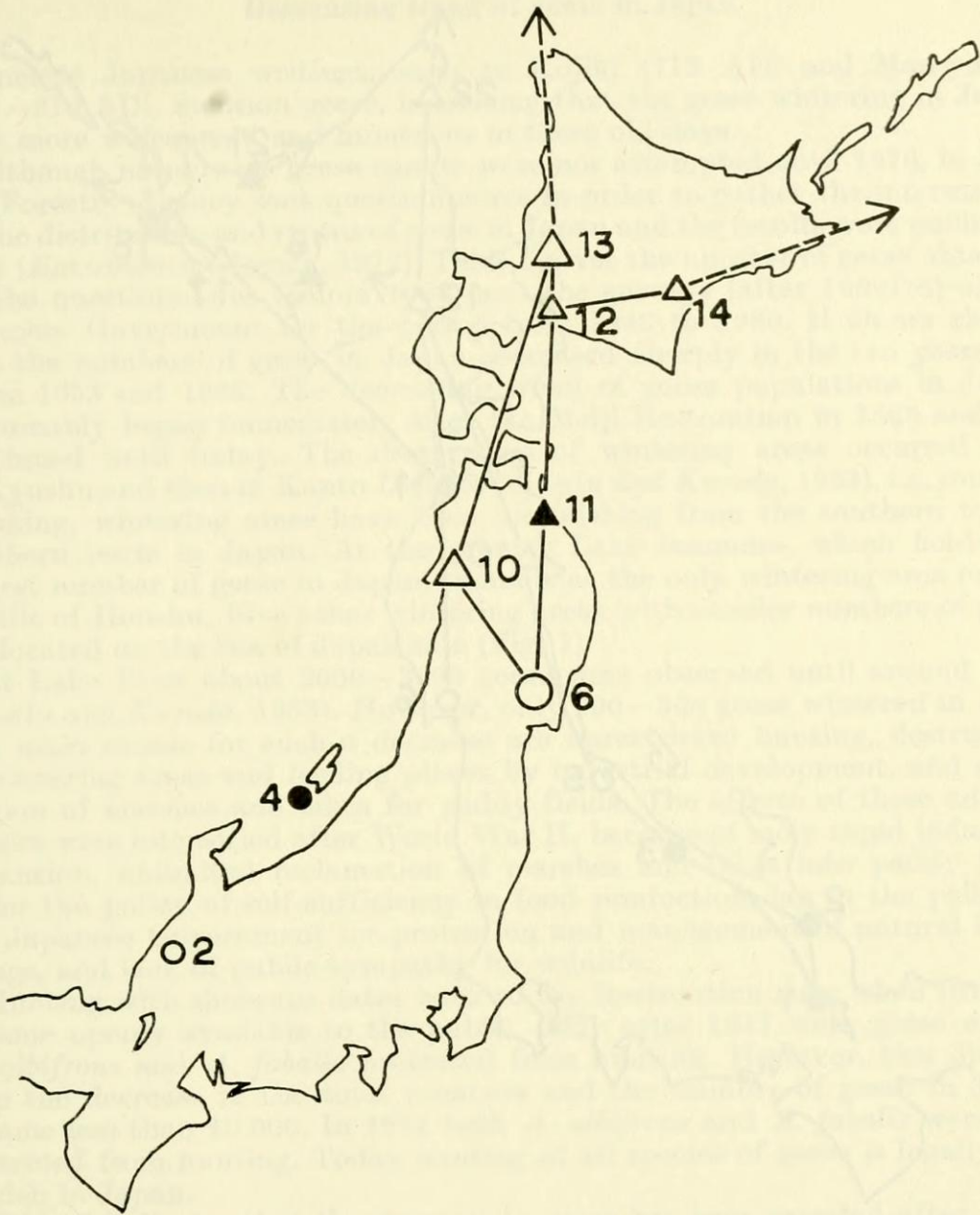


Figure XXVI/3: Spring migration courses of White-fronted and Aleutian Canada geese in Japan (1975 - 80, JAWGP). Solid line = migration courses; dotted line presumed migration courses

May. In April the weather of the breeding grounds in the north should be still very cold. It becomes milder towards May. Thus the departure time of geese corresponds roughly with the northern climate in extreme northeast Asia. Consequently, the departure time is about the same as in Europe (Ogilvie, 1978), although Japan is situated further south in latitude than European countries.

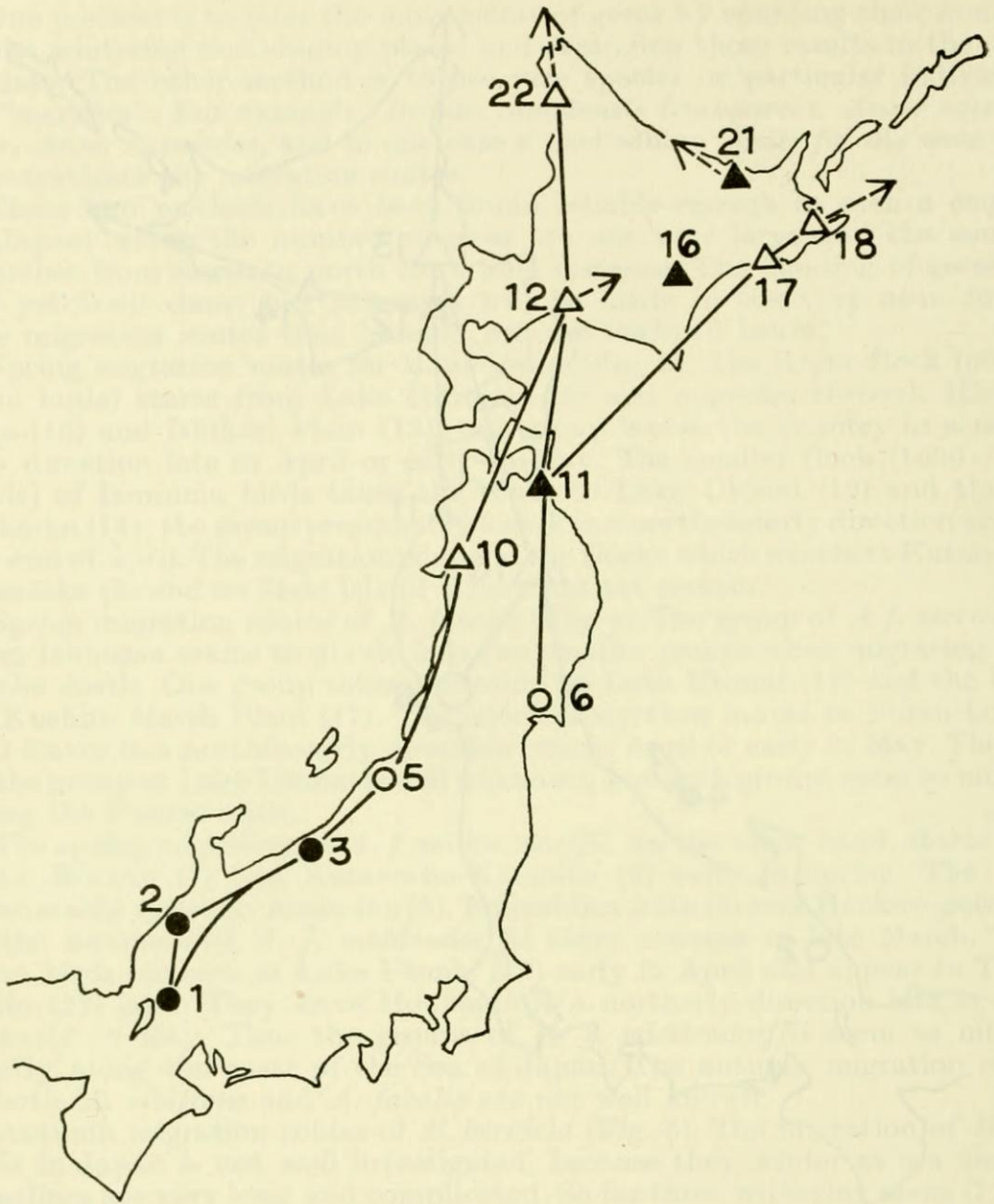


Figure XXVI/4: Spring migration courses of Bean Geese in Japan (1975 – 80). (JAWGP).  
See Fig. XXVI/3 for explanations

## Decreasing trend of geese in Japan

Ancient Japanese writings, such as Kojiki (712 AD) and Man-yo-shu (780–810 AD), mention geese, indicating that the geese wintering in Japan were more widespread and numerous in these old days.

Although nationwide geese counts were not attempted until 1970, in 1964 the Forestry Agency sent questionnaires in order to gather the information on the distribution and status of geese in Japan and the results were published later (*Environment Agency*, 1972). Table 5 gives the number of geese obtained by the questionnaires (before 1963) and the surveys (after 1969/70) of the Japanese Government for the period from 1943 to 1980. It shows clearly that the numbers of geese in Japan decreased sharply in the ten years between 1953 and 1963. The decreasing trend of goose populations in Japan presumably began immediately after the Meiji Restoration in 1868 and has continued until today. The destruction of wintering areas occurred first in Kyushu and then in Kanto District (*Austin and Kuroda*, 1953), i.e. roughly speaking, wintering areas have been diminishing from the southern to the northern parts in Japan. At the present Lake Izunuma, which holds the largest number of geese in Japan, remains as the only wintering area on the Pacific of Honshu. Five other wintering areas with smaller numbers of geese are located on the Sea of Japan side (Fig. 1).

At Lake Biwa about 2000–3000 geese were observed until around 1946 (*Austin and Kuroda*, 1953). However, only 200–300 geese wintered in 1980. The main causes for such a decrease are unrestricted hunting, destruction of wintering areas and feeding places by industrial development, and reclamation of marshes and lakes for paddy fields. The effects of these adverse factors were intensified after World War II, because of more rapid industrial expansion, unlimited reclamation of marshes and lakes into paddy fields under the policy of self-sufficiency in food production, lag in the policy of the Japanese Government for protection and management of natural living things, and lack of public sympathy for wildlife.

Hunting with shotguns dates back to the Restoration time when firearms became openly available to the public. Only after 1947 were geese except *A. albifrons* and *A. fabalis* protected from hunting. However, this did not stop the decrease in the total numbers and the number of geese in Japan became less than 10 000. In 1971 both *A. albifrons* and *A. fabalis* were also protected from hunting. Today hunting of all species of geese is legally forbidden in Japan.

Table 3 indicates that the decrease in geese has been arrested after 1971; in some areas, geese have even been increasing slightly in the past 10 years. Goose counts at Lake Izunuma (Table 4, Fig. 2) also indicate that hunting prohibition was an effective measure to improve the wintering goose populations.

It should be emphasized, however, that the deterioration of the natural environment is still progressing rapidly, so the grievous possibility of extinction of geese in Japan cannot be ruled out.

It is therefore urgently necessary to establish a drastic policy in order to preserve geese permanently.

## Some features of Japanese geese

The situations peculiar to Japanese geese should be mentioned:

### (i) Cause of rapid decrease.

Since the Meiji Restoration in 1868, industrial development and hunting have been favoured by the Japanese as evidence of western modernization, which has had so much influence on national thinking. Industrial development accelerated even more after World War II.

There is a strong correlation between the decrease of geese and social and economic reform in Japan. Such conditions may be seen in many countries over the world, but Japan is a rare case in which radical changes took place so quickly within a short time. Consequently, the geese of Japan diminished very rapidly after the Restoration.

So a really difficult question is posed: will the geese, which are now under complete protection from hunting, recover their original distribution and numbers if some measure for preserving their wintering areas are taken in future? In any case, hunting, industrial development, and reclamation of marshes and lakes are undoubtedly more important factors to be considered for preserving the geese wintering in our country.

### (ii) Feeding habits of Japanese geese

There are some differences in feeding habits between Japanese and European geese. In Japan *A. albifrons* and *A. fabalis* feed chiefly on dispersed rice and gleanings on paddy fields. They supplement their food with the grasses on the edges of paddy fields and some water plants (e. g. *Trapa* spp., *Zizania latifolia*, etc.) in marshes. However, when they settle in northern and northeastern most staging places in Hokkaido on their northward migration, they feed mainly on grasses and remains of farm products as they do in Europe (Yokota *et al.*, 1978).

*B. bernicla* in Japan feed mainly on *Zostera marina* and *Enteromorpha* spp. They feed on cultured laver *Porphyra* spp. when *Zostera* and *Enteromorpha* are in short supply. The cultured laver is one of the important sea products in Japan. In any case, *B. bernicla* feed exclusively on the surface of the sea in Japan and have never been seen feeding on the land as they do in Europe (cf. Owen, 1978).

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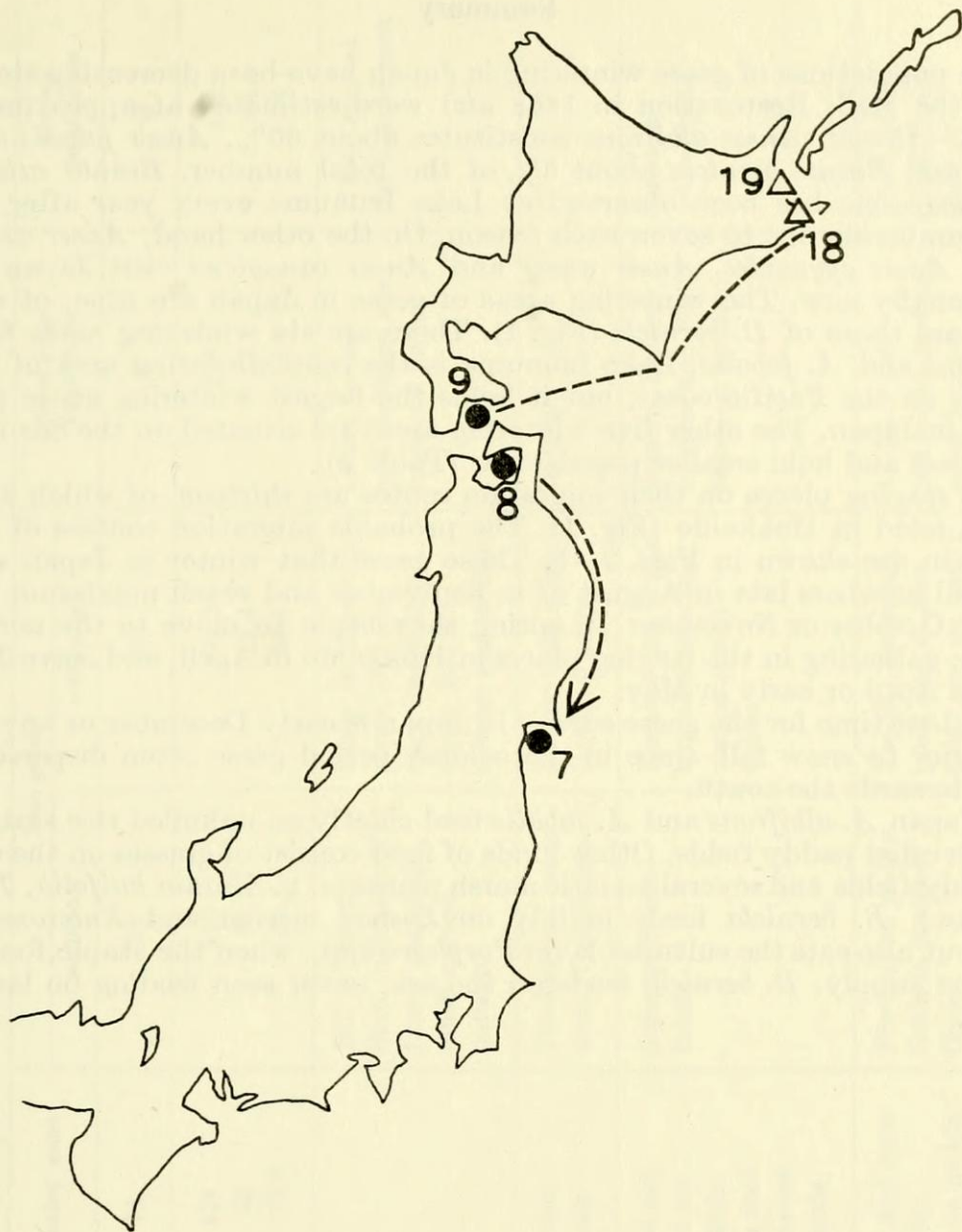


Figure XXVI/5: Autumn migration course of Black Brants in Japan (1975-1980) (JAWGP). See Fig. XXVI/3 for explanations

## Summary

The populations of geese wintering in Japan have been decreasing steadily since the Meiji Restoration in 1868 and were estimated at approximately 10 000–15 000. *Anser albifrons* constitutes about 60%, *Anser fabalis* about 35%, and *Branta bernicla* about 5% of the total number. *Branta canadensis leucopareia* has been observed at Lake Izunuma every year after 1976 and numbering one to seven each season. On the other hand, *Anser caerulescens*, *Anser cygnoides*, *Anser anser* and *Anser canagicus* visit Japan only occasionally now. The wintering areas of geese in Japan are nine, of which three are those of *B. bernicla* (Fig. 1). There are six wintering areas for *A. albifrons* and *A. fabalis*. Lake Izunuma is the only wintering area of these species on the Pacific coast, but it holds the largest wintering goose population in Japan. The other five wintering areas are situated on the Sea of Japan coast and hold smaller populations (Table 2).

The staging places on their migration routes are thirteen, of which eleven are situated in Hokkaido (Fig. 1). The probable migration courses of geese in Japan are shown in Figs. 3–5. Those geese that winter in Japan arrive in small numbers late in August or in September and reach maximum numbers in October or November. In spring they begin to move to the north in March, gathering in the staging places in Hokkaido in April, and leave Japan late in April or early in May.

The best time for the geese survey in Japan is early December or any time just prior to snow fall, since in the coldest period geese often disperse and move towards the south.

In Japan *A. albifrons* and *A. fabalis* feed chiefly on unhulled rice scattered on harvested paddy fields. Other kinds of food consist of grasses on the edges of paddy fields and several aquatic marsh plants (e. g. *Zizania latifolia*, *Trapa* spp etc.). *B. bernicla* feeds mainly on *Zostera merina* and *Enteromorpha* spp., but also eats the cultured laver *Porphyra* spp., when the staple food are in short supply. *B. bernicla* feeds on the sea, never seen feeding on land in Japan.

Table XXVI/1.

## Identification keys of the species or subspecies of geese in Japan

		White-fronted goose	Bean goose		Brent goose (Black Brant)	Aleutian canada goose
			serrirostris	middendorfi		
Measurement mm	Number of ex	11	19	30	1	3
	Wing chord	421	470	798.3	338	402
	Culmen	50	69.3	79.4	33.4	35.5
	Tarsus	72.9	85.4	88.1	59.1	78.1
Characteristics on appearance			Bill is shorter than middeldorfi's Lower mandible much curved outward	Body is larger than serris. Bill and neck longer than serris. Bill is slender and straight	Lower breast and abdomen are fuliginous brown	White ring at the base of neck
Voice		Clearer than Bean goose	Thicker and lower than Whitefronts	Deeper than serris Honking voice	Metallic	
Food		Unhulled rice dispersed on paddy fields. Grass on foot path between paddy fields	Same as Whitefronts	Zissania and Trapa but also unhulled rice on paddy fields	Zostera, Entero-morpha and Porphyra on seafarm	Same as whitefronts
Feeding behaviour		Morning and evening flights. Feeding on paddy fields in larger flocks	Feeding on paddy fields in smaller flocks	Feeding on marsh, pond and at lake coast also on paddy fields in smaller groups	At sea coast and on sea surface, when feed on Porphyra	Feed intermingled with flock of whitefronts

Table XXVI/2.

The numbers of geese at different haunts in Japan  
(1975-76-1980-81)

JAWGP

No.	Name of haunts	District <sup>1</sup>	White-fronted geese	Bean geese		Black Brant	Aleutian Canada geese
				serrirostris	middendorfi		
	Wintering place						
1	Lake Biwa	Shiga			200-300		
2	Katano-ng-Kamaike	Ishikawa	500-1000		300-500		
3	Asahi-ike	Niigata			100-200		
4	Sado Island	Niigata	40-70				
5	Fukushima	Niigata			1500-2500		
6	Lake Izumuna	Miyagi	6000-7000	1000-2000	50-120		1-2
7	Sendai Bay	Miyagi				100-200	
8	Mutsu Bay	Amoari				300-400	
9	Hakodate Bay	Toshima(H)				100-150	
	Staging place <sup>2</sup>						
10	Hachiro-gata	Akita	4000-6000		1000-5000		1-2
11	Ogawara-ko	Amori	50-300	100-200			
12	Lake Utonai	Iburi (H)	1000-3000	500-1000	1000-2000		
13	Ishikari Pl.	Ishikari (H)	5000-6000		20-100		1-2
14	Seika-ko	Tokachi (H)	1000-1500				

15	Yudo-numa- Chobushi n.	Tokachi (H)		200 - 300	
16	Ikusota-numa	Tokachi (H)		300 - 500	
17	Kushiro Marsh	Kushiro (H)	400 - 1000		
18	Furen-ko	Nemuro (H)	1000 - 1500		980
19	Odaito	Nemuro (H)			900
20	Tofutsu-ko	Abashiri (H)	200	600 <sup>3</sup>	
21	Nataro-ko	Abashiri (H)	200 - 400		
22	Teshio Plain	Soya-Rumori (H)		1000 - 1500	

1. Provinces in Hokkaido are designated by (H); others are in Honshu.

2. The numbers of geese at staging places are the numbers on spring migration except at 18 and 19.

3. Subspecies of Bean geese at Tofutsu-ko are not determined.

Table XXVI/3.

## Results of geese counting in Japan (1969 - 1980)

Environment Agency

Winter	No. of obs.	Frequency of count in the year	White-fronted goose	Bean goose	Brent goose	Bcl	Aa	Ae	Ac	Acy	Sp. un-determined	Total
1969 - 70	85	1	3726	1500	339							5565
1970 - 71	69	1	3385	1615	160							5160
1971 - 72	98	1	3485	1899	290						119	5793
1972 - 73	70	1	4991	1554	256						380	7181
1973 - 74	104	1	4596	1466	202	2	2	3	1	1	977	7250
1974 - 75	182	1	3611	2420	146						1072	7249
1975 - 76	152	1	5962	4896	104	2					58	11022
1976 - 77	153	1	2900	2466	374						156	5897
1977 - 78	109	1	4019	1969	140			3				6131
1978 - 79	116	1	5171	1797	236	1		1			624	7830
1979 - 80	123	1	7079	1857	170	2	2	2			48	9161
1980 - 81	114	1	3436	3877	161		1				33	7508
12 winters	average 114	1	4364	2276	215						385	7146

- Bcl = *Branta canadensis leucopareia* - Aleutian Canada goose  
 Aa = *Anser anser* - Greylag goose  
 ae = *Anser erythropus* - Lesser White-fronted goose  
 Ac = *Anser caerulescens* - Snow goose  
 Acy = *Anser cygnoides* - Swan goose

Table XXVI. 4.

## Results of geese counts in Miyagi Prefecture (Lake Igunuma)

Winter	Environment Agency						JAWGP <sup>3</sup>										
	Frequency of counts in the year	White-fronted geese	Bean geese	Brent geese	Other species	Species undetermined	Total	Frequency of counts in the year	White-fronted geese	Bean geese	Brent geese	B <sup>2</sup> cl	B <sup>4</sup> cm	Ae	Ac	Acy	Total
1969 - 70	1	2162	122				2284										
1970 - 71	1	2003	828				2831					1					
1971 - 72	1	2365	273	87		66	2791	25			56	1					3000
1972 - 73	1	3233	661			330	4224	48	3400	230	38	1					3669
1973 - 74	1	3013	482	14	1 <sup>2</sup>	699	4211	32	3644	294	123	3			1		4065
1974 - 75	1	3325	1018			1000	4343	49	4316	1419	118	2					5927
1975 - 76	1	4654	3075		2 <sup>2</sup>	28	7759	43	4325	2468	120	2		1	1		6917
1976 - 77	1	771	250	31		90	1142	42	5300	1501	21	2		2			6826
1977 - 78	1	3013	53				3066	42	5590	1800	100	2		7			7499
1978 - 79	1	4269	228			591	5090	49	5753	1809	200	1		4			7767
1979 - 80	1	6077	390		2 <sup>2</sup>	26	6495	72	7600	1950	184	1		3			9738
1980 - 81	1	2775	1085			20	3880	28	6265	1606	262	2	1	2			8139
Average	1	3085	705			317	4010	43	5132	4406	122						6354

1. *Anser caerulescens*2. *Brenta canadensis leucopareia*

3. Numbers of geese are peatz number in the winter

4. *Branta canadensis minima*

Table XXVI/5.

*Decrease in the numbers of geese – observed sites in Japan for past 38 years*

Environment Agency

Year	Geese observed sites		Number of geese		Method of survey
	Number,	%	Number,	%	
1943	149	100	62300	100	Questionnaire in 1964
1953	140	94	54200	87	
1963	57	38	9300	15	
1969 – 70	40	27	5542	9	Direct counts
1970 – 71	27	20	5161	8	
1971 – 72	All geese were prohibited to hunt				
	42	28	5793	9	
1972 – 73	34	23	7181	12	
1980 – 81	46	31	7508	12	

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