Japanese Cormorant Umi-u (Jpn) *Phalacrocorax capillatus*

Morphology and classification

Classification: Suliformes Phalacrocoracidae

Total length:	800-865mm
Wing length:	315.9 ± 8.9mm (N = 7)
Culmen length:	♂ 69.8 ± 1.3mm (12) ♀ 62.0 ± 2.3mm (15)
Bill depth:	♂ 15.1 ± 0.7mm (12) ♀ 13.2 ± 0.6mm (15)
Tarsus length:	66.9 ± 4.4mm (7)
Tail length:	150.7 ± 6.9mm (6)
Weight:	♂ 3.1 ± 0.2kg (42) ♀ 2.5 ± 0.2kg (37)

Culmen length, bill depth, and body weight are taken from the breeding population of Teuri Island, Hokkaido, and wingspan, tarsus and tail lengths are measured from by-caught individuals in Hamamasu, Hokkaido (Watanuki et al. Unpubl.). The total length after Enomoto (1941).

Appearance:

Photo 1. Japanese Cormorants [Photo. Motohiro Ito]

Japanese Cormorants are black all over except in the bare skin from the periphery of the eyes to the throat, which is yellow. They develop white feather patches at the base of the leg as well as from the head to the neck during the breeding season. Japanese Cormorants are slightly larger than Great Cormorants and their plumage has a greenish sheen. The yellow bare skin cuts into the throat in a V-shape for Japanese Cormorants, while the boundary of the bare skin with the throat is straight for Great Cormorants.

Japanese Cormorant juveniles (less than one year of age) are white from the breast to the belly, but they begin to grow dark feathers on the breast the following year. Young birds of two years or over are dark brown all over, but still have white feathers in places on the breast (Takano 1982, Juou-cho 2000). Japanese Cormorants have adult plumage at the age of 3 or over, but there is a breeding record of birds which have a dark brown breast with white feathers in places (Hayashi 1996).

Vocalization:

Japanese Cormorants rarely call. They utter "Guarr", when people come close to the nest.

Distribution and Habitat

Distribution and Population:

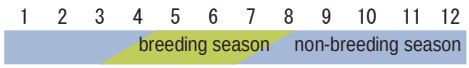
Japanese Cormorants are distributed only in the Far East. In Japan, they breed north of central Honshu, mostly in Hokkaido. In the Asian continent, they breed from the Korean Peninsula to Primorskii, Russia. They move south to winter. In Japan, they winter as far as Okinawa Pref., southern Japan. The breeding populations are estimated to be 5,000 birds along the coast of the Sea of Okhotsk, 8,000 birds in the Kuril Islands, 3,000 birds along the coast of Primorskii and 1,000 birds in the Sea of Japan (Siegel-Causey & Litivinenko 1993). In Japan, the breeding populations were estimated to be 1,000 birds in Hokkaido and 100 birds in Honshu (Hasegawa 1984). More recent estimate is that, more than 3,000 pairs bred in Hokkaido in the 2000s, and they are on the increase (Osa & Watanuki 2002).

Photo 2. Breeding colony of Japanese Cormorants.

Habitat:

Japanese Cormorants generally nest in a colony on relatively wide ledges of cliffs, reefs and steep slopes of rocks. They forage in coastal areas and often rest on breakwaters of a harbor.

Life history



Breeding system: Monogamous.

Breeding season:

In Teurito Island, Hokkaido, the average egg-laying period varies greatly between the years, ranging from the beginning of April to mid-May. They lay eggs earlier when the temperatures of air and water are high in the early spring. They usually breed once a year, but occasionally twice a year. They lay eggs 11.2 ± 5.3 days (N = 206 nests) after they start to build a nest (Hayashi 1996).

Nest:

They build a shallow nest with a diameter of about 60cm, using mainly twigs and generally line the inner cup with seaweed and dried grass. The mean distance between the nests is about 1m.

Egg:

Photo 3. Nest and eggs of Japanese Cormorants

Japanese cormorant eggs are broadly similar to a barrel in shape and mat bluish white in color. The eggs weigh 55.0 ± 3.5g (49.6-59.7, N = 7) and are 63.0 ± 2.1mm (59.5-66.2, N = 7) in length and 39.7 ± 0.8mm (38.8-41.0, N = 7) in diameter (Watanuki et al. Unpubl.). Roughly speaking, the eggs are about the size of a smaller chicken egg. The clutch size ranges from one to six eggs, mostly three or four eggs with a mean of 3.28 ± 0.79 eggs (N = 749 nests) (Kato et al. 2001).

Incubation and nestling periods and fledging rate:

Photo 4. Japanese Cormorant nestlings.

The mean incubation period of Japanese Cormorants is 27.9 ± 2.1 days (N = 16 nests) in Teurito Island (Hayashi 1996). The male and female incubate the eggs in shifts of two to several hours. The egg mortality was attributed to the abandonment of incubation (117 eggs), hatching failure (102 eggs) and accidents including predation (76 eggs) (Hayashi 1996). The eggs hatch from early May to mid-June in Teurito Island. The chicks are born naked. The hatchlings ingest the food the parent birds have regurgitated in the nest, but they eventually put their head into the mouth of gaping parents to feed. Male and female take turns to leave the nest and forage in the sea for 2.2-5.7 hours during the nestling period (Kato et al. 2001). The meal mass (stomach content weight) amounts to 145 ± 20g (N = 23) (Watanuki et al. 2004). The growth rate of chicks is 92-99g per day (Kato et al. 2001) and the chicks leave the nest 50-60 days after hatching. For a while after leaving the nest, the young occasionally come back to the nest to be fed by parents (Hayashi 1996). On a hot day, the parents often carry the seawater in the gular pouch to the nest and spray it on the nestlings. The hatching and fledging rates are 37-95 % and 46-84% respectively (Watanuki and Ito 2012). The death of chicks resulted from nest abandonment (61 birds), starvation or disease (49 birds), predation or accidents (11 birds) and disappearance (208 birds) (Hayashi 1996).

Diet and foraging behavior

Diet:

Based on the study of the stomach contents regurgitated by the parents and nestlings captured in the breeding period or the food

♪ http://www.bird-research.jp/1_shiryo/koe/umiu_130619_muroran_kros.mp3

Reiko Kurosawa

Sumiyoshi 1-29-9, Fuchu, Tokyo, Japan

collected from the nestlings by neck-collar method, the diet of Japanese Cormorants consists of sand lance, naked sandlance, anchovy, sardine, atka mackerel, black rockfish, sculpin and flounder (Table 1). There is no information about their food in the non-breeding season.

Table 1. Diet of Japanese Cormorants

Study periods	1992～1995 Weight ratio	1996～1998 Frequency
sandlance fry	0～43 %	5～29%
sandlance adult (1 year old +)	0～67 %	
naked sandlance		0～19%
anchovy	0～61 %	0～32%
sardine	0～24 %	
atka mackerel	0～77 %	23～24%
rockfish	0～46 %	3～29%
sculpin	0～29 %	0～14%
flatfish	1～19 %	14～24%
gimpo class		0～5%
dace		0～6%
squids		0～10%

Kato *et al.* 2001 Watanuki *et al.* 2004

Foraging behavior:

Japanese Cormorants chase ball-shaped dense shoal of schooling sand lances that Rhinoceros Auklets chased up to the surface near Teurito Island during the summer ("Here comes Darwin!" NHK 2006). They tend to forage in a flock in the year when they primarily eat sand lance and anchovy (Watanuki et al. 2004). They usually forage at a depth of about 20 m around the island and off the main island, but sometimes forage in the area between the island and the main island as well. Each bird has its own favorite feeding site. The distance between the foraging and nesting sites is 7- 9 km in males and 10-13 km in females. Each bird forages in an area of 83-170km^2 in males and 199-200km^2 in females (Ishikawa & Watanuki 2002). Japanese Cormorants are a generalist capturing both epipelagic and demersal fish. In the year when the ocean temperature is low, they tend to eat sand lances in Teurito Island. In the year when the temperature is high, on the other hand, they are out in the sea for a longer time to forage for demersal fish that principally feed in the coastal area of the main island, which is a long way from their breeding grounds (Watanuki et al. 2004). If demersal fish represent a large proportion of the diet, the breeding performance (fledging rate) is decreased due to reduced feeding frequency resulting from extended foraging time (Kato et al. 2001).

Topics of ecology, behavior and conservation

Fish to capture and diving depth

Japanese Cormorants dive repeatedly to a depth of about 30m in the year when they mainly forage for demersal fish, and 10 to 20 m in the year when they primarily capture pelagic fish (Kato et al. 2001). The mean diving depth is 15.1 ± 3.7m (N = 6 birds) with a maximum of 45m for males and 7.2 ± 2.4m (N = 7 birds) with a maximum of 33m for females. Thus, males can dive deeper than females. The mean diving period of males is 37 ± 5s with a maximum of 145s, while that of females is 24 ± 4s with a maximum of 80s. Males can also dive longer than females (Watanuki et al. 1996).

The study of Japanese Cormorants using a depth logger and a radio transmitter suggested that they foraged close to the bottom of the sea at a depth of more than 20m around Teuri Island and in the coastal area of the main island which was less than 40m in depth. On the other hand, they foraged for pelagic fish at a depth of about 10 m in areas more than 40m in depth (Kato et al. 1998).

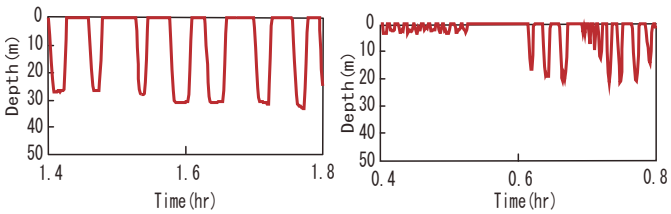


Fig. 1. Comparison of Japanese Cormorant diving behavior in a shallow area (left) and a deep area (right)

Human use of Japanese Cormorants for traditional fishing

Fishing using cormorants is a special method handed down since the 7th century approximately in China and Japan. Chinese people use Great Cormorants for fishing without keeping them on a rope because Japanese Cormorants do not occur in China. Japanese people use Great Cormorants and Japanese Cormorants, both of which are found in Japan, but they mostly use Japanese Cormorants on a rope because Japanese Cormorants are larger and more physically fit for diving, gentler in nature and they have a thicker throat to hold a greater amount of fish (Juou-cho 2000). "Fune-Ukai (cormorant fishing on a boat)" of Inuyama, Gifu and Kyoto is well known, but there is also another type of cormorant fishing in which fishermen enter a river and manipulate cormorants, which is called "Kachi-U". Juvenile Japanese Cormorants are captured on the coast of Juo Town, Hitachi City, central Japan during the spring and autumn migration seasons and large birds more than 2.5 kg in weight are selectively used for fishing across the country.

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Author

Yutaka WATANUKI Hokkaido University Fisheries Sciences Research Institute

I was born in Nagano in 1959 and received my doctorate in Agriculture at Hokkaido University in 1987. A research assistant at the National Institute of Polar Studies between 1988 and 1993. I studied Adelie Penguins at Showa Base in Antarctica. After working in the Graduate School of Agriculture of Hokkaido University, currently an Associate Professor of Fisheries Sciences Research Institute of Hokkaido University. Field of study: behavioral ecology of animals and marine ecology.