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Satellite tracking of a juvenile Steller's Sea Eagle *Haliaeetus pelagicus*

The breeding range of Steller's Sea Eagle *Haliaeetus pelagicus* is confined to narrow strips of coast along the Okhotsk and Bering Seas, together with the forested valleys along the lower reaches of the salmon-rich rivers of these geological basins (Lobkov & Neufeldt 1986, Babenko *et al.* 1988). This species, which is one of the most impressive of the world's birds of prey, has naturally always aroused considerable interest among ornithologists, the more so since still very little is known of its biology.

The first months after leaving the nest area are the most critical period in the lives of young raptors. "In all raptor species so far studied in the wild, more than half the birds that fledged died in their first year" (Newton 1979). For practical reasons, adequate and systematic observation or location of individual birds over a long period has not been possible until recently, thereby leaving a large gap in our knowledge.

According to Lobkov & Neufeldt (1986), part of the Steller's Sea Eagle population remains to overwinter in the breeding area. The rest move southwards in autumn. It is estimated that the major part of the Kamchatkan sub-population (at least 3500 [1985]–4250 individuals [1986], of which *c.* 80% are adults) does not leave the peninsula but merely moves to its southern part. Here there is a major point of concentration on the Kurile Lake (Ladigin *et al.* 1991). The chief overwintering areas outside the breeding range are in the south of Primorski Region on the Kuril Islands and on Sakhalin. In addition, many birds overwinter on the Japanese island of Hokkaido, particularly on its east coast. There, for example, *c.* 2200 Steller's Sea Eagles, of which 93% were adults, were recorded in mid-February 1985 (Nakagawa *et al.* 1987). However the progress of individual birds to these overwintering regions has not been followed.

Satellite telemetry is a new technique that has only recently been developed for the location of medium-sized and large birds of prey so as to study their movements (Howey 1992). In the summer of 1992, within the framework of a World Working Group on Birds of Prey programme (Meyburg *et al.* 1993), we undertook a pilot project aimed at investigating the movements of a young Steller's Sea Eagle from the time it left the nest.

On 8 August, the single, fully-feathered nestling in an eyrie in the Kronotzky Biosphere Reserve, on the River Bormotina near the Semiachik Lagoon (54°10'N, 159°59'E) on the east coast of the easternmost part of Russia, was fitted with a 95-g satellite transmitter (technically called platform transmitter terminal [PTT], I.D. No. 02913, produced by Microwave Telemetry, U.S.A.), together with a small conventional transmitter. The PTT was applied in the usual manner as a "backpack" held by two strips of Teflon fastened over the sternum with silk thread. The young eagle weighed 4500 g, so that the two transmitters constituted only 2.5% of its body-weight. In the 2 days following this fitment, the bird was kept under observation from a hide for 20 h. In general, the young eagle took no notice of the two transmitters. Although it frequently preened its dorsal feathers, it never once touched the PTT throughout the whole period of observation.

In order to prolong the life of the PTT's batteries for as long as possible, the transmitter was adjusted so that it was active for only 8 h every 4 days. Like all PTTs, this transmitter sent out signals at a very high frequency (401.648 MHz), in contrast to the conventional transmitters used in telemetry. Among other items, it provided data on the bird's activity and temperature and on the condition of the batteries. Two TIROS satellites of the ARGOS system, a network of the French and American space authorities CNES, NASA and NOAA, picked up the signals. Locations of the PTT were obtained when there was good reception of signals.

Between 8 August and 21 November, the PTT functioned satisfactorily and 80 locations were obtained through ARGOS, 11 of which were Class 1 (LC 1). LC 1 means that 68% of the locations are expected to fall within the radius of 1 km (Taillade 1992). Up to the time the young eagle left the nest, we received 11 locations of the bird in the nest, including two LC 1, which had this accuracy.

On 23 August, the eagle left the nest aged 89 days (±1 day) (D. Lämmel, pers. comm.). After leaving the nest, the bird was observed twice during visits to the neighbourhood, the last time on 23 September. On one occasion, it was sitting in a tree close to the eyrie. On the second occasion, it was found 2 km from its nest. The young eagle showed normal behaviour.

After fledging, the bird remained in the nest area for nearly 2 months, up to 16 October. Between fledging and departure, it was located 43 times by ARGOS, six of which were Class 1. These revealed that it never strayed beyond 3.7 km (±1 km) from the nest.

On 20 October, the young Steller's Sea Eagle was located for the first time outside the nest territory and was already near the southern tip of Kamchatka at 52°22'N, 157°45'E, about 280 km southwest of its nest area in a direct line to Cape Lopatka. On 24 October, the bird was located three times, including one of Class 1. We expected it to overwinter in Kamchatka, but it had already left the peninsula and was crossing the 65-km-wide Kurile Straits between the islands of Paramushir and Onekotan, *c.* 180 km distant from the southern tip of Kamchatka. Lobkov & Neufeldt's (1986) supposition that the timing and extent of movement were wholly dependent on the food supply and condition of the ice was thus not confirmed by this bird.

On 28 October, the eagle was twice located further south, on the island of Raikoke, beyond the 90-km-wide Krusen Straits, where it remained up to at least 1 November. On 5 November, it had already arrived in the south of the island of Simushir, where it was again reported on 9 November. On 13 November, it was first in the north of Urup Island. The young eagle had thus covered the 1360 km between its birthplace and Urup Island in 3 weeks. In all, we received nine locations on this island of the South Kuriles, including one of Class 1. The Steller's Sea Eagle provided its last location on 21 November at 0604h. Thereafter we received no further locations.

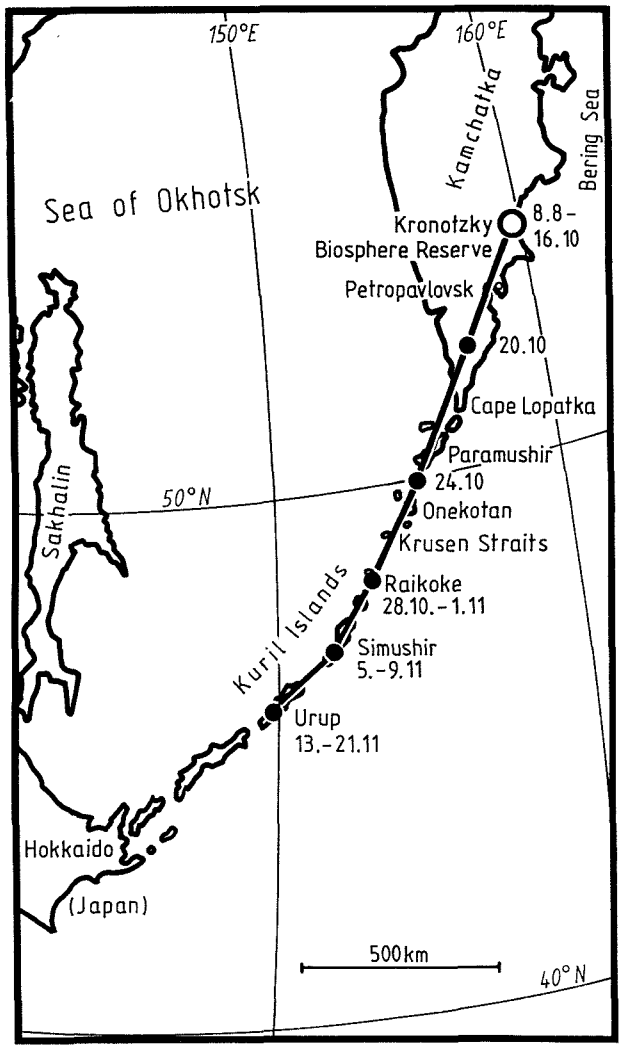

Figure 1. Migratory route of the Steller's Sea Eagle recorded by satellite tracking.

Up to 30 November, the PTT still sent out signals, but the reception was too poor to provide a location. Since the condition of the batteries, which had a life expectancy of 2 years, was excellent up to the last emission on 30 November, it has to be assumed that the young eagle met with an early death.

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