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Title	The physiology and life-history parameters of reproduction in Steller sea lions, spotted seals and ribbon seals from the coastal waters of Hokkaido
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Citation	Japanese Journal of Veterinary Research, 50(1), 50-51
Issue Date	2002-05-31
Doc URL	<a href="https://hdl.handle.net/2115/2950">https://hdl.handle.net/2115/2950</a>
Type	departmental bulletin paper
File Information	KJ00002400434.pdf



the populations of the Xinjiang Tarim red deer.

#### 4. Conservation Status of the Endangered Tarim Red Deer, *Cervus elaphus yarkandensis*

Morphological and genetic analyses showed that the Tarim red deer belongs to the

western (European) red deer lineage and likely experienced an historic population bottleneck. These results suggest that the Tarim red deer is a unique subspecies which warrants higher level protection than its current status in China. Conservation programs should be implemented to stop the fragmentation and deterioration of habitat conditions.

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Original papers of this thesis appeared in *Jpn. J. Vet. Res.*, 49 : 231-237 (2001), and *Zool. Sci.* 19 : 485-495 (2002).

### The physiology and life-history parameters of reproduction in Steller sea lions, spotted seals and ribbon seals from the coastal waters of Hokkaido

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Reproduction is the most important process in wildlife because it directly influences the viability of a population. This study was designed to better understand the physiology and life-history parameters of reproduction in Steller sea lions (*Eumetopias jubatus*), spotted seals (*Phoca largha*) and ribbon seals (*Phoca fasciata*) that migrate from Russian waters to the coastal waters of Hokkaido in winter.

The ovaries, uterus and placenta were collected from harvested female sea lions and seals that have been in the coastal waters of the Nemuro Strait, northeast Hokkaido, Japan, between late January and early April, 1995-1999. Thin sections were made for immunohistochemistry and histology analyses.

Firstly, I analyzed the localization of steroidogenic enzymes (P450 scc, 3  $\beta$  HSD and P450 arom) in the corpus luteum and placenta of Steller sea lions, spotted seals and ribbon seals. P450 scc and 3  $\beta$  HSD were present in all luteal cells of each corpus luteum, and

most luteal cells was immunostained for P450 arom. P450 scc and 3  $\beta$  HSD immunostained negatively in placentae, however, P450 arom was present in the syncytiotrophoblasts. These findings suggest that (1) corpora lutea of these species synthesize pregnenolone, progesterone and estrogen during the late gestational period, and (2) placentae of these species are not capable of synthesizing progesterone, although they are capable of synthesizing estrogen. These characteristics are similar to those of some terrestrial carnivores in the suborder Caniformia.

Secondly, I analyzed the localization of prolactin receptors in the pregnant corpora lutea from the three pinniped species. Prolactin receptors were present in all luteal cells of each corpus luteum. This suggests that pinnipeds require prolactin to maintain corpora lutea during late pregnancy, as for other terrestrial carnivores.

The average age of sexual maturity in female Steller sea lions, based on the presence of corpora lutea or retrograde corpora lutea,

was 3.95 years. The average ages of sexual maturity for spotted seals and ribbon seals were not calculated, due to highly-biased age structures of the specimens. Pregnancy rates of adult females were 90.5% (57/63) in Steller sea lions, 91.3% (21/23) in spotted seals, and 82.2% (37/45) in ribbon seals, respectively. No decline in these percentages were observed over the years that the pinnipeds were collected, as compared to other reports.

To evaluate the effect of nuisance control activities on Steller sea lions in the coastal

waters of Hokkaido in winter, a population viability analysis (PVA) was conducted, using VORTEX 8.41. Under current conditions, the model predicted that if most of the harvested sea lions were born at Brat Chirpoev Island or Srednego Rocks on the Kuril Islands, then these metapopulations will decline markedly or go extinct. The analysis also showed that the total population of Steller sea lions that originated from the Kuril Islands could easily go extinct if birth rates decline and 60% or less females reproduce each year.

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Original papers of this thesis appeared in *Biosphere Conserv.*, 2 : 11-19(1999), *J. Vet. Med. Sci.*, 63 : 955-959 (2001) and 64 : 329-333 (2002).