

Population dynamics of the Commander squid, *Berryteuthis magister* (Berry) in the Western Bering Sea during the autumn spawning season

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The studies of the Commander squid were performed aboard the Japanese commercial trawler "Kashima-Maru No.8" in the Western Bering Sea, 165-180° E, from October 9 to November 23, 1993. 137 bottom trawls were taken. The Commander squid was recorded at the depths 235-750 m in almost all catches. Maximal catches, up to 1250-1400 kg/hour, were recorded at 175-177° E at the depths 300-500 m. The largest squids were caught at the depths 300-400 m. The catches increased during October and reached the maximum during the second half of the month; then they fall rapidly and steadily, up to less than 1 kg/hour in some trawls. The male modal size was 21 cm, that of female — 27 cm. They were rather constant during the time. Maximal sizes were 28 cm in males and 36 cm in females. The male-to-female ratio in general was on average 1:2.2, but the share of males strongly decrease in the course of time, down to zero in some trawls by the end of works. The beginning of maturation (transfer from I to II maturity stage) was observed in males at mantle length 16-18, in females at 17-19 cm, the mass maturation occurred at 19-20 and 23-24 cm respectively. Some larger but not mature squids were also observed: males of 23-24 cm and females of 28-29 cm but at III-IV stages. The ratio between the number of mature females at substages V₁, V₂ and V₃ was on average 44, 49 and 7%. The portion of V₁ females increased in the course of our works, that of V₂ diminished and V₃ females finally almost disappeared. The share of mated females increased from 29-30% at the beginning of works to nearly 100% at the end. Only mature females (V stage) mated. When a female mated in due time, it spawned at the substage V₁ ("primary V₁ female") but if the mating delayed, it goes successively from V₁ to V₂ and even to V₃ substage. But after mating it began to spawn and moved back to V₁ substage ("secondary V₁ female"). Only the V₁ females transferred to the spent (VI) stage. The first spent females were recorded in mid-November and by the end of our works their share reached 15% of all V+VI females. The average size of spent females, 23-27 cm, was equal to or less than the modal size of mature (V) females. The peak of spawning occurred in late October and November and it may be supposed that the wave of spawning moved from the west to the east. The feeding activity of squids was extremely low, the portion of empty stomachs exceeded 90% in juvenile and adult animals. Euphausiids predominated in the stomachs with food. Two seasonal spawning groupings apparently exist in the Western Bering Sea, autumn-winter-spawning and summer-spawning one. They are probably not separated genetically. The former grouping is much more abundant than the latter.

**Динамика популяции командорского кальмара
Beryteuthis magister (Berry) западной части Берингова моря
в осенний нерестовый сезон**

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Исследования командорского кальмара проводили на японском промысловом траулере "Касима-мару No.8" 9 октября-23 ноября 1993 г. в западной части Берингова моря, 165-180° в.д. Взято 137 донных тралов. Командорский кальмар встречался на глубинах 235-750 м почти повсеместно. Наибольшие уловы, до 1250-1400 кг/час, отмечены на 175-177° в.д. на глубинах 300-500 м. Самые крупные особи ловились на глубинах 300-400 м. В октябре уловы возрастали, достигли максимума 15-30 октября, затем быстро и непрерывно падали, иногда до менее 1 кг/час. Мода размерного ряда самцов 21, самок 27 см. По времени она мало меняется. Максимальный размер самца 28, самки 36 см. Соотношение числа самцов и самок в среднем 1:2,2, но со временем доля самцов резко падала, почти до нуля к концу работ. Начало созревания (переход из I во II стадию зрелости) у самцов при размере 16-18, у самок — 17-19 см. Массовое созревание — при 19-20 и 23-24 см. Есть и более крупные, но незрелые особи: самцы 23-24 см, самки 28-29 см, но на III-IV стадиях. Соотношение числа зрелых самок на подстадиях V₁, V₂ и V₃ в среднем 44, 49 и 7%. Со временем доля самок V₁ растет, самок V₂ снижается, самки V₃ почти исчезают из уловов. Доля спаривавшихся самок увеличивалась с 29-30% в начале работ до почти 100% в конце. Спариваются только зрелые самки на V стадии. Если самка спаривается вовремя, она нерестится на подстадии V₁, ("первичная самка V₁"), если спаривание запаздывает, самка последовательно переходит из V₁ в V₂ и потом в V₃, но после спаривания она начинает нереститься и переходит обратно в подстадию V₁ ("вторичная самка V₁"). В стадию выбоя (VI) самка переходит из подстадии V₁. Первые выбойные самки отмечены в середине ноября, а к концу работ их доля достигла 15% самок V+VI. Средний размер самок VI 23-27 см, т.е. они не крупнее модального размера зрелых самок. Разгар нереста — конец октября и ноябрь, волна нереста, по-видимому, продвигается с запада на восток. Питание кальмаров было очень слабым, доля пустых желудков и у молоди, и у взрослых более 90%. В желудках с пищей преобладают эвфаузииды. Очевидно, в западной части Берингова моря у командорского кальмара есть две предположительно не обособленные генетически нерестовые группировки, осенне-зимняя и летняя. Первая значительно многочисленнее второй.

The gonatid squid *Beryteuthis magister* (Berry, 1913) is one of the commonest squids of the northern North Pacific and adjacent seas. It is the only species of gonatids fished in commercial quantities. It is distributed from the Bering Sea slope to Eastern Honshu (northward of Cape Inubo) and to Oregon, including almost all the Okhotsk Sea, the Japan Sea to Tsushima Strait and the subarctic North Pacific [Nesis, 1973, 1987; Okutani et al., 1988]. Paralarvae, juveniles, and adult squids live in pelagic layers (initially in upper layers, then deeper). In the time of maturation onset the squids gradually descent to the bottom and live at and near the bottom at depths of approximately 100 to 1500 m. Thus *B. ma-*

gister inhabits epipelagic, mesopelagic, upper bathypelagic and benthic/near benthic layers in lower sublittoral and, mostly, bathyal [Nesis, 1987, 1989; Naito et al., 1977a].

The Russian fisheries for this species began in the 1960s off Commander Islands where it was fished as a bycatch to Alaska pollack. Later a specialized fisheries began along the Pacific side of, initially, Northern and then Central Kurile Islands on very narrow "tracks" in upper part of steep slopes. The catches increased to some 25 thousand tons in the late 1970s and early 1980s [Fedorets, 1986b; Zuev, Nesis, 1971]. Some narrow "tracks" were also found near summits of seamounts of the Yamato Bank complex in the Central