



Workshop FY2007 /
The 6th Hanasaki Program Workshop

Proceedings of
SakhNIRO/Nemuro Joint Workshop for
Report and Discussion on Progress in FY2007 and Future Plan
of
Joint Study on Hanasaki Crab

Time & Place: Jan. 31~Feb.2, 2008, Yuzhno-Sahalinsk
Host: Sakhalin Research Institute of Fisheries and Oceanography
Promoting Committee for Nemuro City Hanasaki Program

On the Feeding of Three Craboids (Anomura, Lithodidae) at the Southern Kuril Islands

KLITIN, A.K.
(SakhNIRO)

Introduction

Only one publication (Kun, Mikulich, 1954) is known, where the results of studies of the feeding of King crab at the Kuril Islands are given (at Pacific side of the Iturup Island, Roka Bay, Kasatka Bay). The basic purpose of our work - to compare diet characteristic of the males of King crab (*Paralithodes camtschaticus*), Red spiny crab (*Paralithodes brevipes*) and Golden king crab (*Lithodes aequispinus*) near the Southern Kuril Islands. The study of feeding makes it possible logically to explain some of the seasonal migrations and to spot the different sides of life crab's cycle at the Southern Kuril Islands.

Materials and Methods

All crabs species were caught during trawling survey from September, 21.09 till October, 16 in 2003 at the Southern Kuril Islands (Table 1). Material on the feeding of King crab is assembled in the Dobroe Nachalo Bay, in the Southern Kuril strait and from the oceanic side of Iturup; *P.brevipes* - in the Southern Kuril strait only. Golden king crab (*Lithodes aequispinus*) was caught on the North coast of Kunashir and in the Dobroe Nachalo Bay (Iturup) (Fig. 1) at the beginning October 2003 on maximally less depths for this form - 180286 m (table 2). Because of a small volume of the assembled material (20 species of King crab, 7 species of Red spiny crab, and 8 species of Golden king crab, the obtained data by the quantitative and qualitative composition of crabs feeding follows to consider as preliminary.

The frequency of occurrence calculated as the relation of the number of stomachs, where abundance this component, to the total number of stomachs with the food, the frequency of domination - as the ratio of the number of stomachs with this feeding prevailed component to the total number of stomachs, which contain food. For the quantitative assessment the feedings were calculated and expressed into ‰ general and particular indices of the fullness of stomachs (Zenkevich, Brotskaya, 1931). The average values of indices were calculated taking into account individuals, who have empty stomachs. The role of the separate groups of food organisms in the feeding of crabs defined as the ratio of their mass to the overall mass of the contained stomach and expressed in %.

Results and Discussion

The fullness of stomachs in the overwhelming majority of the males of King crab was weak and did not exceed 3.6 ‰, with the mass of food - 1.01 g. All crabs were caught from the Iturup's ocean side (30 % of total sampling) were fixed with empty stomachs. In the Dobroe Nachalo Bay 13.3 % males of King crab had no feeding. In rest of others crabs the mass of food in the stomach varied from 10 to 1010 mg, and the fullness index - from 0.04 to 1.72 ‰, with average values of 237 mg and 0.92 ‰ respectively. Only one male, caught in the Southern Kuril strait at the depth of 203 m, had a fullness of stomach reached 8.9 ‰ (Table 3).

Among males of *P.brevipes* was discovered no one specie with empty stomach. The mass of food in their stomachs reached 4.34 g, and the value of the fullness index of stomachs 48.3 ‰. With an increasing in the depth from 19 to 70 m the fullness of the stomachs of *P.brevipes* consecutively was reduced from 19.5 to 0.05 ‰ (Fig. 2).

Golden king crab was fed among others most intensively. The mass of food lumps varied from 1.2 to 18.5 g, the values of the index of the fullness of stomachs attained 43.15 ‰, with average value of 16.21 ‰. On the separate stations the average values of the index of the

fullness of stomachs varied from 6.2 to 27.4 ‰, reaching maximum near Dokuchayeva cape on the Kunashir at the depth of 280 m.

In the food of King crab most frequently were encountered the needles of Heteropiidae (is probable *Grantessa nemurensis*), in one of the stomach were noted the remains of glass sponge (Hyalonematidae). Throughout the mass in the King crab stomachs the sponges reached 17.6 %. Echinodermata in the diet of King crab were only sea urchins *Strongylocentrotus pallidus*. They were obtained in the King crab diet only in the Southern Kuril strait at the depth of 203 m, but since in other regions the fullness of stomachs was very weak, this forage component was occupied up to 53.8% of the entire mass of feeding in the total sampling. Besides Echinodermata and sponges in the stomachs benthos guts (Polychaeta sp.) were prevailed (Tables 4, 5). Bivalvia mollusks, hermit crawfish, *Leieshara* sp. in the feeding of King crab in the Dobroe Nachalo Bay were occupied subordinate positions.

In the food of Red spiny crab in the Southern Kuril strait sea urchins were prevailed (*Strongylocentrotus intermedius*), to which it was 84.1% of the overall mass of the forage lumps of this specie. The same object was encountered and prevailed in stomachs up to 42.9% of all three kinds of crabs. Considerably smaller role in the feeding of Red spiny crab played the flat sea urchin *Echinarachnius parma* and *Amphiodia rossica* (2.8 and 0.4% respectively). In the forage of Red spiny crab are noted Amphopoda, Oediceridae, hermit crawfish, mollusc's carapaces, fish's bones.

In the feeding of Golden king crab the role of sea urchins (*Strongylocentrotus pallidus*) was still higher than in the feeding of Kamchatka and Red spiny crab. Echinodermata rised up to 90.8% for the Golden king crab feeding, this form of sea urchins prevailed in the food of all crabs, caught both in the Dobroe Nachalo Bay and near the Northern coast of Kunashir. Among the crustaceans, on which it was 5 % of the overall mass of food, in the stomachs of the Golden king crab the Cirripedia sp., Tanaidacea sp., isopods Idoteidea sp., crustaceans *Diastylis bidentata*, amphipods *Caprogammarus* sp., *Dulichia* sp., *Caprella* sp. were obtained.

Furthermore in the forage of the Golden king crab were noted following Hydroidea (*Obelia longissima*, *Abietinaria* sp.), digested remains of the benthos guts and mollusk carapaces.

Regarding food similarity index, the calculation of the qualitative composition of food of three crabs feeding is shown result as 54.6%. In generally the feeding consisted from main component - ball sea urchins of kind *Strongylocentrotus*, to which in Golden king crab feeding share was 90.8%, for Red spiny - 84.1%, while for King crab - 53.8% of forage mass (Fig. 3, 4). The agreement of the remaining groups of benthos in the crabs diet shown as insignificant.

Most stable was the feeding of Golden king crab. This specie most actively fed, in all forage lumps prevailed one and the same food of components — ball sea urchins, secondary role in the feeding was everywhere diverted to the crustaceans. The stomachs content of the Golden king crab near Iturup and the northern part of Kunashir (16.21 ‰) noticeably exceeded their diets at Kashevarov Bank and in the central part Sea of Okhotsk (Tarverdieva, Zgurovsky, 1985).

Also the feeding types of the Golden king crab were different. At the Kashevarov Bank and in the central part of the Sea of Okhotsk the crab feeding by Echinodermata (Ophiuroidea) were prevailed, at the Western Kamchatka - Decapoda crustaceans and Polychaeta (Nadtochy et al., 1998). It's should be noted that sampling of the Golden king crab was done at the most shallow depths 180-200 m in the Dobroe Nachalo Bay and 280 m near north-western Kunashir. It's obviously, that fall migration of the Golden king crab from slope to the "shallow depths" was obtained due highest benthos biomass at the shelf comparing with slope and having expressed feeding character.

Less stable feeding was remarkable for Kamchatka king crab. Almost third part of the caught species had no forage in stomachs, meanwhile in the prevailed quantity of the crabs forage mass in their stomachs didn't exceed 1 g. In the general picture of the weak stomachs fullness the forage consisted from occasional components as Bryozoa sp. and Spongia sp. mostly. The usual share of the diet, which was general in the other regions and included Mollusca, Polychaeta, Echinodermata, here was extremely low or near empty. That diet data confirmed that King crab feeding completed at the September middle in 2003 at the Dobroe Nachalo bay, Pacific shelf near Iturup, perhaps, as feeding region, was insignificant for the King crab recently. Good fullness of the King crab stomachs was noted for the Sout-Kuril Strait only, where were feeding grounds for the whole South-Kuril population during her high abundance in the 80th, last century. It's should be noted, that situation was obtained not always in time. For example, the stomachs fullness of the King crab in Roka Bay (Iturup Pacific side) in 1948 was high and equal in average 10,83 ‰ (Kun, Mikulich 1954). In crab diet of that region the flat sea urchins were dominated (55.8 %) and different mollusks (20-25%); for Kasatka Bay - *Pelonaia corrudata* (70-80%) and *Ampelisca macrocephala*.

High fullness of the Red spiny crab stomachs was remarkable near Malaya Kuril'skaya Gryada from 19 to 48 m depths range (19.5 ‰ and 18.7 ‰). With depth increasing toward 70 m the stomachs fullness fallen to 0.05 ‰. All collected materials confirmed, that Red spiny crab migrations from shallow to the deep spots had occasional character and not linked with diet behavior.

Conclusion

Sea Urchins from the genus of *Strongylocentrotus* prevailed in the diet of far-eastern crabs along the Southern Kuril Islands in September-October 2003. Their percentage was as follows: 90.8% for Golden king crab, 84.1% for Red spiny crab, and 53.8% for red of King crab. The most active and stable feeding was noted for Golden king crabs. Their autumn migrations aiming "small depths" (189-280 m) had a clearly feeding character. All the King crab specimens caught along the ocean coast of Iturup Island did not feed; the specimens caught in the Dobroye Nachalo Bay had food in their stomachs that did not exceed 1 g. Casual components (sponges, bryozoans) prevailed in the diet. A good fullness of stomachs was recorded for King crabs only in the South- Kuril Strait. A high fullness of stomachs for Hanasaki crab was recorded only near the Malaya Kuril'skaya Gryada between 19 and 48 m depth. With the increase in depth up to 70 m, the amount of food in Red spiny crab stomachs declined to 0.05 ‰. Most probably, their autumn migrations for large depths are casual.

References:

ZHIVOGLYADOVA L.A.: Feeding Golden king crab *Lithodes aequispinus*, Benedict at the North-Western part Sea of Okhotsk // TINRO proceedings. Vol. 143. 2005. pp. 196-202. *In Russian*.

ZENKEVICH L.A., BROTKHAYA V.A.: Materials on the fish feeding of Barents Sea. Report of I GOIN session. 1931. Numb.4. *In Russian*.

KUN M.S., MIKULISH L.V.: Forage content of the Far-Eastern commercial crabs at the summer time//TINRO proceedings. 1954.Vol.41.pp.319-332. *In Russian*.

NADTOCHY, V.A., CHUCHUKALO, V.I., KOBLIKOV, V.N.: Feeding characteristic of the Kamchatka (*Paralithodes camchatica*) and Golden king (*Lithodes aequispina*) crabs at the southern Kamchatka shelf in summer//TINRO proceedings. Vol. 124. p.2.1998. pp 651-657. *In*