Northwest Atlantic Fisheries Organization

Serial No. N4615 **NAFO SCR Doc. 02/14**

SCIENTIFIC COUNCIL MEETING – JUNE 2002

By-catches of Snow Crab *Chionoecetes opilio* in Russian Bottom Trawl Fishery in Divisions 3NO in 2001

by

V.A. Pavlov

Polar Research Institute of Marine Fisheries and Oceanography
(PINRO), 6 Knipovich Street, Murmansk 183763 Russia

Abstract

Data on by-catches of snow crab (Genus *Chionoecetes*) in June-December 2001 obtained from the results of fishing cruises carried out by Russian vessels in Div. 3NO are presented.

Snow crab *Chionoecetes* opilio occurred on the southern slope of the Grand Bank of Newfoundland within 46-560 m depth range. The greatest amount of the crab was taken in depths 201-250 m and 551-600 m. All the crabs in by-catch were males with 62-138 mm carapace length, 85% had the size of more than 100 mm. The percentage of individuals with exosceleton at Molt Stages 2 and 3 was equal to 90%. The traumatism of snow crabs reached 49% in Div.3N and 42% in Div.3O. In Div.3N the mean weight of *C. opilio* without any damages was 50 grams more than that one of crabs having traumas. Among sedentary organisms having been found on snow crab carapace the cirripedes from Genus *Balanus* made up 81%.

Introduction

One of the problems of trawl fishery is by-catch of the other marine organisms, which are not the legal objects of fishing. The necessity to determine the extent of negative fishery effect on these species vital activity arises. For this, the study of species from by-catches permits the peculiarities of their distribution and abundance to be revealed and their biology to be investigated more completely.

Since 1998, according to the verbal communications from Russian observers, outside the 200-mile zone of Canada, snow crabs began to occur in catches. The snow crab opilio (*Chionoecetes opilio*) is a common and abundant representative of bottom communities from the shelf and continental slope of the northern areas in the Atlantic and Pacific Oceans (Davidson *et al*., 1985; Kobyakova, 1958). At present, the biology of the given species is intensively studied due to extending the areas of harvesting decapods, which earlier were considered as the non-target fishery objects (Fedoseev and Slizkin, 1988; and others). However, many peculiarities of intra and interspecific relations of *C.opilio* in bottom communities, which, to a great extent, stipulate the structure of local aggregations and populations, as well as the biological condition of resources, have remained to be poorly studied up to now (Ivanov, 1997; Jadamec *et al*., 1999).

The purpose of this paper is to identify the size and sex composition, the degrees of traumatism, the distribution by depth and the size of snow crab by-catches in the Russian bottom trawl fishery for skates and redfishes on the southern slope of the Grand Bank of Newfoundland.

Materials and Methods

Samples of snow crabs collected when fishing skates (Div. 3N) and redfishes (Div. 3O) by five Russian commercial vessels in the period from June to December 2001 served as the material for the paper. Characteristic of fishing gears and the data collected are presented in Table 1. Of 1 857 crabs caught, 836 individuals were analyzed.

Biological analysis included:

- measurement of carapace width to the nearest 1 mm;
- measurement of carapace length (to eyepit) to the nearest 1 mm;
- weighting crabs to within 5 g (Div.3N);
- identification of sex;
- identification of molt stage;
- identification of damages to legs;
- identification of carapace incrustation.

After the biological analysis all crabs were released alive into the sea.

Results

The trawl fishery for skates was conducted in 46-105 m depths in Div.3N from 21 October to 1 December. The duration of hauls fluctuated from 2 to 7 hours.

In catches snow crab was represented by males with the carapace width of 66-135 mm (Fig. 1). Of them, the crabs with the size of more than 100 mm by carapace width made up 77%. Crabs occurred in 38% of hauls made in Div.3N. In this division, the snow crab by-catch was equal to 0.5 of an individual per an hour of hauling. When fishing skates moderate by-catch of snow crab was, apparently, conditioned by significant mesh size (240-320 mm) in trawl cod-end.

Snow crabs with carapace at Molt Stages 2 and 3 made up the bulk of by-catches. Early in December two males (with carapace width of 100 and 125 mm) with clean and soft carapace at the first post-molting stage were registered.

The percentage of traumatized crabs (with missing or partly damaged legs) was 49%. Of them, 3.8% of individuals had lost five walking legs. All the species of commercial crabs can loose the legs, to a greater or lesser extent. According to the observations by Ivanov (1997), the autonomy takes place more often in snow crab, in particular, in *C. opilio*, than in a stone king crab. A great traumatism does not allow crabs to perform vital functions (feeding, molting and so on) that, as a rule, lead to their death. The lack of animals with more than five traumas in the catch indicates that, obviously, this level of traumatism is critical (Selin, 1998). Mean weight of crabs without traumas amounted to 670 grams. That was 56 grams more, than in crabs having various damages. There were no observations over carapace incrustation in the area.

Some single specimens of crab *Hyas* sp. caught by trawls were recorded.

Fishery for redfish took place in 180-560 m depths in Div. 3O from June to December. Snow crab occurred within the range of 240-560 m. The largest by-catch of snow crab *opilio* (the average amount - 2.5-3.5 specimens per a haul) was recorded in 201-251 m and 551-600 m depths (Fig. 2). The duration of hauls varied from 3 to 6 hours. The by-catch of snow crab by various vessels fluctuated from 0.1 to 1.7 individuals per a hauling hour. In the catches, the snow crab *opilio* was only represented by males with 62-138 mm carapace width (Fig. 3). Of them, crabs with the carapace width of more than 100 mm made up 87%. All the snow crabs had exoskeleton at Molt Stages 2 and 3. Only in September, in the depth of 470 m five males (carapace width - 92-118 mm) having the carapace at the first post-molting stage were caught. Among the analyzed part of snow crabs, the percentage of those ones with damaged legs was 42%. Of them, 1.7% individuals lost five walking legs.

Observations over the carapace incrustation showed, that cirripedes from Genus *Balanus* made up 81%. The other sedentary organisms found on crabs were represented by cirripedes from Genus *Lepas* (2.5%) and corals (1.5%).

The lack of females in catches was apparently, caused by different occurrence depths of different sex individuals. Perveeva (1999) investigating snow crab distribution at the north-eastern slope of the Sakhalin Island arrived at the same conclusion. The analogous results were obtained by the author (Pavlov, 2000) before, during the trawl fishery in Div. 3L in 2000.

Single individuals of *Hyas* sp. and *Lithodes maja* crab males were registered in trawl catches.

According to the results of investigations in Div. 3L in 2000 (Pavlov, 2000), the snow crab was of less size (72-128 mm), the percentage of individuals with carapace width of more than 100 mm was equal to 56%. Higher traumatism of snow crab in Div. 3L (56%) was, obviously, connected with a great number of tracks suitable for haulings in the Greenland halibut fishery.

Further, more complete study into snow crab *opilio* by-catches during the bottom trawl fishery in NAFO Regulatory Area will make it possible to obtain new, more detailed data on biology, distribution, abundance and structure of population in this crab habitat.

Acknowledgements

The author expresses his gratitude to the Russian observers in the NAFO Regulatory Area V. N. Mashkov, S. V. Bryzgalov, N. V. Gnilitsky and V. A. Lukjanov for collecting biological material on snow crab.

References

DAVIDSON, K., J. C. ROFF, and R. W. ELNER. 1985. Morphological, Electrophoretic, and Fecundity Characteristics of Atlantic Snow Crab, *Chionoetes opilio* and Implications for Fisheries Management. *Canadian Journal of Fisheries and Aquatic Sciences*, **42**(3): 474-482

FEDOSEEV, V. Ya., and A. G. SLIZKIN. 1988. Reproduction and formation of populational structure of snow crab *Chionoecetes opilio* in the Far East seas. Marine commercial invertebrates: Trudy VNIRO, M., p.24-35 (in Russian).

IVANOV, B. G. 1997. On the behavior of some commercial crabs (*Crustacea: Decapoda, Brachyura*, *Majidae* and *Anomura*, *Lithodidae*) and, in particular, snow crab (*Chionoecetes opilio*). Zoological Journal, **76**(3): 287-293 (in Russian).

JADAMEC, L. S., W. E. DONALDSON, and P. CULLENBERG. 1999. Biological field techniques for *Chionoecetes* crabs. Published by University of Alaska Sea Grant College Program. 80 pp.

KOBYAKOVA, Z. I. 1958. Decapods (*Decapoda*) in the area of the southern Kuril Isls. Investigations of the Far East seas. AN SSSR Press, p.220-248 (in Russian).

PAVLOV, V. A. 2000. By-catch of snow crab of the genus *Cheionoecetes* in Greenland halibut fishery in Division 3L in 2000. NAFO SCR Doc., No. 11 Serial No. N4378, 4 p.

PERVEEVA, E. R. 1999. Distribution, living conditions and abundance dynamics of snow crab *Chionoecetes opilio* of the eastern Sakhalin. Investigations of fishery in the Sakhalin-Kuril and adjacent areas. Vol.**2**. Juzhno-Sakhalinsk, p.100-106 (in Russian).

SELIN, N. I. 1998. Traumatism of snow crab *Chionoecetes opilio* from the western Bering Sea. Biology of the Sea, **24**(4): 261-264 (in Russian).

Table 1. Characteristic of fishing gears and data collected

Division	Characteristic of fishing gears			Hauling depths, m	Total number of haulings	Number: of caught crabs/investigated crabs
	Horizontal opening, m	Vertical opening, m	Mesh of cod-end, mm		Catches with crabs	
3N	30-35	3-3,5	240-320	46-105	171 65	373/108
3O	27-29	5-7	130	180-560	1246	1484/728
	30-32	6-8			348	
Total:						1857

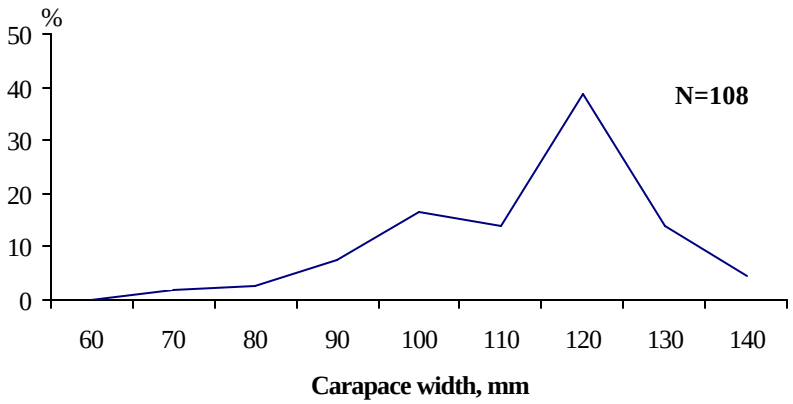

Fig. 1. Size composition of snow crab *opilio* males in Div. 3N in 2001.

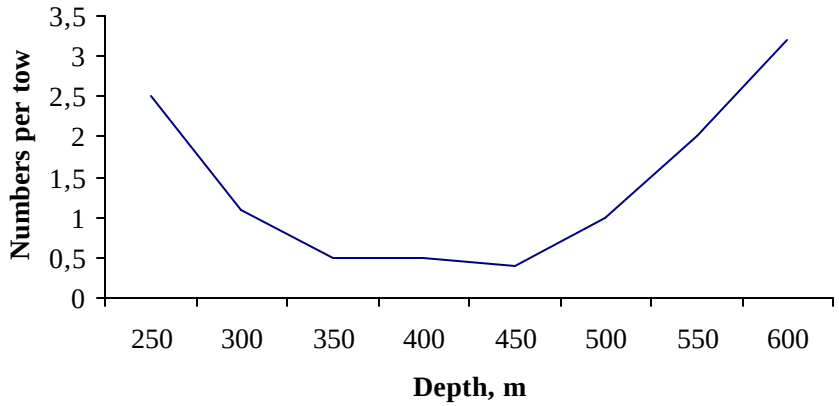

Fig. 2. Bathymetric distribution of snow crab *opilio* males in Div. 3O in 2001.

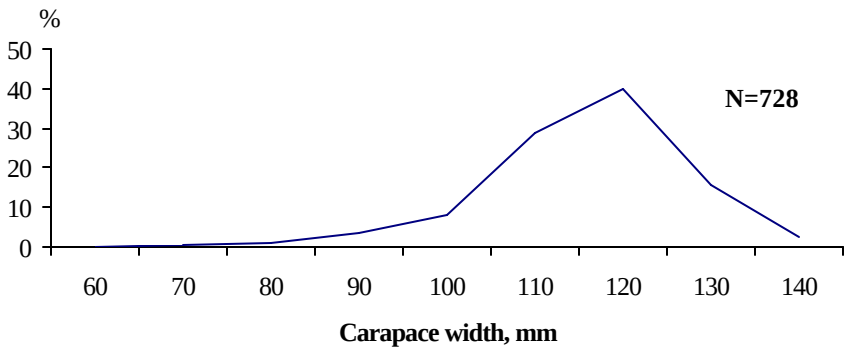

Fig. 3. Size composition of snow crab *opilio* males in Div. 3O in 2001.