

Introduction

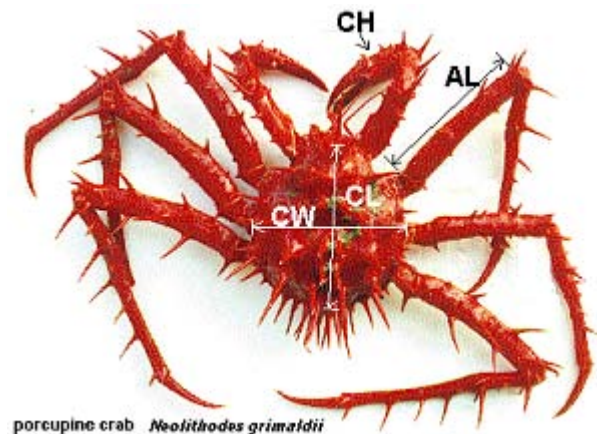
Porcupine Crab (*Neolithodes grimaldii*) inhabits the sea bed off the Coast of Newfoundland and Labrador in depths beyond 500 fathoms (fm). This large crab is often caught as a by-catch in the turbot gillnet fishery. Preliminary experiments with processing limited amounts have shown that marketable crab meat products can be produced from porcupine crab. Attempts have been made to increase the volume of raw material for processing by utilizing the by-catch, either by sectioning the crab onboard the vessel or landing whole crab, iced in boxes. This approach has not proven effective mainly because the crab has to be removed from gillnets which is extremely time consuming, especially when large quantities are involved. Also, fishermen try to avoid porcupine crab as turbot is their main species. It is generally accepted that if the fishery is to develop a method of potting the crab has to be devised. To date this has not been accomplished in spite of two separate projects in which various pot designs and bait types were set in locations where porcupine crab had been caught in turbot nets.

Generally speaking, very little is known about the feeding habits of porcupine crab and considering the fact that previous experiments took place over relatively short periods of time, 10 to 15 fishing days, it was believed that a project carried out over an extended time period might produce better results. As a result of a request and participation by a major crab processing company, Daley Brothers Limited, and an international snow crab marketing firm, Orion Seafood Group Canada, the Newfoundland and Labrador Department of Fisheries and Aquaculture with funding provided by the Fisheries Diversification Program carried out an experimental fishing project from June to November 2000. Fishing trips were made on a monthly basis to areas where porcupine crab had been caught as a by-catch in turbot nets.

Biological Profile

Porcupine crab is truly a deep water member of the king crab (*Lithode*) family and is found on the sea bed along the continental slope on both sides of the Atlantic Ocean generally in depths beyond 500 fm. Its dark red colour and long sharp spines give it a distinctive appearance even among a family as diverse

as the king crab family of which 79 species have been identified throughout the oceans of the world. Male specimens have been measured with a carapace length (CL) of 180 mm and weighing 2.28 kg. Females of the species do not grow quite as large but carapace lengths up to 160 mm have been recorded.



The crab has three pairs of walking legs and one pair of claws. The right claw is larger than the left and is probably used for crushing while the smaller left claw is most likely used for handling food. There is also a fifth pair of legs under the carapace that is used for cleaning its gills. As the name suggests the crab is covered with long spines on its carapace and walking legs.



Project Vessel MFV "Ocean Gaze"

Like many other crustaceans, porcupine crab grow by molting, which doesn't seem to be dependent on the season. A possible explanation for this is that the habitat at depths of 500 to 1000 fm appears to be very stable and therefore the growth cycle is probably not linked to any particular season.

Porcupine crab eggs are black or dark brown and quite large when compared to those from other members of the family and indeed other crab species. The females tend to spawn significantly less eggs and don't seem to have the ability to form new eggs in the gonads while simultaneously incubating eggs under the abdomen. This seems to be a unique reproductive adaptation to the great depths that the species inhabits.

Fishing Vessel and Gear

The F.V. Ocean Gaze, a 90 foot RSW crabber was chartered to conduct the fishing trials and the main fishing gear used for the project was the



Preparing to Set the Pots

standard conical snow crab pot. This pot is 24" high and has a top diameter of 28" and a bottom diameter of 48". The entrance is an 8" wide polyethylene cone with a 20" diameter opening at the top and a 14" diameter opening at the bottom. The frame is constructed from 1/2" rod iron and covered with 5 1/4" braided polyethylene netting.



Large Opening Standard Snow Crab Pot

A modified design in which the top of the entrance cone was expanded to a 28" diameter opening and the bottom to a 20" diameter opening was also included.



Alaskan Style King Crab Pot

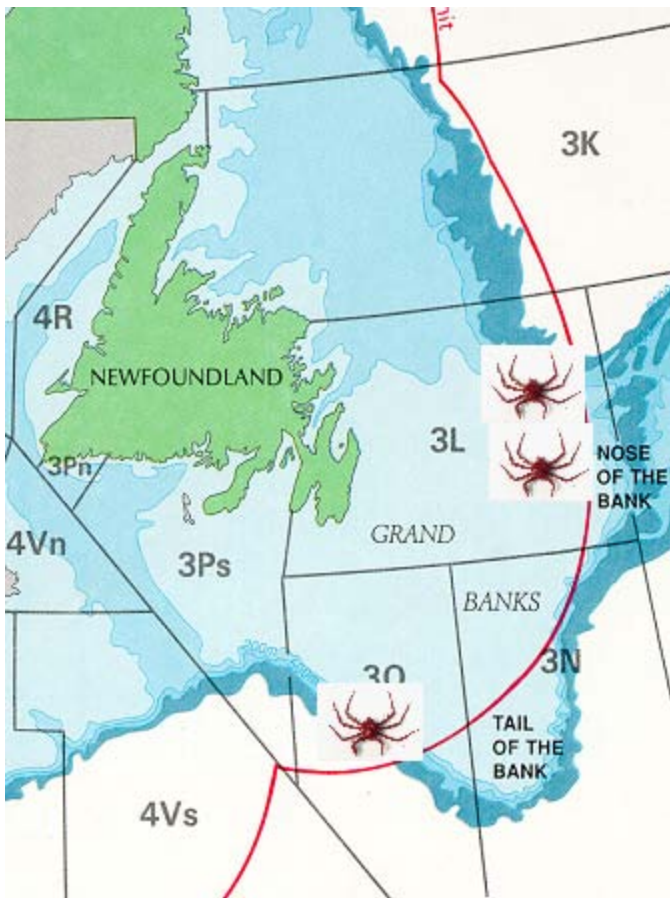
Large rectangular and circular Alaskan style king crab pots with side and top entrances were also part of the fishing gear. An experimental design, referred to as a "hoop pot", was included in the project. This pot consisted of a 5 foot diameter ring to which monofilament netting was attached and bait placed in the center. An experimental fishing trial with this design proved to be successful in catching snow crab.



Experimental "Hoop Pot"

Fishing Plan

The project fishing area was selected based on analysis of the porcupine crab by-catch data from the deep water turbot gillnet fishery. This information is



Exploratory Fishing Areas

collected as part of the DFO Observer Program as is administered by Sea Watch Inc., which also provided the observers for this project. The actual positions at which pots were set were the same as those where a porcupine crab by-catch in excess of 20,000 lbs. was recorded for one fishing trip. Contact was also maintained with the turbot fleet throughout the course of the project for any reports of significant catches of porcupine crab.

The gear was set in fleets consisting of various numbers of pots. The conical and hoop pots were separated by a distance of 50 fm and the rectangular pots 100 fm. Different bait types were used in a specific number of pots in each fleet. Each pot was baited by placing the bait in a plastic screw top container and a fine mesh draw string bag or on a short piece of steel wire known as a bait skiver. Sometimes all three baiting devices were used depending on the condition and bait type. The baits used during the project were: squid, mackerel, herring, redfish, turbot, flounder, snow crab offal, cod offal, skate, shrimp, grenadier, dogfish, wolffish and an extruded, sausage-type bait consisting of various types of fish waste.

Results

The project commenced in June and continued until November during which time four separate trips were made to the same general location. Two trips were made at intervals of thirty days and the fourth and final trip was made at an interval of sixty days. A total of 1243 pots were set and hauled at that location. One porcupine crab was caught in a large entrance conical pot during the final trip in November. The pot was baited with squid placed on a wire skiver and set as part of a string of 48 pots in an average depth of 644 fms. The gear had been soaking on the bottom for 91 hours and the squid bait was in good condition when hauled onboard. The crab was a hard shell male weighing one kilogram. It had a carapace wide of 97 mm and a carapace length of 105 mm. This was the only porcupine crab caught during the project



Catch of Porcupine Crab

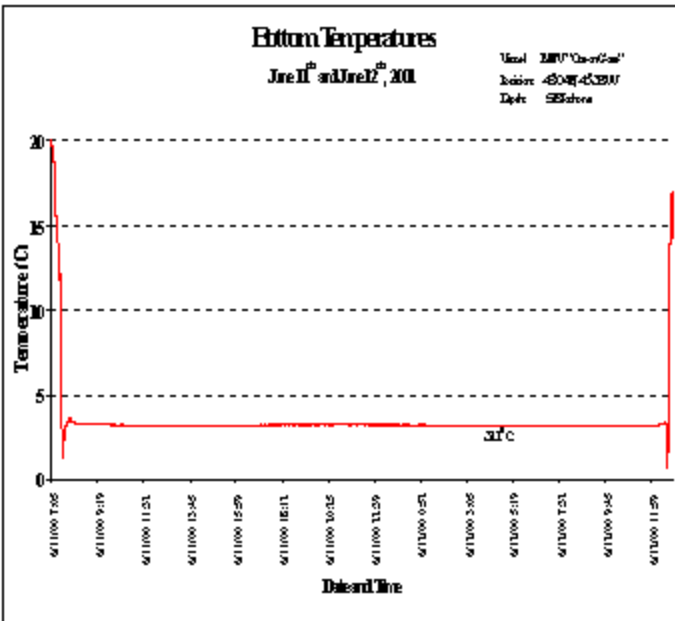
A fishing set was also made in an area where a turbot gillnet fishing vessel had reported an unusually high by-catch of porcupine crab during a trip that it had completed the previous week. Two hundred and thirty four pots were set and hauled at that location without any success in catching porcupine crab.

By-catches of various species of ground fish as well as snow crab and deep sea red crab were caught in all pot designs and on all bait types, with squid and mackerel proving to be the most productive especially for catching snow crab. Most of the baits returned in good condition regardless of soak time.



By-catch of Deep Sea Red Crab

A temperature logger was attached to a string of 147 pots and set at a depth of 578 fm. The sensor indicated that the pot landed on the bottom 15 minutes after it had been set and recorded a bottom temperature of 3.11°C.



Conclusion

The project was designed to examine a number of critical factors that would have an impact on the successful development of a porcupine crab fishery. In this regard the following was covered:
 *Seasonality: the survey was carried out over a period of 6 months (commencing June 8, 2000, finishing November 18, 2000).
 *Gear types: standard conical snow crab pots, enlarged opening conical snow crab pots, large rectangular and circular Alaskan King crab

post, and experimental designed "hoop pots".
 *Water depths: depths ranged from 500 fm to 1180 fm.
 *Bait: squid, mackerel, herring, redfish, turbot, flounder, snow crab offal, cod offal, skate, shrimp, grenadier, dogfish, wolffish, and extruded product.

While the exploratory fishing initiative was not successful in catching porcupine crab (only one animal was actually caught) despite the fact that the targeted area appeared to contain a significant porcupine crab biomass, it did examine all of the above noted factors much more extensively than previous projects. From this perspective it was very successful in determining that these factors appear to have little influence on a harvesting effort. Notwithstanding, no crab was caught and the challenge remains to determine why these animals do not respond to conventionally baited traps. Further work similar in nature would therefore be of little benefit unless a new direction/strategy is proposed.

References:

1. Squires, H.J. (1990), *Decapod Crustaceans of the Atlantic Coast of Canada*, Department of Fisheries and Oceans, Ottawa, pp. 391 - 401.
2. He, P. (1997) *The Porcupine Crab (*Neolithodes grimaldii*) in the Northwest Atlantic: Biology, Distribution and Behavior*; Fishing Technology Unit, Fisheries and Marine Institute, Memorial University of Newfoundland, Report 03/97.

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Trip # 1: June 8 - 19, 2000

General Area:

Lat 48°10'N Long 47°30'W

	Depth	Fishing Gear
Set # 1	506 to 608 fm.	147 Conical Pots
Set # 2	750 fm.	18 Rectangular Pots
	.....	14 Large Conical Pots
Set # 3	528 to 585 fm.	147 Conical Pots
Total	.....	326 Pots

Bait Type:

Squid; Turbot Heads; Redfish; Shrimp; Cod Offal; Quality Bait.

Bait Device:

Plastic screw top container; Fine mesh drawstring bag; Steel wire.

Catch:

Wolfish; Grenadier; Black Dogfish; Turbot; Snow Crab.

Trip # 2: July 27 - 31, 2000

General Area:

Lat 48°09'N Long 48°32'W

	Depth	Fishing Gear
Set # 1	604 to 633 fm.	1 Rectangular Pot
	.....	26 Hoop Pots
	.....	1 Large Conical Pot
Set # 2	673 to 701 fm.	9 Rectangular Pots
	.....	100 Conical Pots
	.....	50 Large Entrance Conical Pots
Set # 3	750 fm.	1 Rectangular Pot
	.....	23 Hoop Pots
	.....	6 Conical Pots
Total	.....	217 Pots

Bait Type:

Squid; Turbot; Flounder; Redfish; Quality Bait

Bait Device:

Plastic screw top container; Fine mesh draw string bag; Steel wire.

Catch:

Turbot; Grenadier; Snow Crab.

Trip # 3: August 31 - September 8, 2000

General Area:

Lat 48°12'N Long 47°15'W

	Depth	Fishing Gear
Set # 1	755 fm	40 Hoop Pots 10 Rectangular Pots
Set # 2	885 fm	100 Conical Pots 50 Large Entrance Conical Pots
Set # 3	1050 to 1180 fm	29 Conical Pots 50 Large Entrance Conical Pots
Set # 4	893 to 1040 fm	77 Conical Pots
Total	.....	356 Pots

Bait Type:

Squid; Mackerel; Turbot; Redfish; Flounder; Cod Offal.

Bait Device:

Plastic screw top container; Fine mesh draw string bag; Steel wire.

Catch:

Turbot; Blue Hake; Grenadier.

Trip # 4: October 9 - 17, 2000

General Area:

Lat 43°40'N Long 52°46'W

	Depth	Fishing Gear
Set # 1	675 to 687 fm	35 Hoop Pots 55 Conical Pots
Set # 2	577 to 697 fm	90 Conical Pots
Set # 3	647 to 775 fm	54 Conical Pots
Total	.....	234 Pots

Bait Type:

Squid; Mackerel; Skate; Flounder; Turbot; Redfish.

Bait Device:

Plastic screw top container; Fine mesh draw string bag; Steel wire.

Catch:

Black Dogfish; Turbot; Blue Hake; Grenadier; Deep Sea Red Crab (*Geryon quinquedens*)

Trip # 5: November 6 - 18, 2000

General Area:

Lat 48°09'N Long 47°59'W

	Depth	Fishing Gear
Set # 1	655 fm	45 Conical Pots
Set # 2	630 to 710 fm	25 Hoop Pots
	.....	48 Conical Pots
Set # 3	610 to 690 fm	45 Conical Pots
	.....	25 Hoop Pots
Set # 4	670 to 685 fm	30 Conical Pots
Set # 5	647 fm	48 Conical pots
Set # 6	635 to 672 fm	30 Conical pots
Set # 7	607 to 710 fm	48 Conical pots
Total	.....	344 Pots

Bait Type:

Squid; Mackerel.

Bait Device:

Plastic screw top container; Fine mesh draw string bag; Steel wire.

Catch:

Turbot; Grenadier; Blue Hake; Black Dogfish; Snow Crab; Wolffish; (One Porcupine Crab).

**Soak Time by Set
(hours)**

