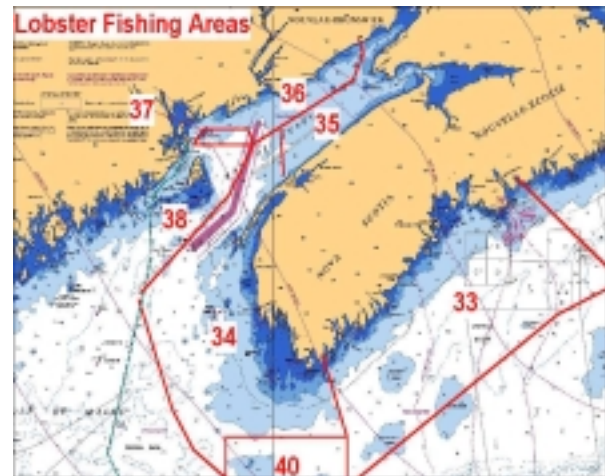


Inshore Gulf of Maine Rock Crab (*Cancer irroratus*)

Background

Rock crab (*Cancer irroratus*) have a broad, oval carapace with nine smooth teeth along the margin of each side. They concentrate in shallow water less than 20 m deep and prefer sandy bottom, although they can be found on all types of substrate. Molting occurs primarily in April and May and earliest maturity is around 25 mm and 40 mm carapace width (CW) for females and males respectively. Average maturity occurs between 50 mm and 57 mm for females while average male maturity is between 65 mm and 75 mm CW. Egg extrusion appears to occur in late October with development of six larval stages occurring the following summer. Males reach a larger size than females with a maximum carapace width of 150 mm and 110 mm respectively. Commercial size is reached in approximately 6 years.

Inshore Gulf of Maine exploratory rock and Jonah crab fisheries were initiated in southwest New Brunswick (Lobster Fishing Areas, LFA's 36 & 38) in 1995 and in southwest Nova Scotia (LFA's 34 & 35) in 1996. Two Developing Species Advisory Boards (DSAB's) were created to manage these new crab fisheries as well as other developing fisheries. One was initiated in southwest New Brunswick in 1995 and the other in southwest Nova Scotia in 1996. The crab permits were distributed by Lobster Fishing Areas (LFA's).



Summary

- Commercial concentrations of rock crabs were found in only a few specific areas: In St. Marys Bay (LFA 34), in Annapolis Basin (LFA 35) and in southwestern New Brunswick (LFA 36).
- Removals of rock crab as a bycatch in the lobster fishery are currently underreported but in LFA 34 & 35 landings statistics have shown that bycatch of rock crab surpassed landings from the directed fishery in 1999. Until the quantity of rock crab removals by the lobster fishery is better documented, biological sustainability of the directed fishery cannot be evaluated.
- Risks of overfishing of rock crab by the directed fishery are low given current effort levels and the high protection for broodstock provided by minimum size regulation.
- Based on logbook analysis, annual catch rates were higher in Annapolis Basin (from 5.6 to 8.1 kg per trap haul (kg/th)) compared to St. Marys Bay (from 1.7 to 4.3 kg/th) and southwest New

Brunswick (from 2.3 to 3.5 kg/th). Data collected to date is insufficient to detect trends.

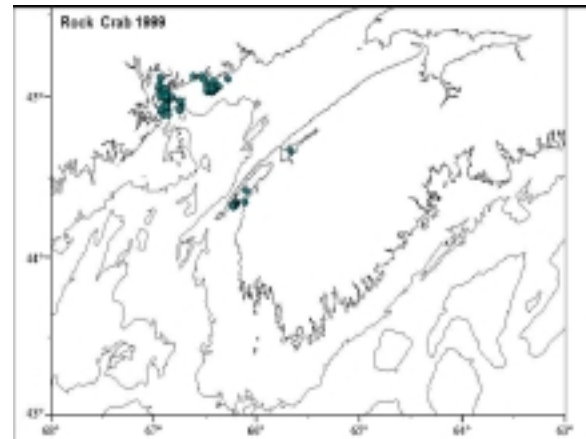
- Based on at-sea sampling of trap contents, monthly mean size of males and females were similar in all areas and between years. The percentage of berried females in the traps was low (<2 %).
- Lobster by-catch, as reported in logbooks from the inshore rock crab fishery, was a problem in St. Marys Bay (LFA 34) and Annapolis Basin (LFA 35), during 1996 and 1997. However, generally low numbers of lobsters per trap haul were reported during 1999 (< 0.01). In limited sea sampling in St. Marys Bay and Annapolis Basin (4 samples), the number of lobster per trap haul was 0.1 and 0.4 compared to 0.2 and 2.0 in 1996, respectively.

The Fishery

Evolving from two separate Developing Species Advisory Boards (DSAB's), the present management regime has various regulations. Presently, in LFA's 34 and 35 participants are allowed to land rock crab only. The minimum size limit for male rock crab was set at 102 mm CW. Modified lobster traps were permitted to be used as well as conical crab traps, with a trap limit of 150. Traps were to include a minimum of two escape gaps of a minimum diameter of 63.5 mm (2.5 inches). They were only allowed to begin fishing for crab one week after the closure of the spring lobster fishing season, and had to remove their traps one week before the opening of the fall lobster fishing season. In order for participants to retain their exploratory permits, they had to land and sell a minimum of 5,000 kg of rock crab.

In LFA's 36 & 38, exploratory crab permit holders were allowed to land rock and Jonah crab. The minimum size limit for male rock crab was set at 102 mm CW. The trap limit was set at 200 in LFA 36 and 300 in LFA 38. Only conical traps were allowed, and were required to have a minimum of two circular openings of 63.5 mm (2 ½") in diameter. Also the crab-fishing season is open all year. For participants to retain their exploratory fishing permits, they were required to complete 15 fishing trips and had to land at least 30 % of average landings (in weight) of all fishers within a given year for their respective LFA.

Distribution of rock crab fishing locations as reported in fishers' logbooks.



The exploratory rock crab fishery, in operation since 1995, has located several commercial concentrations: St. Marys Bay (LFA 34); Annapolis Basin (LFA 35); along the New Brunswick coast in the Maces Bay area and around the Fundy Isles (LFA 36). Rock crabs were mostly found in shallow waters near the coast.

Resource Status

There are no fishery-independent surveys for this species, and this assessment is based on catch rates and size composition data from

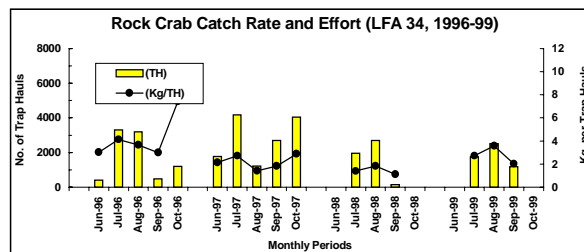
the commercial catch. Traps are highly selective, and crustacean catchability is affected by a variety of factors. The **catch rate** data have not been standardized for fisher, trap type, area and season, and standardization would be difficult because the important variables are available for only a small subset of the data. Some of the variation in the catch rate and size composition probably results from factors other than the abundance of rock crab.

In all LFA's most of the fishing took place between June and the end of October even when the crab season was open all year as in LFA 36.

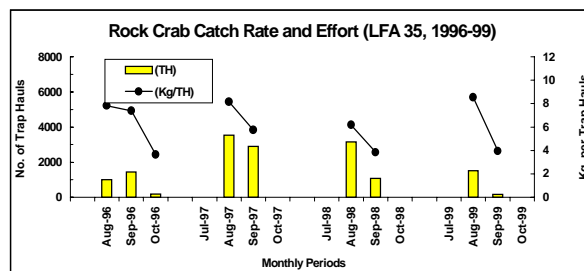
Rock Crab		1995	1996	1997	1998	1999
LFA 34	Trap Hauls		8558	13916	3000	5451
(St. Marys Bay)	Landings (t)		36.7	33.5	5.0	16.1
	Mean CPUE		4.3	2.4	1.7	3.0
	No. of Logbooks		2	2	2	2
	By-catch (t)		**	**	48	33
LFA 35	Trap Hauls		2618	6445	4235	1685
(Annapolis Basin)	Landings (t)		19.1	45.5	23.7	13.6
	Mean CPUE		7.3	7.1	5.6	8.1
	No. of Logbooks		3	4	2	2
	By-catch (t)		**	**	13	26
LFA 36	Trap Hauls	7383	6103	2608	14696	10748
	Landings (t)	22.8	16.3	9.1	37.1	24.3
	Mean CPUE	3.1	2.7	3.5	2.5	2.3
	No. of Logbooks	4	4	2	6	5
	By-catch (t)	**	**	**	0	23
LFA 38	Trap Hauls	2023				
	Landings (kg)	1938				
	Mean CPUE	1.0				
	No. of Logbooks	1				
	By-catch (t)	**	**	**	0.9	5.7

** Unknown

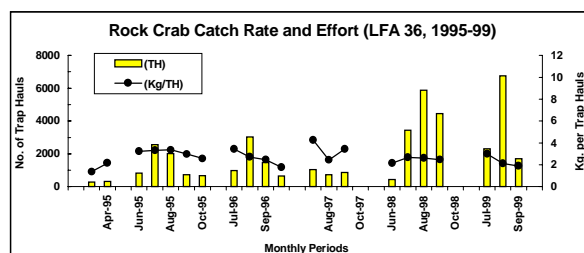
In St. Marys Bay (LFA 34), two crab fishers have been fishing for rock crab since 1996. Rock crab landings obtained from logbooks peaked the first year (1996) at 36.7 t and subsequently declined to 5 t in 1998 and were up at 16.1 t in 1999. Since 1996, yearly average catch rate in kg per trap haul (kg/th) varied between 1.7 and 4.3. Monthly average catch rates varied between months and no seasonal trend was noticeable.



In Annapolis Basin (LFA 35), landings peaked in 1997 at 45.5 t. Preliminary landings in 1999 show a decline to 13.6 t. However the yearly average catch rate has remained at higher levels (varied between 5.6 and 8.1 kg/th) than all other areas. Monthly average catch rates show a decline between August to September of each year.



In southwestern New Brunswick (LFA 36), landings obtained from logbooks from the original four permit holders decreased from 22.8 t in 1995 to 9.1 t in 1997. After the replacement of inactive permits, and allocation of four new permits, landings increased to 37.1 t in 1998 and preliminary landings were 24.3 t in 1999. Yearly average catch rate for 1998 and 1999 varied between 2.5 to 2.3 kg/th with the increase of effort during 1998 and 1999. Monthly average catch rates show no seasonal trends.



Yearly average catch rates were similar in LFA's 34 and 36 despite the fact that

different trap types were used (1.7 to 4.3 kg/th). However yearly average catch rate in Annapolis Basin (5.6 to 8.1 kg/th) was higher than in the other two LFA's.

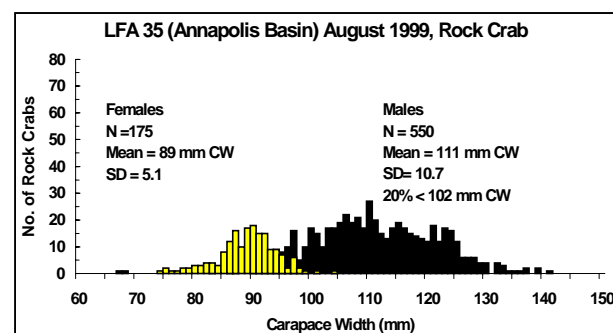
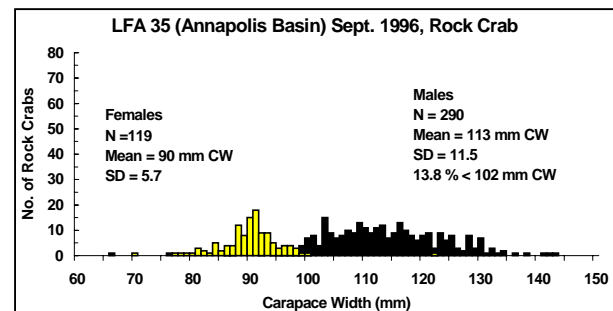
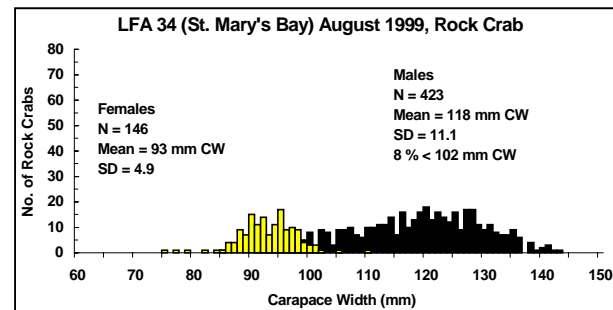
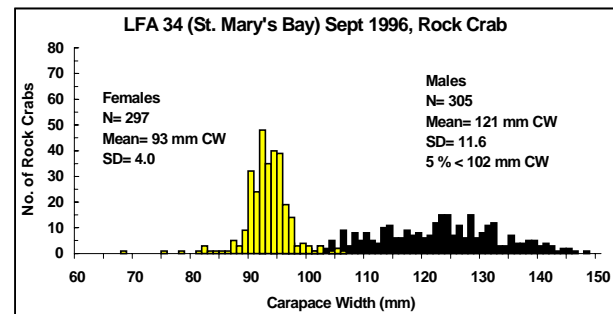
At-sea sampling provides detailed information on crab size structure in the traps. All crabs retained in individual trap hauls are measured, and examined to determine species, sex, molt condition and egg development stage for berried crabs. As the exploratory rock/Jonah crab fisheries were evolving in the various LFA's, emphasis was placed in sampling a series of representative ports in areas and at time periods when high fishing activity occurred.

All the sampling occurred during July, August and September. In some instances, when several samples were taken during the same month in the same location, the samples were combined into one monthly sample.

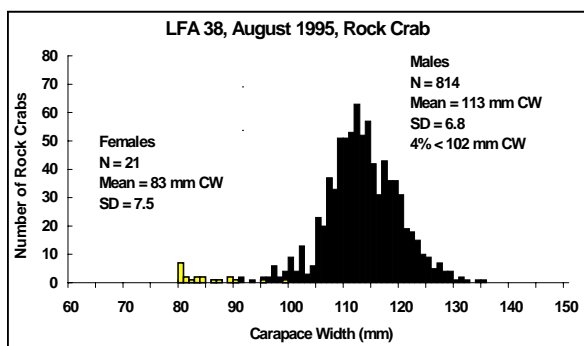
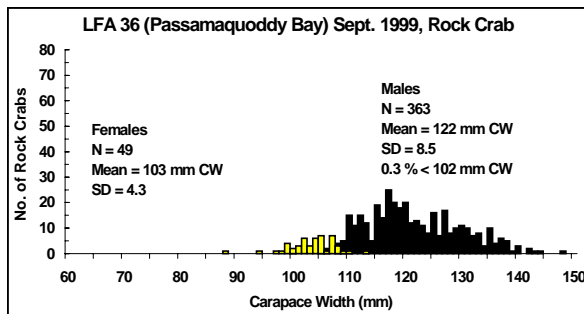
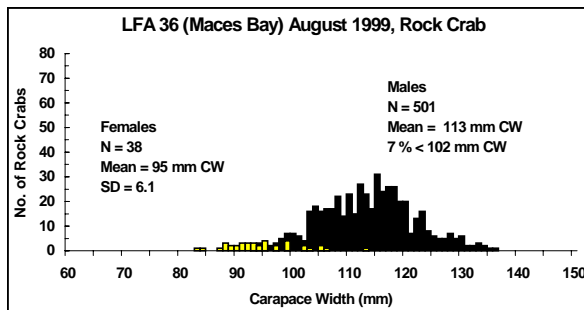
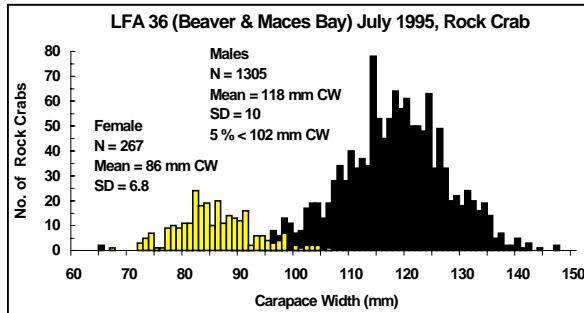
In LFA 34 (St. Marys Bay) and LFA 35 (Annapolis Basin), rock crab at-sea samples were obtained during September 1996 and August 1999, respectively. The average size of males was greater in St. Marys Bay (121 and 118 mm CW) compared to Annapolis Basin (111 and 113 mm CW). The percentage of males below the legal size limit of 102 mm CW was less in St. Marys Bay (5 and 8 %) compared to Annapolis Basin (14 and 20 %). The mean size of females was higher in St. Marys Bay (93 mm CW) compared to Annapolis Basin (89 and 90 mm CW). The percentage of berried females was less than 1 % in both areas.

LFA 36 was sampled in July 1995 and in August and September 1999. The mean size of males was greater in Passamaquoddy Bay (122 mm) compared to the samples along the New Brunswick shore (113 and 118 mm). The percentage of males below the

minimum legal size of 102 mm CW was also lower in Passamaquoddy Bay (0.3%) compared to the samples taken along the New Brunswick coast (5 to 7 %). The mean size of females was larger in Passamaquoddy Bay (103 mm CW) compared to the area along the N.B. coast (86 and 95 mm CW). The percentage of berried females was less than 2 %.



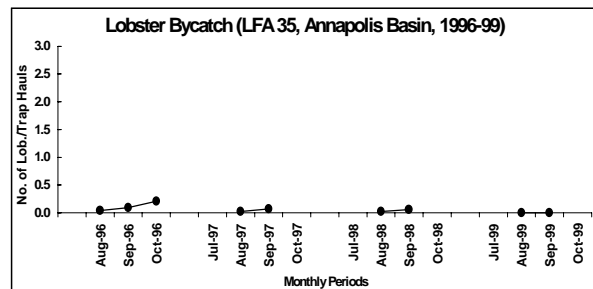
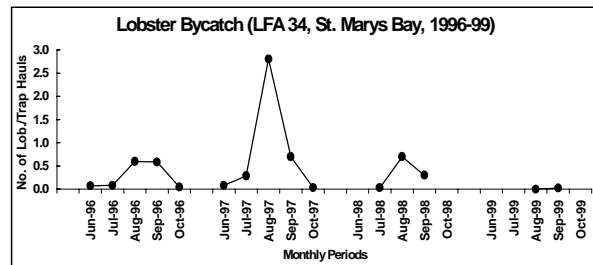
In LFA 38, one rock crab sample was taken during August 1995 before fishing effort was diverted to Jonah crab fishing. The mean size of males was 113 and 83 mm CW for females.

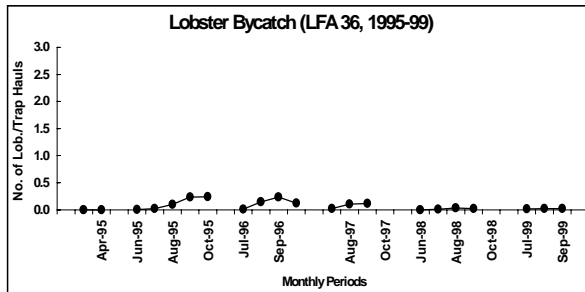


Overall, although different trap types were used in LFA's 34 & 35 (modified lobster traps) and LFA's 36 & 38 (conical traps) the

mean sizes of rock crabs were similar in all areas.

Lobster bycatch has been a management concern since the inception of the exploratory crab fishery. However, restrictions on the type of traps used and limitations on the size and shape of the entrances, seem to have reduced the incidence of lobster bycatch. Yearly average number of lobster per trap haul (lob./th), as reported in logbooks was higher in St. Marys Bay (LFA 34) (0.3 and 0.5 lob./th) and Annapolis Basin (LFA 35) (0.08 and 0.04 lob./th) during 1996 and 1997. However, on average low numbers of lobsters per trap haul were reported during 1999 (< 0.01). Limited sea sampling in St. Marys Bay and Annapolis Basin (4 samples) has shown that in 1999, the number of lobster per trap haul was 0.1 and 0.4 compared to 0.2 and 2.0 in 1996, respectively. In LFA's 35 and 36 the monthly average number of lobsters per trap haul, as reported from logbooks, has been low (< 0.3). Limited sea sampling in 1999 indicates that the number of lobsters per trap haul was 0.07 compared to 0.0 in 1995.





Sources of Uncertainty

Total removals of rock crab in the Gulf of Maine are not known because the bycatch of rock crab by the lobster fishery is not well documented. Anecdotal evidence indicates few rock crab are retained by lobster fishers in some areas (e.g. LFA 38) but in other areas lobster traps are set specifically for rock crab to be used as bait or sold. Reported landings in LFA's 34 and 35 have shown that bycatch of rock crabs surpassed landings from the directed fishery in 1999, and could increase or decrease in response to economic factors.

Outlook

There is still some room for limited expansion in unexplored areas in LFA 34 and especially in LFA 38 where rock crab were initially found in 1995 but ignored as effort was directed at the more lucrative Jonah crab. In LFA 35 & 36 it is unlikely that commercial concentrations of rock crab will be located in the upper part of the Bay of Fundy. There is still some possibility of moderate expansion around the Fundy Isles in LFA 36. The current level of effort does not appear to be having any obvious impact on the resource such as a reduction in average catch size or reduction in catch rates. Risks of overfishing of rock crab by the directed fishery are low given current effort levels and the high protection for broodstock provided by minimum size regulation. The economic feasibility of this

fishery is marginal and very dependent on the value and the demand for the product.

Removals of rock crab by the lobster fishery as a bycatch, are currently underestimated and under no limitation. Reported landing statistics shows that rock crab landings as a bycatch to the lobster fishery in LFA 34 & 35 have surpassed the directed fishery in 1999. Until the quantity of rock crab removals by the lobster fishery has been further evaluated, biological sustainability of the directed fishery cannot be evaluated.

Other Considerations

Smaller rock crabs are an important component of the diets of lobster and some inshore groundfish. The directed fishery focuses on larger crabs that are not as important as a food source. Thus the effect of rock crab removals on the production of lobsters and other species is likely negligible as long as small rock crab are not harvested, and removals are below the level at which overfishing occurs.

The rock crab fishery is male only (as are all Canadian crab fisheries), and there are some concerns that this could limit future egg production if large males are needed to mate females. More research in this area is needed.

Management Considerations

Rock crabs are fished by a directed fishery and as a bycatch in the lobster fishery. The potential effort by the lobster fishery is far greater than the directed fishery. Removals by the lobster fishery are a fundamental piece of missing information needed for the assessment of rock crab stock(s). Until the quantity of rock crab removals by the lobster fishery is evaluated and controlled, biological

sustainability of the directed fishery cannot be evaluated. The bycatch issue should be looked at on an LFA by LFA basis since in some LFA's these issues could be more easily resolved than in others. Lobster fishermen should be encouraged to report their bycatch whether it is used directly as bait or sold.

Fishing Areas 34, 35, 36 & 38. DFO Can. Stock Assess. Sec. Res. Doc. 2000/051.

As far as the directed fishery is concerned, management provisions should remain flexible to reflect the developing nature of the fishery. More work needs to be done on evaluating trap designs that limit lobster bycatch before more stringent trap specifications are added to the regulations.

To better evaluate the potential for rock crab directed fishery, more fishing effort (e.g. increased participation rates, additional permits or additional traps) should be targeted to lightly fished areas.

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References

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