



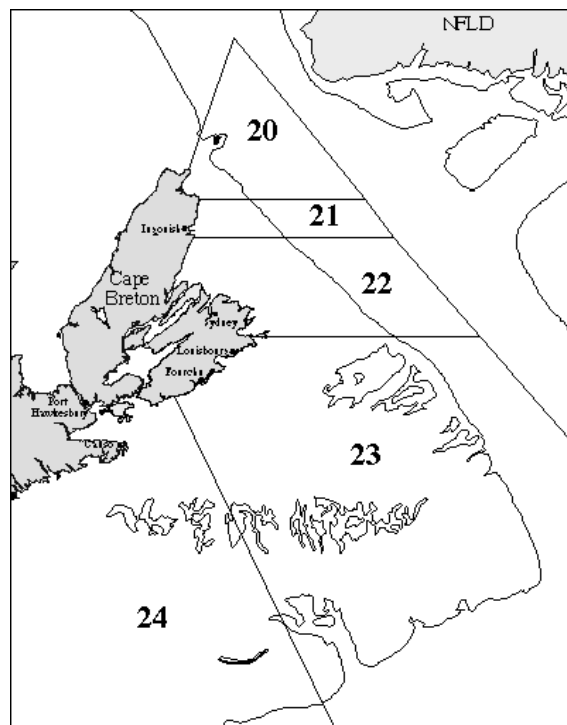
## Eastern Nova Scotia Snow Crab

### Background

Snow crab (*Chionoecetes opilio*) is a crustacean like lobster and shrimp, with a flat almost circular body and five pairs of spider-like legs. The hard outer shell is periodically shed in a process called molting. After molting, crab have a soft shell for a period of time. Soft-shelled crab is defined by shell hardness (<68 durometer units). The term white crab describes both new-soft and clean hard-shelled crab (categories 1 and 2).

Unlike lobster, snow crab do not continue to molt throughout their lives. Females stop growing after the molt in which they acquire a wider abdomen for carrying eggs. This occurs at shell widths less than 95 mm. Male snow crab stop growing after the molt in which they acquire large claws on the first pair of legs. This can occur at shell widths as small as 40 mm. Female crab produce eggs that are carried beneath the abdomen for approximately 2 years. The eggs hatch in late spring or early summer and the tiny newly hatched crab larvae spend 12-15 weeks free floating in the water. At the end of this period, they settle on the bottom. It takes at least 8-9 years for snow crab males to reach legal size.

The minimum legal shell width is 95 mm, and female crab are not kept by industry. Fishing is by baited square or conical traps constructed of wire or tubular steel and netting. The traps are set on muddy or sand-mud bottoms at temperature ranging from -0.5 to 4.5 C and depth ranging from 50 to 280 m. Typical fishing depths off eastern Nova Scotia are 130 m to 250 m.



From 1982 to 1993, management of these fisheries was strictly based on effort controls (seasons, licenses and trap limits). In 1994-95, restrictions were placed on the landings of soft-shelled crab, and individual boat quotas (IBQ) that were tied to overall quotas were introduced in all areas except for Area 22 where they were introduced in 1998. In addition to the fishery on traditional grounds off eastern Nova Scotia, a small exploratory fishery is underway in NAFO Division 4X which is part of Area 24. Compared to 1997, the number of permanent licenses remained stable, but temporary permits were introduced in Areas 23 and 24. In 1998, the same management measures (IBQs and restriction of landings of soft-shelled crab) were maintained.

### Summary

- Catch and catch rate information suggested an increase in abundance in all areas.

- Size distributions from a trawl survey indicated an increase in recruitment in Areas 23-24, also an increase in recruitment in the northern or near shore part of Area 22. This new recruitment should occur over the next three years. The absence of crab at smaller sizes indicates that there may be a decline in recruitment in the longer term.
- One more year of survey for all areas and a detailed accounting of bottom topography will be required before fishery-independent estimates of biomass could be available.
- There is potential to increase the TAC in all areas but there is no scientific basis for providing any magnitude to these increases.

**The Fishery**

The fishery in Areas 20 to 24 began in 1978. The fishery collapsed in the mid-1980s but from 1987 to 1993 landings increased steadily. This increase resulted from a greater abundance of crab, an expanded fishing area, and an increase in effort.

In 1998, **individual boat quotas (IBQ)** were set as follow:

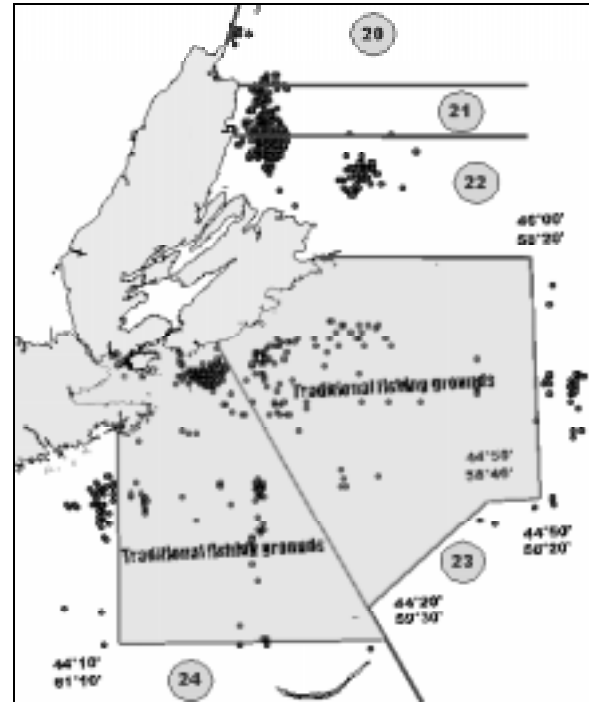
Area	IBQ (lbs)	IBQ (kg)
20	20,000	9,072
21	15,000	6,804
22(north)	22,000	9,979
22(south)	27,000	12,247
23 <sup>1</sup>	55,000	24,948
24 <sup>1</sup>	55,000	24,948
4X	competitive	competitive

<sup>1</sup> for both permanent and temporary fishers

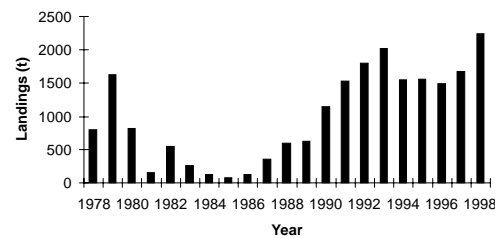
Certified observers conducted at-sea monitoring in Areas 20 and 21 for the first time, while this program had been introduced in 1997 in Areas 22, 23 and 24. The voluntary reduction in the trap limit from 30

to 25 introduced in Area 21 in 1997 has been maintained in 1998.

**Fishing positions reported in 1998 logbooks.**



**Landings (metric tons).**



**Landings (metric tons).**

Area	Average		1995	1996	1997	1998 <sup>1</sup>
	90-94	95-98				
20	17	45	44	43	45	45
21	159	150	100	136	146	216
22	238	303	284	188	343	396
23	555	637	576	565	592	813
24	662	605	550	560	565	745
4X	-	26	17	12	2	42 <sup>2</sup>
<b>Total<sup>3</sup></b>	<b>1631</b>	<b>1740</b>	<b>1554</b>	<b>1493</b>	<b>1691</b>	<b>2215</b>

<sup>1</sup>Preliminary data, unadjusted

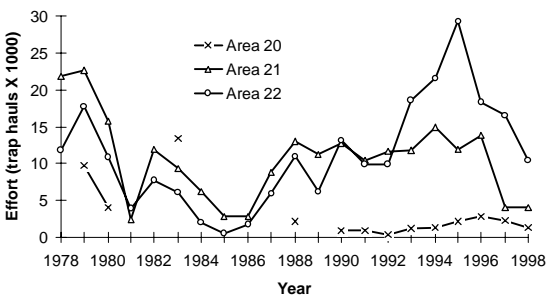
<sup>2</sup>From January to September 1998

<sup>3</sup>Total does not include results from 4X

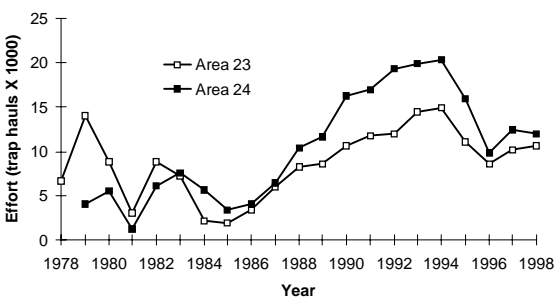
The 1998 total **landings** in eastern Nova Scotia were 30% higher than those of 1997. The increase in landings within areas was mostly the result of the 50% increase in IBQ in Area 21, a slight increase in IBQ in Areas 23 and 24, and the introduction of new allocations for temporary fishers in Areas 23 and 24. Dockside monitoring of catches was introduced in 1994; coincidentally, return of logbooks declined from 75% prior to 1993 to 30% in 1995. Since 1996, logbooks have been mandatory and have combined dockside monitoring and science requirements.

Overall, for the eastern Nova Scotia fishery there was a 15% decrease in **fishing effort** compared to 1997. While the reported fishing effort was similar in Areas 21, 23 and 24, it was 35% to 45% lower in Areas 22 and 20, respectively.

#### Fishing effort for Areas 20, 21 and 22.



#### Fishing effort for Areas 23 and 24.



**At-sea sampling** of the commercial catch to evaluate the percentage of soft-shelled crab prior to sorting was carried out during the second half of the fishing season through a

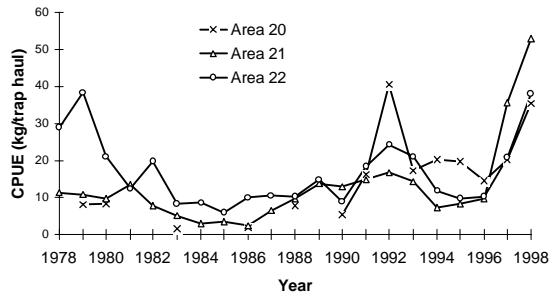
certified observer program except in Area 22 where no sampling occurred. Samples of male crab were categorized by shell characteristics (size, hardness) and claw height. The seasonal average percentage of soft-shelled crab was 14% in Area 20, 24 % in Area 21, 9% in Area 23 and 23% in Area 24.

#### Resource Status

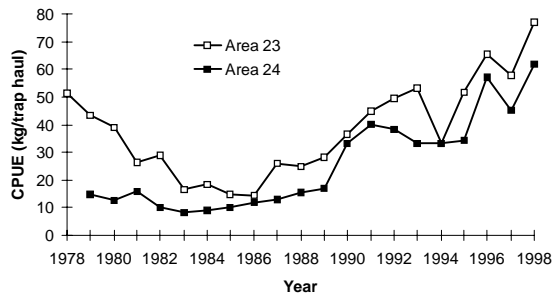
The evaluation of stock status for 1999 is based primarily on fishery information. A trawl survey was initiated in 1997 and was used to evaluate recruitment trends. **Catch rate** (CPUE: kg/trap haul) and effort (total number of trap haul) were derived from fishing logs. Catch rates are not adjusted for soak time. In 1998, over 85% of the logs had complete information and were used in this analysis.

**Distribution** of catch rate information suggested that Area 20 exploited two main fishing grounds in 1998, one close to the boundary with Area 19 and the other close to the boundary with Area 21. The fishing grounds close to the boundary of Area 21 appear to be continuous with the location of the fishery in Area 21 and that in the northern part of Area 22. Fishers in Area 22 also fished further offshore known as the southern (outer) area. In Areas 23 and 24, fishing occurred primarily on three to four grounds in the traditional portion, and included some fishing in the non-traditional grounds.

CPUE for Areas 20, 21 and 22.



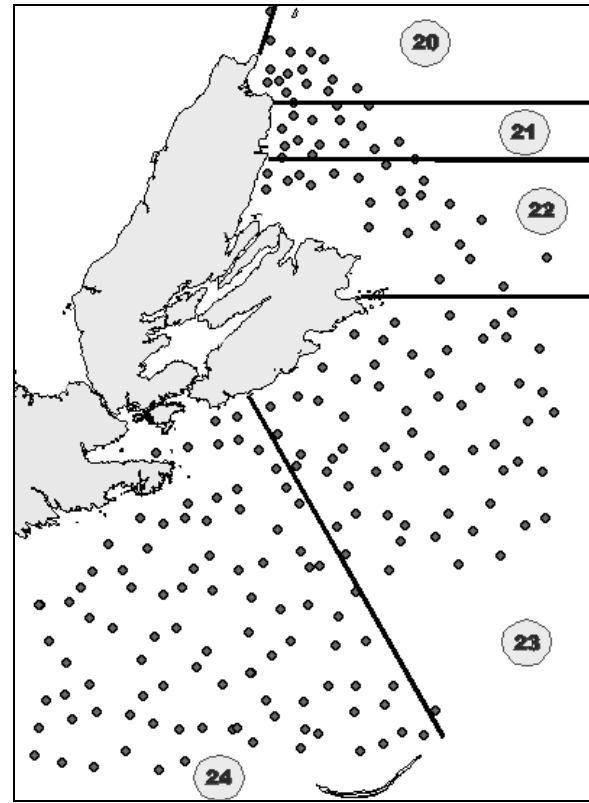
CPUE for Areas 23 and 24.



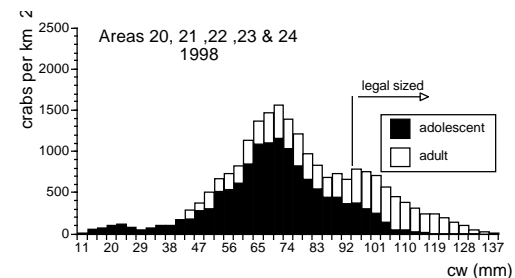
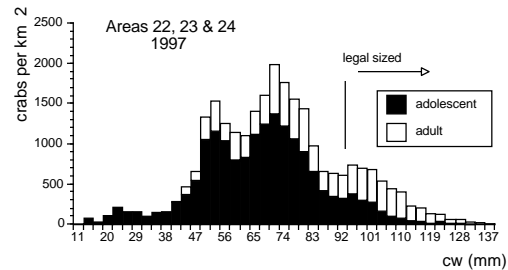
Marked increases in CPUE were observed in Areas 20 (75%), 21 (50%) and 22 (84%), while the increases in Areas 23 and 24 were 33% and 37%, respectively. It should be noted that because of the increase in landings allowed in Area 21 in 1998, some snow crab buyers (Areas 20 and 21) requested fishers of Area 20 to fish their traps every second day, which would have affected catch rates. In 1997, attempts were made to fish each trap every day, especially in Area 20. In Areas 20, 21 and 22, the overall state of these fisheries has improved considerably since last year.

In 1998, the second annual trawl survey in this area was conducted and was used to evaluate recruitment trends. The presence of large numbers of adolescent crab in Areas 22, 23 and 24 indicates improved future recruitment for these grounds.

Distribution of the survey stations



Survey size frequency of male crab in 1997 and 1998.

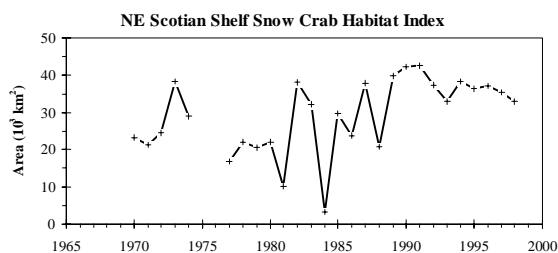


### *Sources of uncertainty*

One of the greatest sources of uncertainty in the survey was the concentrations of crab found in the gullies between the banks. The ocean bottom off Cape Breton is extremely rugged, quite different from the relatively smooth bottom of the southern Gulf. Therefore simple areal expansion of the survey estimates off Cape Breton was not considered to be appropriate at this time. Two sources of uncertainty noted in the 1998 SSR have been addressed. Equations used to identify maturity of male crab and to convert numbers to weight have now been developed for eastern Nova Scotia.

### *Ecosystem Considerations*

Snow crab on the Scotian Shelf are near the southern limit of their distribution. Temperatures have been colder than average in Sydney Bight (Areas 20-22) and Misaine Bank (Areas 23-24) since the mid-1980s. The snow crab thermal index remained high in 1998.



### *Outlook*

Stock status appears better than in previous years. Catch rates have increased in all areas, although changes in fishing habits (fishing every second day rather than every day) explain some of the marked increase in catch rates in the northern portion of eastern Nova Scotia. A new survey indicates that the resource is widely distributed, particularly in

Areas 23 and 24 and that there are concentrations of crab outside where the bulk of the fishery occurred in 1998. One more survey for all areas will be required before an estimate of exploitable biomass will be available.

The survey indicates good signs of new recruits to the fishery (category 1) in Areas 23 and 24, and noticeably in the northern portion of Area 22. There is potential to increase the TAC in all areas but at this time there is no scientific basis for providing any magnitude to this increase. There is indication of future recruitment (primarily adolescents between 56 and 95mm) that should enter the fishery in the next 2 to 3 years. However, the absence of immature crab in all areas (except Area 22) indicates that the biomass will decrease after that period if this population follows a life cycle comparable to other known snow crab stocks.

### *Management Considerations*

Soft-shelled crab have low meat content and low commercial value. If handled carefully, survival should be high when returned to the sea, but there is a potential for wastage. Incidence of soft-shelled crab may be associated with a high exploitation of hard-shelled crab or strong recruitment. If high exploitation is the cause of a high incidence of soft-shelled crab, then reductions in effort would be necessary. The high density of adolescent snow crab observed in the survey in the northern portion of Area 22 is a cause for concern.

The 4X fishery needs to be examined for potential as a legitimate fishery. The exploratory fishery has been focussed on large concentrations of snow crab but it is not conducting a systematic search of the

entire 4X area. A proper evaluation of resource status is required.

### ***For more Information***

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### ***Reference***

Biron, M., M. Moriyasu, E. Wade, P. DeGrace, R. Campbell and M. Hébert. 1999. Assessment of the 1998 Snow crab (*Chionoecetes opilio*) fishery off eastern Nova Scotia (Areas 20 to 24, and 4X). DFO Can. Stock Assess. Sec. Res. Doc. 99/12.

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