

Effect of A Voluntary Fishing Moratorium on an Inshore Stock of Snow Crab

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The snow crab, *Chionoecetes opilio* in Bonne Bay, Newfoundland were not harvested commercially until the mid 1990s. Prior to this, in the 1960's, exploratory surveys occurred in Bonne Bay (NAFO zone 12G) and elsewhere throughout the Gulf of St. Lawrence (Hare and Dunn, 1993). These surveys reported low abundance of snow crab in Bonne Bay with little economic value. By the 1990's however, while groundfish stocks were declining, the population of snow crab in Bonne Bay had increased in abundance and a market for snow crab product was developed.

July of 1995 marked the opening of the first official snow crab fishery in Bonne Bay. Approximately fifteen licenses were permitted (Sargent, 1997). Quotas were set, but these were not apparently based on stock assessments. Licenses had been issued throughout Western Newfoundland to compensate for the loss of the groundfish fisheries (Fisheries and Oceans Canada, 2003). This was the same year the groundfish moratorium was implemented in the Gulf of St. Lawrence. Having lost a significant source of their income, snow crab gained economic significance to local inshore harvesters.

The importance of the snow crab fishery to the livelihood of local harvesters did not waver over the next decade. For those fishing inshore Bonne Bay, crab and lobster provided the majority of their income. Unfortunately, after only a decade, sudden plummeting catch rates were recognized by local harvesters. This spurred the group to immediate remedial action. A committee was formed, representing the overwhelming majority of Bonne Bay crab harvesters. They submitted a formal proposal for a voluntary moratorium to Fisheries and Oceans Canada in 2008. The proposal was rejected in 2008, but was accepted in the second attempt in 2009. A moratorium was implemented for the 2009 and 2010 seasons. The aim of this moratorium was to allow the stock to recover. This was the first such moratorium on snow crab in Newfoundland.

Fishing for snow crab ceased for the 2009 and 2010 seasons. After the second season of the moratorium had passed, researchers from Memorial University recognized the opportunity to survey the crab population in Bonne Bay, looking for signs of stock recovery. The study concluded just prior to the reopening of the fishery in 2011. 1140 snow crab were trapped in total. Biological measurements were taken to assess the size distribution and proportion of mature and legal size crabs in the population. Following this, all crabs were also tagged and released at the collection location in Bonne Bay.

The study found that catch per unit effort (CPUE) had increased since the closure. However, the population consisted largely of undersized (non-legal) individuals. The majority of the sample fell between 10 mm below legal size and 5 mm above legal size, and very few (5.3%) large snow crab (115 mm +) were found. Since this cohort (115mm+) was the only group that had experienced exploitation by the fishery, their low representation within the population may have been at least in part due to fishing mortality on this group prior to the two-year closure.

A startling finding of this study was that only minute proportions (approximately 5%) of the sample displayed visible signs of maturity. Though 48% of the males sampled were legally exploitable size (≥ 95 mm), only 5% had reached terminal molt, a maturity event indicated by enlarged claws. The assumption that most male snow crab will reach maturity and reproduce before being recruited to fishable size, an assumption fundamental to the management of the resource, was challenged. Of the snow crab in sampled in Bonne Bay for this study, none showed clear evidence of maturity by 95 mm. The discrepancy between those crab that were legally harvestable (≥ 95 mm) and those that were mature suggested that juvenile snow crab in Bonne

Bay are not protected by the size-exclusive management effort and are caught before making reproductive contributions. This implies that the current management strategy of minimum legal size is not providing reproductive protection for the Bonne Bay population.

This loss of reproductive capacity has consequences to the long-term recovery and sustainability of this stock but also has economic consequences to the harvesters who rely on this resource. Without allowing for growth and recruitment, the 95 mm size restriction does not allow the Bonne Bay population to replace itself on the long term. Continued use of this management strategy may predict further decline in the upcoming years.

In addition, harvesting snow crab before they have achieved maturity does not maximize the value of the resource. The claw of mature male snow crab contains considerably more flesh than that of an immature. Immature males at 95mm therefore have not reached the optimum developmental stage for harvest. Given time to molt terminally, these crab become substantially more valuable; claws become larger and contain more meat.

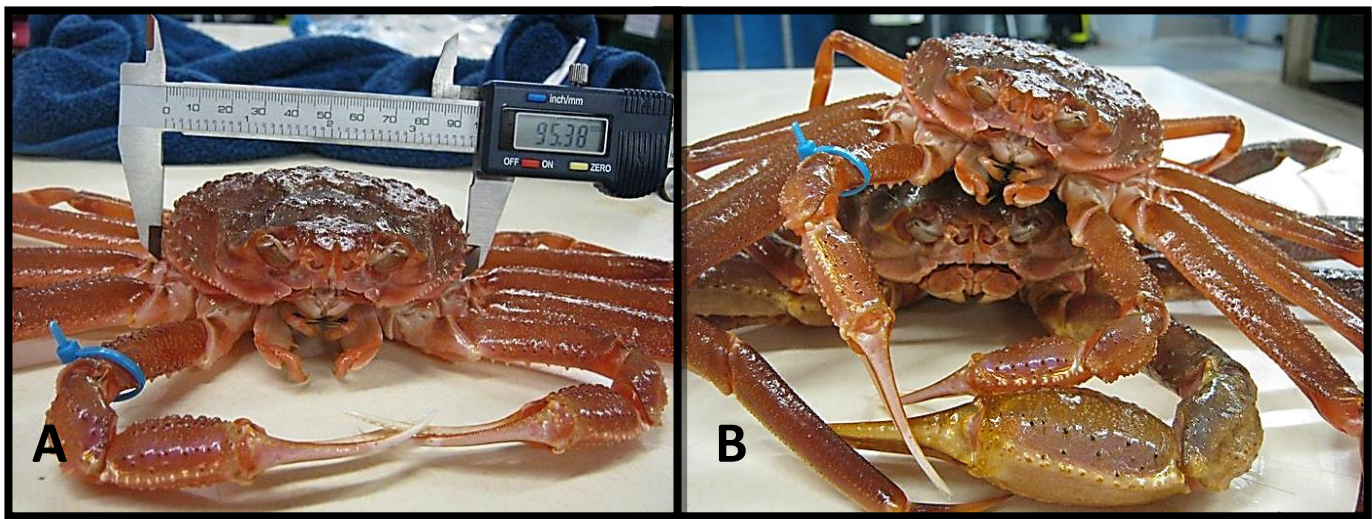


Figure 1. (A) Legal size but immature male snow crab displaying small claw . (B) Claw comparison of immature legal size crab (95mm) to mature crab (115mm) (right).

The snow crab population in Bonne Bay, Newfoundland showed signs of recovery during the two-year fishing closure (Strong cohorts of crab 85-100mm wide). However, the occurrence of a serious decline in landings in the area over a short period of fishing suggests that the Bonne Bay population was not being fished at a rate at which it can replace itself. Evidence in our study suggests that this may be due to an inappropriately chosen minimum size that allows for the removal of adolescent males, and subsequently dampens recruitment.

In the two fishing seasons that have passed since the voluntary moratorium was lifted, landings improved relative to the conditions just prior to the closure. TAC (Figure 2) and length of season has been reduced for the area since the closure. Though these management efforts reduce some aspects of fishing pressure on the stock, recruitment overfishing remains a concern and this strategy does not maximize yields to local harvesters. It is likely, that if the legal minimum size requirement is increased to 115mm, the overall yields of this fishery will improve due to a greater overall spawning biomass. Additionally, harvesters would benefit from a higher quality product and more meat/weight per crab. A comprehensive re-evaluation of management assumptions and regulations is necessary, in order to maximize economic and ecological sustainability of the Bonne Bay snow crab harvest.

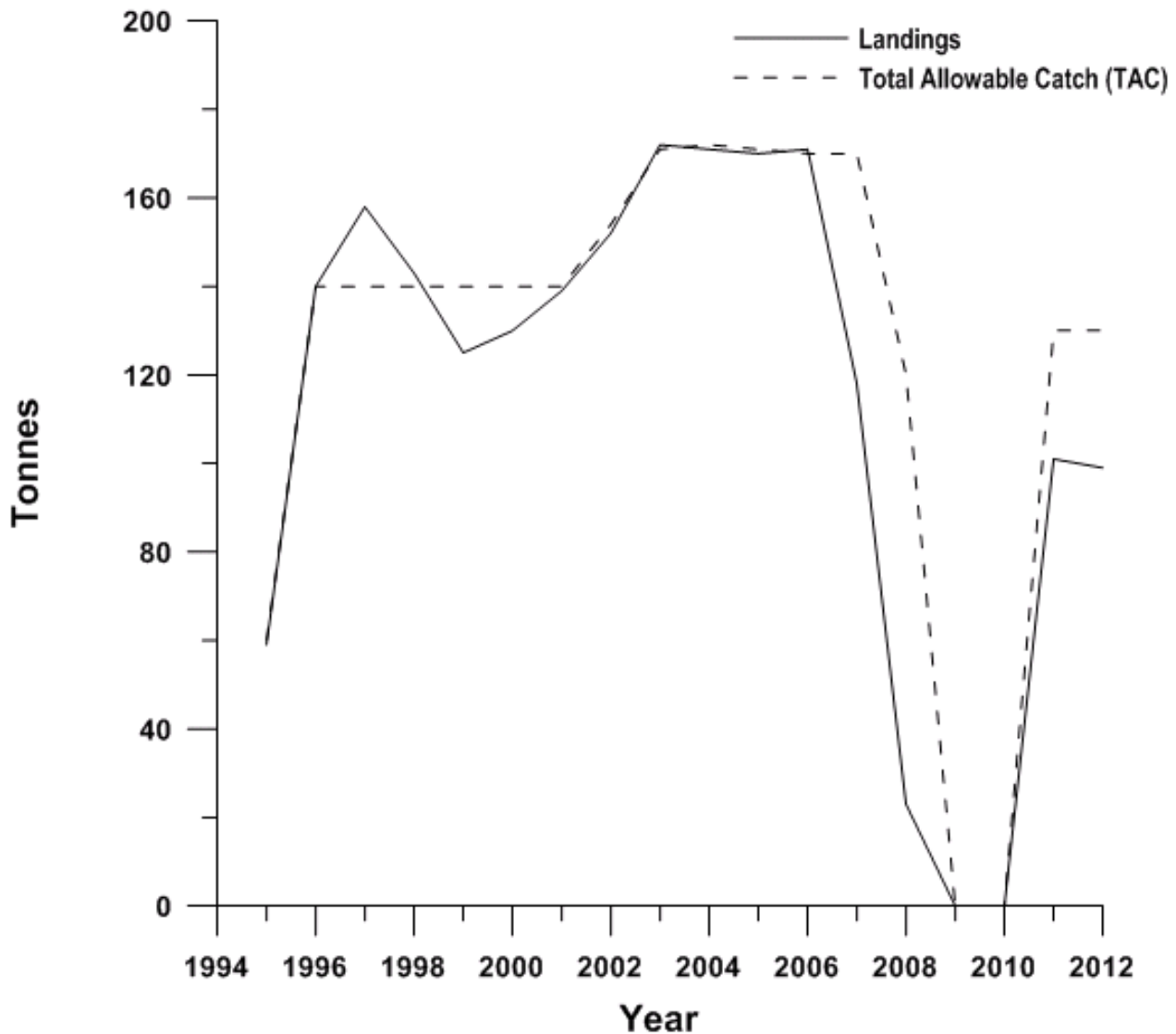


Figure 2. Total Allowable catch and landings in tonnes of Bonne Bay Snow Crab stock 12G from 1995 - 2012

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