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Science | Sciences
Newfoundland and Labrador Region
Canadian Science Advisory Secretariat
Science Advisory Report 2009/043

AN ASSESSMENT OF THE ICELAND SCALLOP (*CHLAMYS ISLANDICA*) RESOURCE IN THE STRAIT OF BELLE ISLE AND THE LILLY CARSON CANYONS

DFO photo

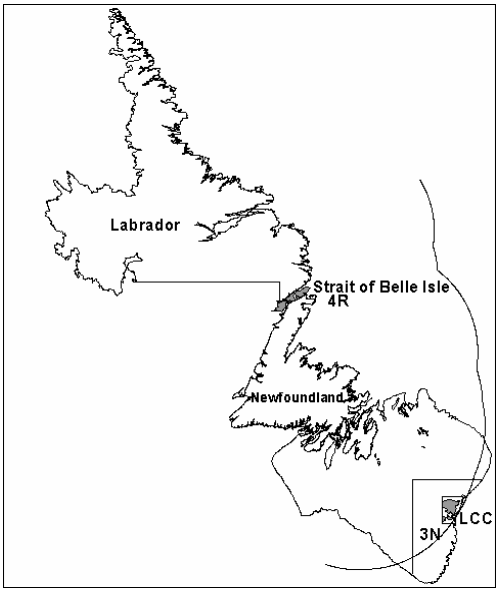

Figure 1: Newfoundland and Labrador showing the scallop fishing area in the Strait of Belle Isle and Lilly Carson Canyons.

Context

The Iceland scallop (Chlamys islandica) is widely distributed within the sub-arctic. Populations off Newfoundland and Labrador are normally found in water depths from 30-100 fathoms, usually on hard bottom with variable substrate composition consisting largely of sand, gravel, shell fragments and stones.

The directed fishery for Iceland scallops started in the Strait of Belle Isle (Div. 4R) in 1969 and later expanded onto St. Pierre Bank (Subdiv. 3Ps) in 1989 and the Grand Bank (Div. 3N) in 1993.

Resource status is evaluated on trends in fishery catch per unit effort (CPUE), biomass and mortality indices. Data are derived from harvesters' logbooks and DFO scallop surveys.

The last update for the scallop resource in Div. 4R was in 2001. That document provided a fishery performance summary for Div. 3N, primarily the Lilly Carson Canyons (LCC). There is no assessment schedule for this stock.

A meeting of the Regional Advisory Process was held Feb. 17 – 21 and Feb. 23 – 27, 2009 in St. John's, NL to assess the status of the Iceland scallop. Participants included DFO scientists, fisheries managers and representatives from industry and Memorial University.

SUMMARY

NAFO Division 4R (Strait of Belle Isle)

- The fishery started in 1969 and peaked in 1972, 1985, and 1994 at ~ 2500 t each year. Removals have averaged less than 400 t since 2000 although the annual TAC has been 1000 t.
- The latest DFO research survey was completed in September 2007, the first since 2000. The minimum dredgeable biomass has shown no clear trend since 1995 and was estimated at 5700 t in 2007.
- A refugium was established in 2000 in hopes of promoting survival of newly settled scallops.
- Although the biomass has always been higher north of the refugium, the fishery has been concentrated south of the refugium since 1995.
- The refugium:
  - For the 5 surveys from 1995 to 2007, shell height has been larger inside the refugium than outside.
  - There was no difference in density (mean number/tow) between inside and outside of the refugium.
  - Natural mortality estimates were higher inside than outside in 2007.
  - Density of predatory starfish was greater inside than outside in 2007.

NAFO Division 3N (Lilly Carson Canyons)

- The fishery in LCC started in 1994 with removals of 4200 t. There have been little to no removals each year since 1999.
- The latest DFO research survey was completed in September 2008, the first since 2002. The minimum dredgeable biomass has shown no clear trend since 1995 and was estimated at 7500 t in 2008.
- The natural mortality estimate for Iceland scallop has increased from 0.20 in 1997 to 0.56 in 2008.
- The biomass estimate of the predatory starfish (*Leptasterias polaris)* has increased from 10,300 t in 1997 to 35,800 t in 2008.

BACKGROUND

The Fishery

NAFO Division 4R (Strait of Belle Isle)

The fishery, the longest existing scallop fishery in Newfoundland and Labrador, started in 1969 and has been prosecuted annually with the exception of four years (1975 - 79). The number of active licenses has ranged from a high of 107 (1985) to the current low of 10. The fishery has been cyclical in nature, often driven by market considerations.

The fishery has been regulated by a Total Allowable Catch (TAC) since 1996. Other management measures include weekly catch limits and spatial regulation of removals. The majority of vessels in this fishery are less than 45' LOA. They make daily excursions and land fresh product with nearly all scallops shucked at sea.

The three scallop beds in this area are considered to be a single stock for assessment purposes. Aggregations in the southern bed have been particularly hard hit throughout the 1990's with removals sometimes exceeding 90% of the total catch. An attempt was made in 1999 to redistribute more of the effort to the northern beds. It was decided between management and stakeholders to partition the TAC equally north and south of the 51^{o} 25' N line. This harvesting strategy was first implemented in 2000.

A significant number of pre-recruits have not been caught in the survey gear anywhere within this area. It was felt this may be due to intensive fishing, resulting in high incidental mortality. This concern led to the idea of closing a portion of the fishing area to test this hypothesis and to provide a basis for evaluating a pulse-fishing strategy for this species. In consultation with stakeholders, a corridor 5 miles wide across the Strait of Belle Isle was established in 2000 where scallop fishing would be prohibited. This resulted in a refugium, 106.5 n.mi.^{2} intended to determine whether recruitment would be facilitated in the absence of fishing.

NAFO Division 3N (Lilly Carson Canyons)

The fishery started in LCC in 1993 as a result of diversification by groundfish license holders into other fisheries after the cod moratorium in 1992. The number of active licenses has ranged between 0 and 57 (1994). The fishery came under TAC regulations in 1995 with a quota of 3000 t round.

ASSESSMENT

NAFO Division 4R (Strait of Belle Isle)

Commercial Fishery

Landings (Fig. 2) peaked in 1972, 1985, and 1994 at ~ 2500 t each year. Removals have averaged less than 400 t since 2000 although the TAC was 1000 t. Only 111 t were landed in 2008. With the exception of 2004, over 80% of the removals have been from the southern bed since 2000.

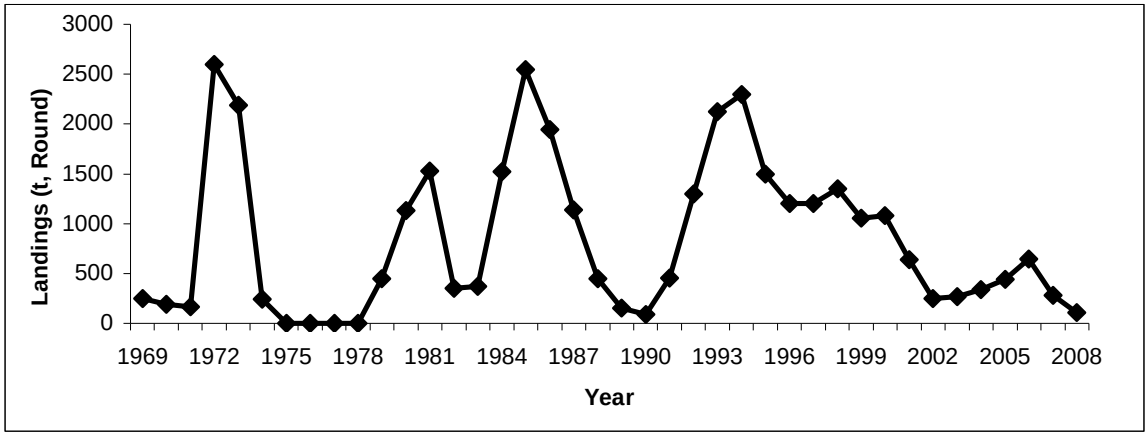

Figure 2: Nominal catch of Iceland scallop from the Strait of Belle Isle (Div. 4R), 1969 – 2008.

Commercial catch per unit of effort (**CPUE**) (Fig. 3) indicates that fishery performance has improved since 2002. During this period the number of active licenses has fluctuated between 13 in 2002 and 26 in 2006 and has since declined to 10 in 2008.

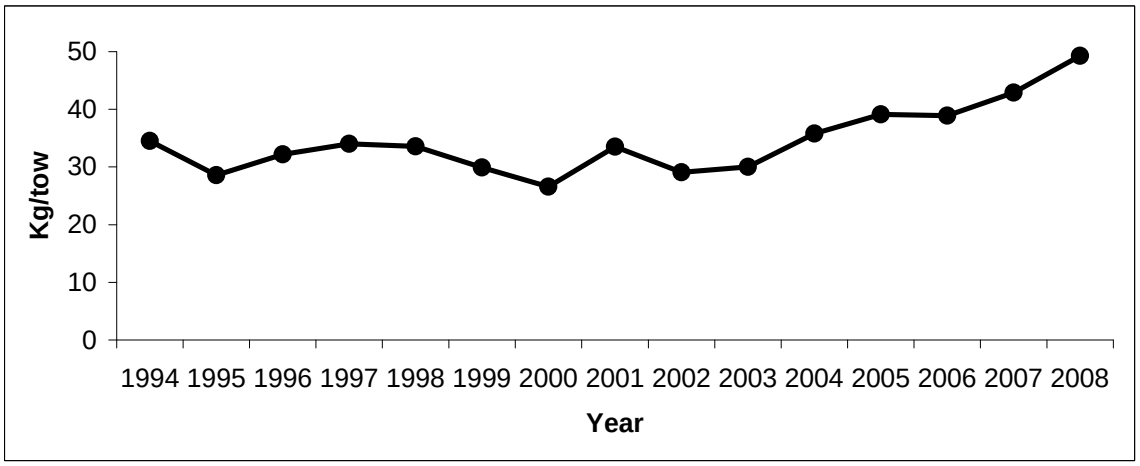

Figure 3: Trends in Div. 4R commercial CPUE (kg/tow round), 1994 to 2008.

Biomass

Resource assessment surveys were conducted in 1995, 1997, 1999, 2000 and 2007. Between 1995 and 2000 bottom mapping techniques were used to delineate scallop habitat, resulting in the identification of 3 strata or beds in the survey area. The original survey strata used from 1995-1999 were redesigned to match the stratification scheme used in the 2000 and 2007 surveys for comparison.

The minimum dredgeable biomass (MDB) has shown no clear trend since 1995 and was estimated at 5700 t round in 2007 (Fig. 4). The survey biomass estimate has always been higher north of the refugium while the fishery has taken place primarily south of the refugium since 1995.

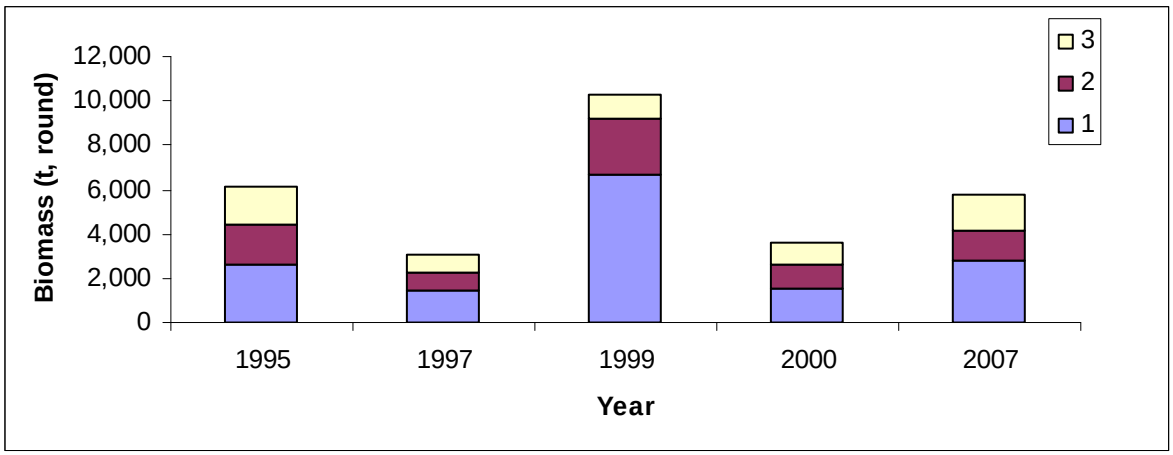

Figure 4: Biomass estimates for Iceland scallop in the Strait of Belle Isle by bed. Beds 1 & 2 are north of the 51°25' N line, which bisects the refugium, and bed 3 is to the south.

Recruitment

As in previous assessments, there is no signal of incoming recruitment. Pre-recruits, scallops less than 60 mm shell height, contributed less than 1% of the total numbers caught.

Mortality

Natural mortality rates (Fig. 5), computed from the proportion of cluckers (non-disarticulated valves) to live scallop, were higher in the two northern beds where there is less fishing than in the southern bed. Mortality estimates averaged 0.15 in bed 1, to 0.28 in bed 2 and 0.09 in bed 3. Mortality varied without trend over time.

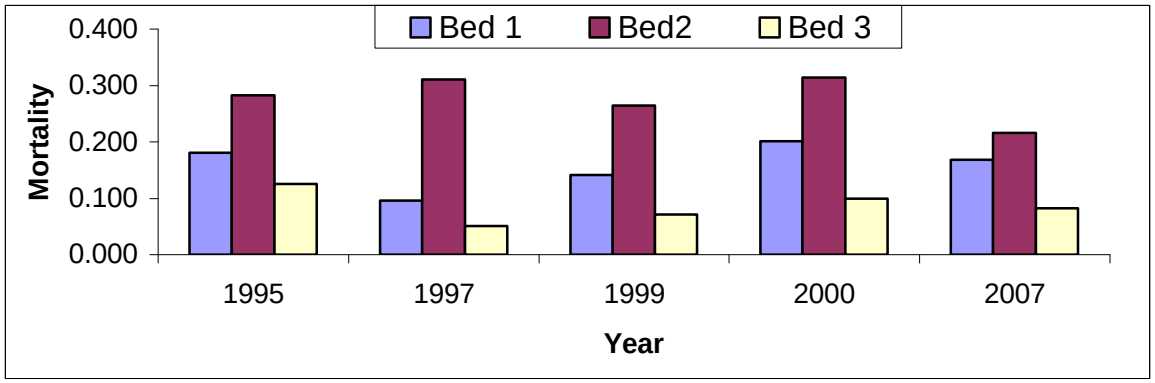

Figure 5: Natural mortality estimates for Iceland scallop in Div. 4R by bed. Beds 1 & 2 are north of the 51°25' N line and bed 3 is to the south.

Predation

Biomass (Fig. 6) of *Leptasterias polaris,* a predatory starfish of Iceland scallop, has changed little over the survey time series. However, densities of starfish were higher in the northern beds than in the bed to the south, as were the natural mortality rates of Iceland scallop.

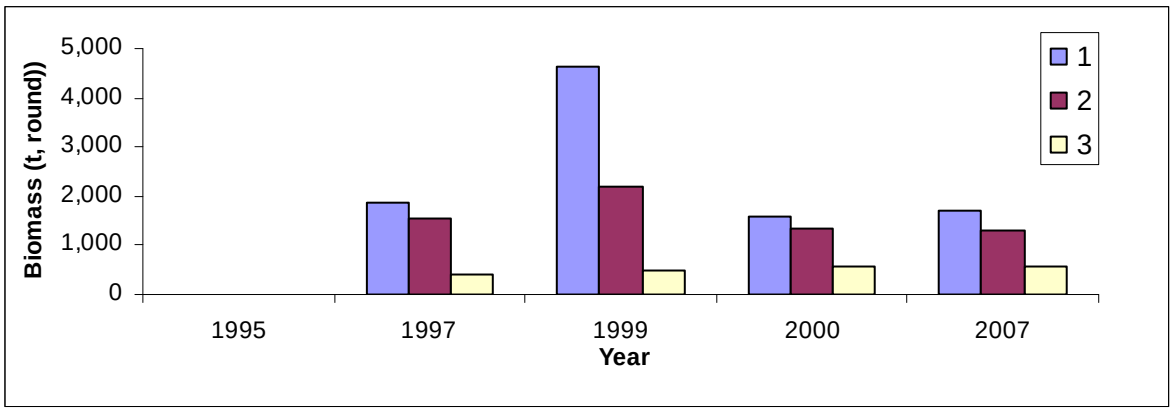

Figure 6: Biomass estimates for Leptasterias polaris by bed. Beds 1 & 2 are north of the 51°25' N line and bed 3 is to the south.

NAFO Division 3N (Lilly Carson Canyons)

The fishery began in 1994 with **landings** of 4200 t which declined to 134 t in 1999. There have been little to no removals since then. There has been no fishing activity in LCC since 2006.

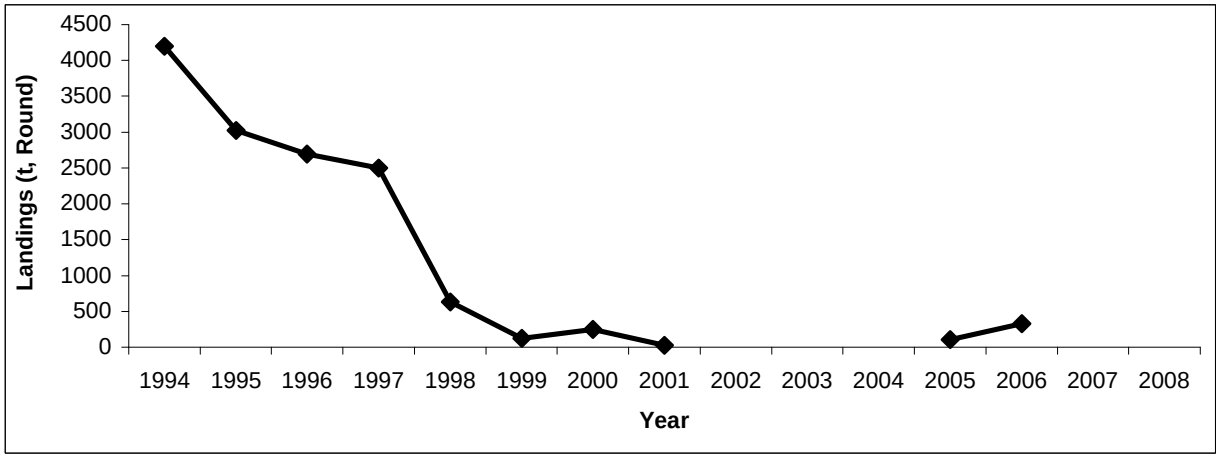

Figure 7: Nominal catch of Iceland scallop from Lilly Carson Canyons (LCC), 1994 – 2008.

Commercial catch per unit of effort (**CPUE)** (Fig. 8) declined steadily from 1994-2001. During this time period the number of active licenses declined from 57 to 2. Catch rates were higher when the fishery resumed in 2005-06 but these were based on very little effort.

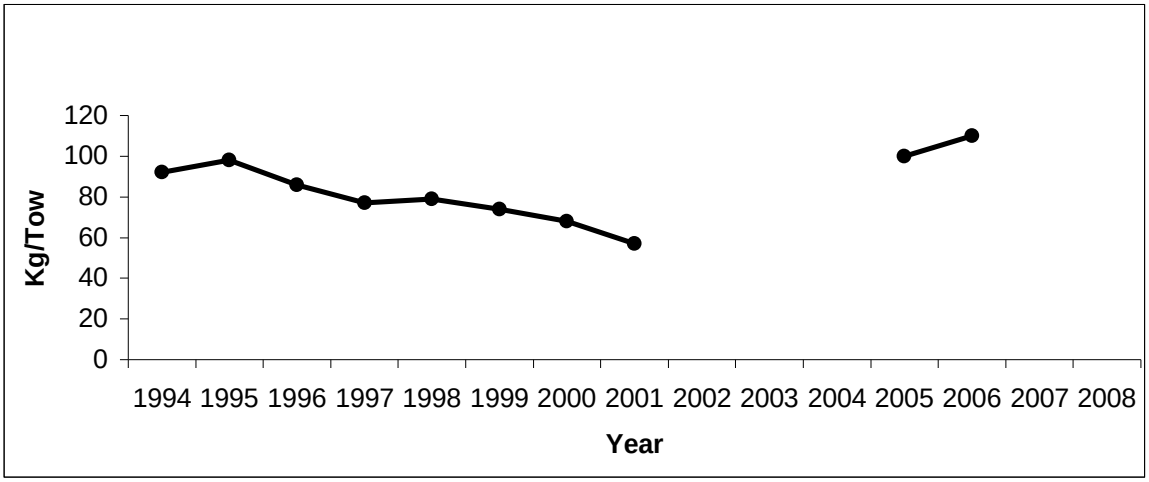

Figure 8: Trends in LCC commercial CPUE (kg/tow), 1994 to 2008.

Biomass

Resource assessment surveys were conducted in 1994, 1997, 2002 and 2008. During the 1997 and 2002 surveys, bottom mapping techniques were used to delineate scallop habitat, resulting in 4 strata or beds in the survey area. The original survey strata were redesigned to match the stratification scheme used in the 2008 survey and biomass values were recalculated to reflect this new bed delineation. In 2002 only the eastern portion of the largest stratum was sampled, which was considered to be the main commercial fishing area. This resulted in an over-estimate of biomass.

The minimum dredgeable biomass (MDB) has shown no clear trend since 1994 and was estimated at 7500 t round in 2008 (Fig. 9).

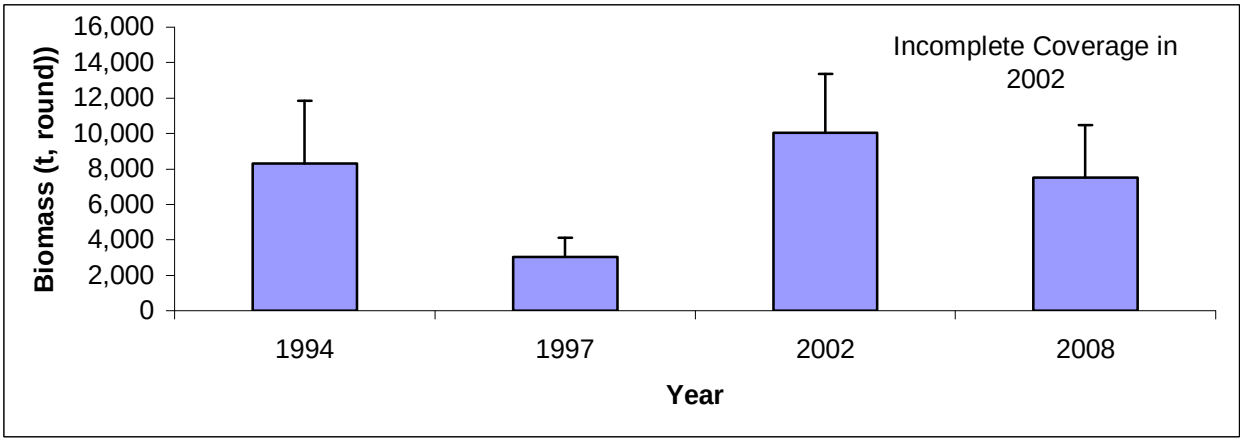

Figure 9: Biomass estimates for Iceland scallop in LCC (T indicates upper 95% CI).

Mortality

Natural mortality rates (Fig. 10) have increased from 0.20 in 1997 to 0.56 in 2008.

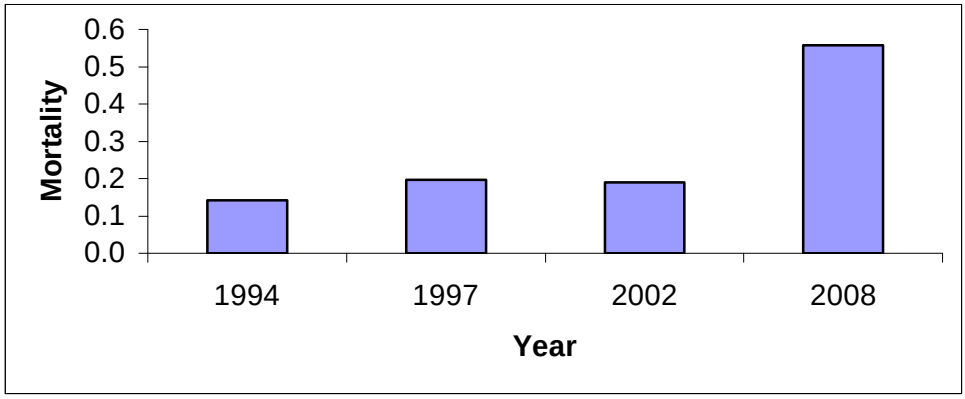

Figure 10: Natural mortality estimates for Iceland scallop in LCC.

Predation

The biomass estimate (Fig. 11) of the predatory starfish (*Leptasterias polaris)* has increased from 10,300 t in 1997 to 35,800 t in 2008.

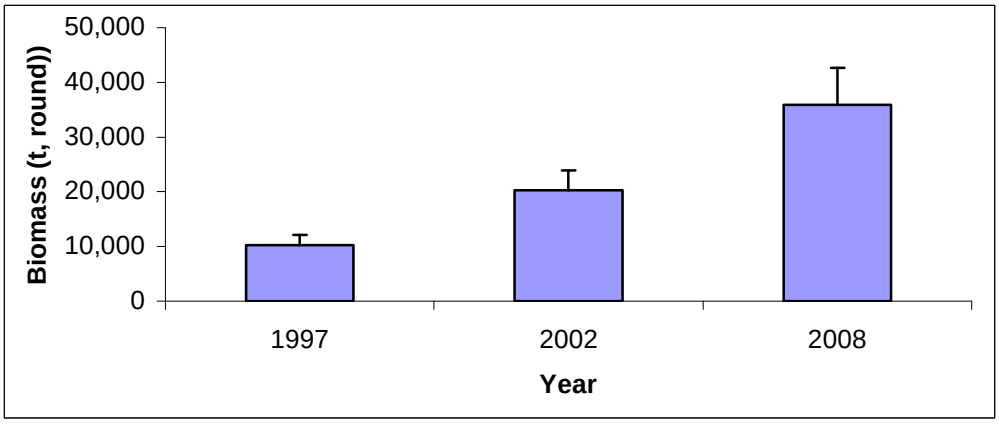

Figure 11: Biomass estimates for Leptasterias polaris in LCC. (T indicates upper 95% CI).

CONCLUSIONS

Removals from the Strait of Belle Isle in 2008 were at a near-record low of 111 t while there was no fishery in LCC. In both the Strait of Belle Isle and LCC there have been no clear trends in recruitment or biomass. Most recent MDB estimates are 5700 t in the Strait of Belle Isle and 7500 t in LCC. Natural mortality has increased in both study areas after a cessation of fishing. This coincided with increases in biomass of *Leptasterias polaris,* a predator of Iceland scallop.

OTHER CONSIDERATIONS

The Refugium in the Strait of Belle Isle

A refugium was established in 2000 in the hopes of promoting survival of newly settled scallop in the absence of fishing. In 2009 Fisheries and Aquaculture Management (FAM), NL Region, asked that this be reviewed.

Four metrics were examined to measure the effect of the refugium on the Iceland scallop resource:

1. Pre-recruits: The survey found no increase in abundance of pre-recruits (scallops with a shell height less than 60 mm.). The addition of a liner in the survey gear (8' New Bedford dredge), to target pre-recruits, did not result in increased catches.
2. Shell Height: Prior to the establishment of the refugium shell height had been larger in this area. This remained unchanged in the 2000 and 2007 surveys. Therefore, the refugium has had no effect on shell height.
3. Density: There has been no difference in density (mean number/tow) of Iceland scallop inside and outside the refugium.
4. Natural mortality: Estimates of natural mortality for 2007 were higher inside the refugium than outside. Along with this, the density of predatory starfish, *Leptasterias polaris,* was greater inside than outside in 2007.

Scallops recruit to the exploitable biomass at ~ 7 years of age. There has been no clear increase in recruitment to the exploitable biomass inside the refugium over the 2000-07 period of closure. More time is required to evaluate the effect of a closure on the recruitment of scallops to the exploitable biomass.

SOURCES OF INFORMATION

Stansbury, D.E., Cahill, F. M. and Hynick, E. M. In preparation. Update of the Iceland Scallop resource in The Strait of Belle Isle and The Lilly Carson Canyons. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/nnn. *In prep.*

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