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EASTPORT MARINE PROTECTED AREAS MONITORING REPORT 2012

by

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ABSTRACT

In 1997, the Eastport Peninsula Lobster Protection Committee (EPLPC) and the Science and Fisheries and Aquaculture Management Branches of DFO collaborated to establish the Eastport Peninsula Lobster Management Area (EPLMA). Fishery conservation practices were implemented within the EPLMA, including the closure of two small areas around Round Island and Duck Islands. The two closed areas were designated as Marine Protected Areas (MPAs) under the *Oceans Act* on October 11, 2005.

Following designation, a management plan was developed to outline goals and objectives, highlight program achievements and determine how the performance of the MPAs would be measured (Fisheries and Oceans 2007). A monitoring report was developed to further guide the scientific monitoring and management of the MPAs, and outline how MPAs would be evaluated. This monitoring report outlines the lobster monitoring program developed for the Eastport MPA, documents changes to that program following a Science Regional Advisory Process (RAP) in 2011, and provides a brief description of related research in the area, as well as an overview of enforcement and compliance activities. This plan will be updated as program results are analyzed and as future program modifications dictate.

RÉSUMÉ

En 1997, le Eastport Peninsula Lobster Protection Committee (EPLPC) et la Direction des sciences ainsi que la Direction de la gestion des pêches et de l'aquaculture du MPO ont travaillé de concert pour établir la zone de gestion du homard de la péninsule d'Eastport. Des pratiques de conservation de la pêche ont été mises en place au sein de cette zone, notamment la fermeture de deux petites zones autour de l'île Round et des îles Duck. Les deux zones fermées avaient été désignées zones de protection marine (ZPM) le 11 Octobre 2005 en vertu de la *Loi sur les océans*.

Après la désignation, un plan de gestion avait été élaboré pour définir les buts et les objectifs, mettre en valeur les réalisations et déterminer comment on mesurerait le rendement des ZPM (Pêches et Océans Canada 2007). Un rapport de suivi a été créé pour guider la surveillance et la gestion scientifiques des ZPM et préciser la manière dont les ZPM seraient évaluées. Le rapport de suivi présente le programme de surveillance du homard élaboré pour la ZPM d'Eastport, contient les changements à ce programme à la suite d'un Processus de consultation régionale en 2011 et fournit une brève description des recherches pertinentes menées dans la zone de même qu'un aperçu des activités d'application de la loi et de conformité à la loi.Ce plan sera mis à jour au fur et à mesure que les résultats seront analysés et en fonction des modifications futures au programme.

1.0 INTRODUCTION

1.1 EASTPORT PENINSULA

The Eastport Peninsula is located in Bonavista Bay, Newfoundland. It consists of a rugged coastline with several coves, beaches and headlands. Marine waters surrounding the Eastport Peninsula support a wide range of groundfish, pelagic fish, shellfish, marine mammals, and marine plants. Seven communities are situated on the Eastport Peninsula: Salvage, Eastport, Happy Adventure, Sandy Cove, Burnside, St. Chad's and Sandringham. The collective population for these communities in 1996 was approximately 1500 (Statistics Canada 1996). The fishing industry has been the backbone of the Eastport Peninsula since the late 1600s (DFO 2004). Fishing activity in Eastport has declined in recent years, but still remains vital to the local communities.

1.2 EASTPORT MARINE PROTECTED AREAS

In the early 1990s, lobster harvesters in the Eastport area recognized a serious decline in lobster landings. The decline was attributed to increased lobster harvesting pressure on the lobster resource as a result of the collapse of local groundfish stocks. The Fisheries Resource Conservation Council (1995) report on lobster in Atlantic Canada recommended that measures be taken to increase egg production, reduce exploitation rates, and improve stock structure, and suggested that local stakeholder groups and management officials collaborate to sustain their resources. As a result of these factors, local harvesters formed the Eastport Peninsula Lobster Protection Committee (EPLPC) in 1995. The main goal of the EPLPC was to implement an overall lobster conservation strategy for the Eastport Peninsula. EPLPC members provided the information and data required for the management of the resource and implemented measures to address conservation and sustainability.

Based on the initial success of various measures implemented to protect the lobster fishery, such as self- policing and V-notching to protect ovigerous (egg-bearing females), the EPLPC and the Fisheries and Aquaculture Management Branch (FAM) of Fisheries and Oceans Canada (DFO) developed a Joint Project Agreement to establish the Eastport Peninsula Lobster Management Area (EPLMA) in 1997 (Figure 1.1). Fishery conservation practices were implemented within the 400 km^2 EPLMA, including two *Fisheries Act* closures in areas of prime lobster habitat around Round Island and Duck Islands (DFO 2007).

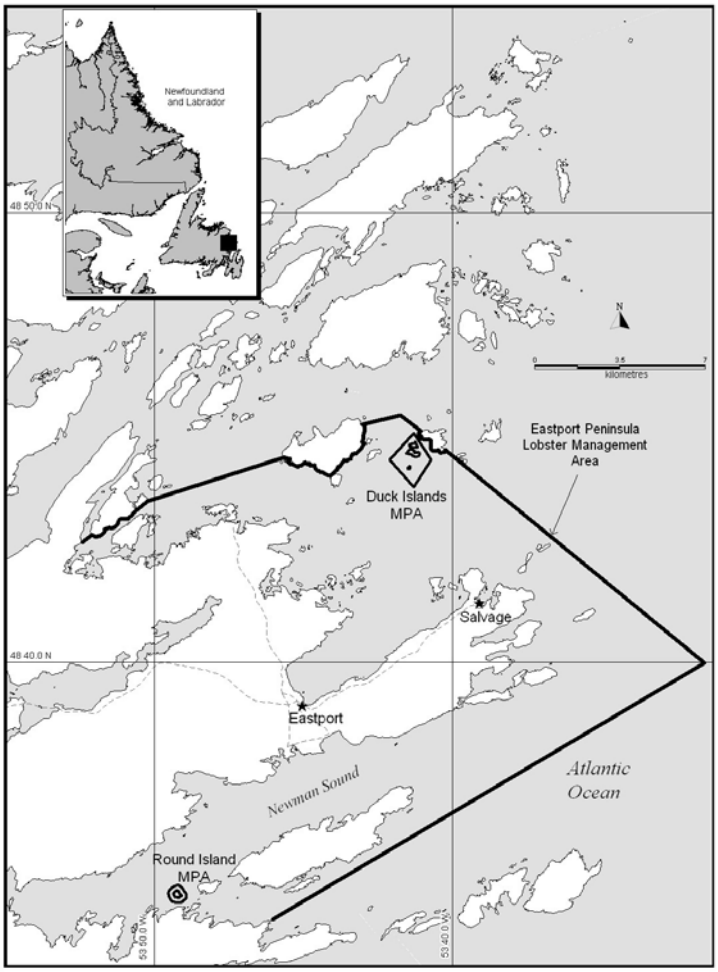

Figure 1.1: The Eastport Peninsula Lobster Management Area, including Duck and Round Islands MPAs, in Bonavista Bay, Newfoundland.

In October of 2000, the Minister of Fisheries and Oceans Canada announced the Eastport closed areas as Areas of Interest (AOIs). To guide the ongoing evaluation process of the proposed MPA site, a steering committee was formed in 2002 and remained active until MPA management was well underway. The steering committee was co-chaired by DFO and the EPLPC and consisted of representatives from several stakeholder groups including municipalities, provincial and federal government departments, harbour authorities, regional tourism associations and an economic development association. Through consultations with the steering committee and other stakeholders the Eastport MPA Regulations were developed. Bi-lateral and public consultations were conducted to ensure that all stakeholders were comfortable with the regulatory intent of the proposed MPAs. Once this lengthy review process was complete, the Eastport MPAs were designated under the *Oceans Act* on October 11, 2005 (DFO 2007). As the next step in the MPA process, the Eastport Marine Protected Areas management plan was released on July 18, 2007. This management plan was intended to guide and inform management decisions for the Eastport MPAs over a five year period. The plan outlined conservation objectives and management

actions with respect to scientific research and monitoring in the MPAs, compliance and enforcement, as well as public awareness. The internal review of the first management plan is nearing completion, and a new draft will be provided for public review in the near future. In 2010 the steering committee was renamed the advisory committee to reflect its new and changing role.

2.0 MPA CONSERVATION OBJECTIVES

The regulatory conservation objectives outlined in the Eastport MPA management plan include:

- To main a viable population of lobster through the conservation, protection and sustainable use of resources and habitats in the Eastport Peninsula Lobster Management Area.
- To ensure the conservation and protection of threatened or endangered species.

3.0 LOBSTER MONITORING

Since the late 1990s, monitoring activities in Eastport have included logbooks, at-sea sampling, a fall sampling/tagging program, and a tag return program. These initiatives have been conducted by researchers from Fisheries and Oceans Canada and Memorial University of Newfoundland along with trained samplers from the Eastport Peninsula.

Data acquired through these initiatives is used to monitor the effectiveness of the MPAs in maintaining a viable lobster population over time, and to determine if amendments to the management plan are needed. MPAs may potentially enhance lobster populations in adjacent areas through increased egg production and recruitment, as well as through export of harvestable biomass (*i.e.*, 'spillover').

3.1 LOGBOOKS

Logbook data has been collected around the Eastport Peninsula since 1997. A voluntary program was administered by DFO's Science Branch from 1997-2003 and by DFO's Oceans Division from 2004-2009. Throughout the commercial lobster fishing season harvesters collected daily information on the numbers of legal size lobsters caught, traps hauled, ovigerous (*i.e.*, egg-bearing) females caught, and undersize males and females caught (Janes 2005). Commercial logbooks became mandatory in 2010. The data presented in Figure 3.1 indicates that the Catch per Unit Effort (CPUE) has varied without trend (remained stable) between 1997 and 2011.

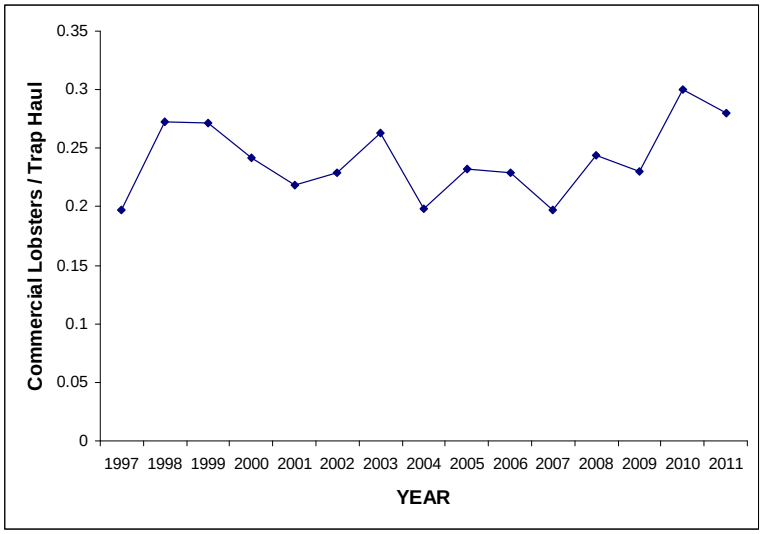

Figure 3.1: Commercial Catch per Unit Effort (CPUE) for the Eastport lobster fishery, 1997- 2011.

3.2 AT-SEA SAMPLING

At-sea sampling data have been collected annually since 1998. This sampling occurs during the commercial fishing season throughout the Eastport Peninsula Lobster Management Area. Harvesters measure all lobsters in their sample traps with vernier calipers. Information on carapace length, sex, and condition (ovigerous and/or V-notched) is recorded for each lobster sampled.

V-notching is the process of cutting a shallow notch in the tail of an egg-bearing female. V-notched lobsters caught during the commercial fishery are released, thereby protecting known spawners for several years. A V-notch persists for at least two molts (DeAngelis *et al.* 2010). Although V-notching is voluntary, the purchase, sale or possession of a V-notched lobster is illegal in Newfoundland and Labrador.

The at-sea sampling data provides an index of population structure. In 2011, as in all other recent years, the highest relative abundance of lobsters are sub-legal, and a high proportion of the females are ovigerous (Fig. 3.2; Fig. 3.3), although the undersize and protected female portions of the population are subject to overrepresentation due to increased probability of recapture. When compared to lobster at-sea sampling data for the rest of the NL Region (DFO 2009), Figure 3.2 and Figure 3.3 suggest an unusually high incidence of large male and female lobsters in the EPLMA, including those which are V-notched.

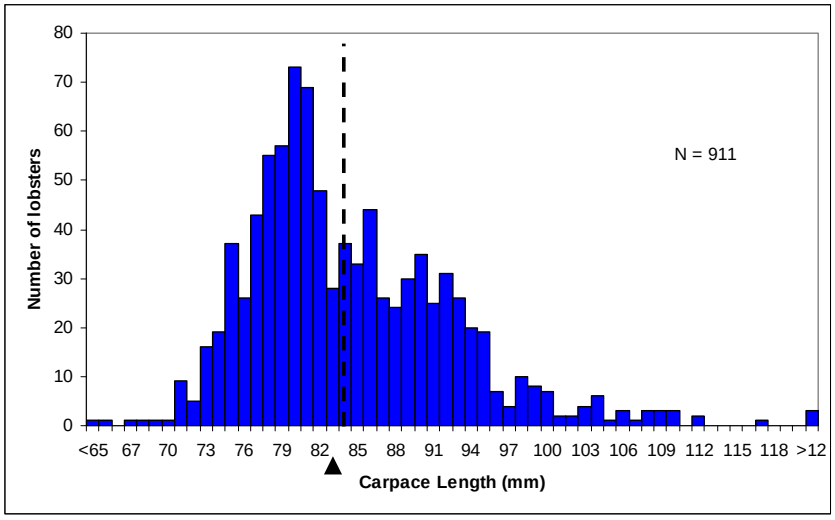

Figure 3.2: Size-frequency distributions of male lobsters in 2011; (▲) represents the minimum legal size and (-------) represents the mean size.

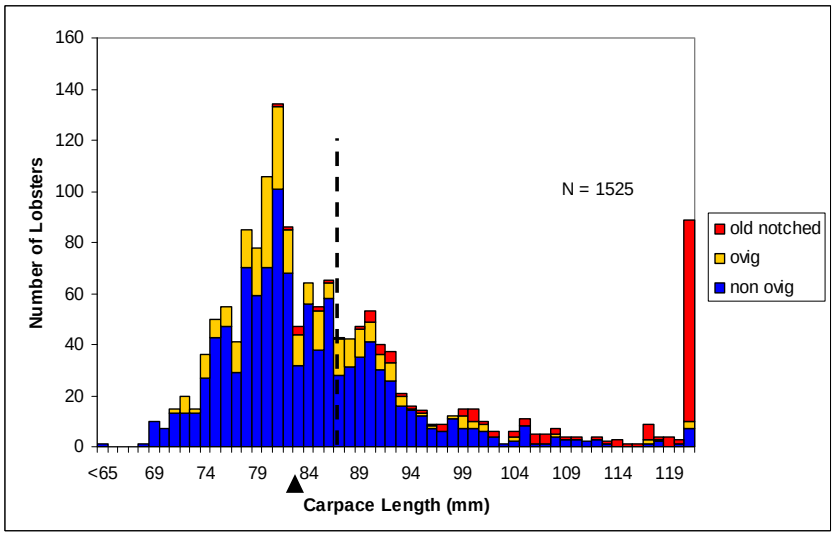

Figure 3.3: Size-frequency distributions of female lobsters in 2011; (▲) represents the minimum legal size and (-------) represents the mean size.

At-sea-sampling data also provides estimates of mean size for males and females. Mean sizes of male and female lobsters have been increasing since 1998 (Fig. 3.4). In recent years, the mean size of female lobsters is larger than that of males. The mean size of females has also experienced a larger increase over time. This is likely due to the added protection afforded females through V-notching.

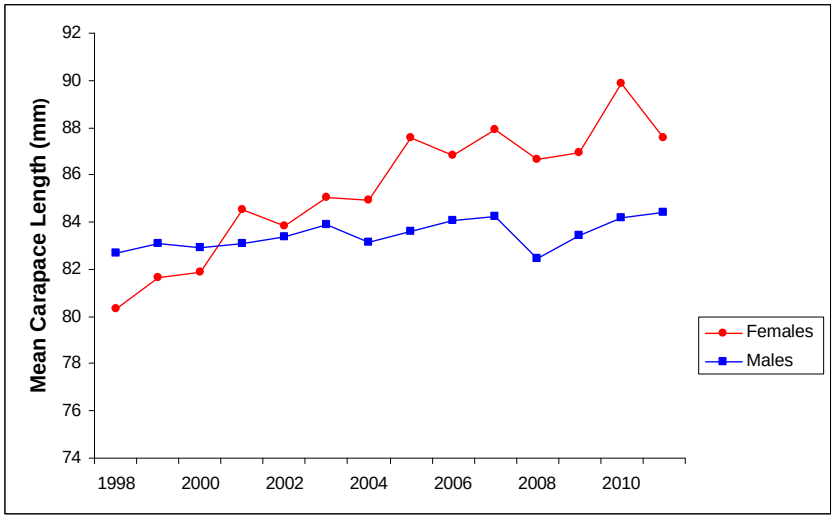

Figure 3.4: Mean carapace lengths for male and female lobsters caught during commercial at-sea sampling in Eastport, 1998-2011.

3.3 FALL SAMPLING (TAGGING) INSIDE AND ADJACENT TO MPAS

Various tagging studies have been conducted in Eastport since 1997 (Rowe 2001a, 2001b, 2002; Collins 2010). Tagging studies also became part of the MPA monitoring program in 2004. This research takes place in the fall (September-October) inside the Round Island and Duck Islands MPAs, as well as in the adjacent commercial fishing areas. Lobsters are caught using traditional wooden traps (25 traps inside and 25 traps outside at each site) and are sampled every day (weather permitting) for approximately 3 weeks. Participants tag the lobsters with streamer tags and collect information on carapace size, sex, condition (ovigerous and/or V-notched), tag numbers, trap numbers, and area where caught or recaptured. The areas are subdivided into smaller areas and assigned unique location numbers to track movement.

Results from tagging research include size-frequency distributions showing changes to the population structure inside the MPAs, mean sizes of male and female lobsters inside and outside the MPAs, and movement of lobsters. After a decade of protection, data suggests that the population inside the MPAs has a greater number of large lobsters (Fig. 3.5 and Fig. 3.6). Lobsters are also present in all size groups, sometimes referred to as a broadening of the population structure. In addition, there is a significant presence of very large lobsters ($\geq$120 mm CL) inside both MPAs (Fig 3.6 and Fig 3.7). The presence of many large male and female lobsters can increase the egg production in the area.

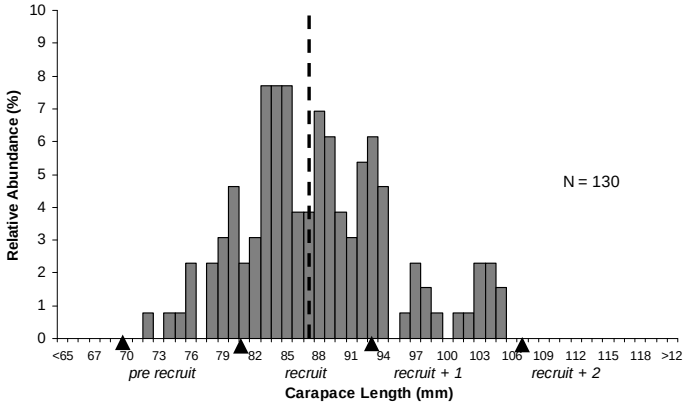

Figure 3.5: Relative abundance (%) of male lobsters inside the Round Island MPA, 1997; (▲) represents the CL size group and (-------) represents the mean CL.

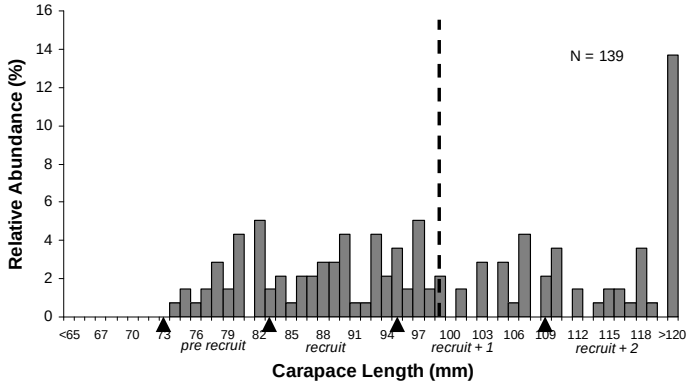

Figure 3.6: Relative abundance (%) of male lobsters inside the Round Island MPA, 2007; (▲) represents the CL size group and (-------) represents the mean CL.

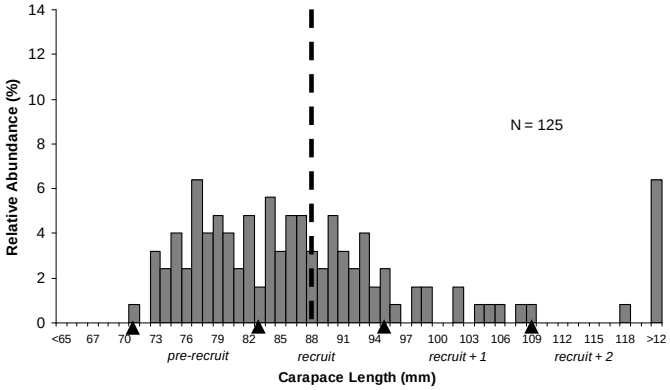

Figure 3.7: Relative abundance (%) of male lobsters inside the Duck Islands MPA in 2007; (▲) represents the CL size group and (-------) represents the mean CL.

Figure 3.8 shows a broad representation of ovigerous females and a relatively high abundance of large ovigerous females inside the MPAs in 2009. The proportions of ovigerous females are generally higher inside both the MPAs than in the outside adjacent areas. Results were similar in 2010 and 2011.

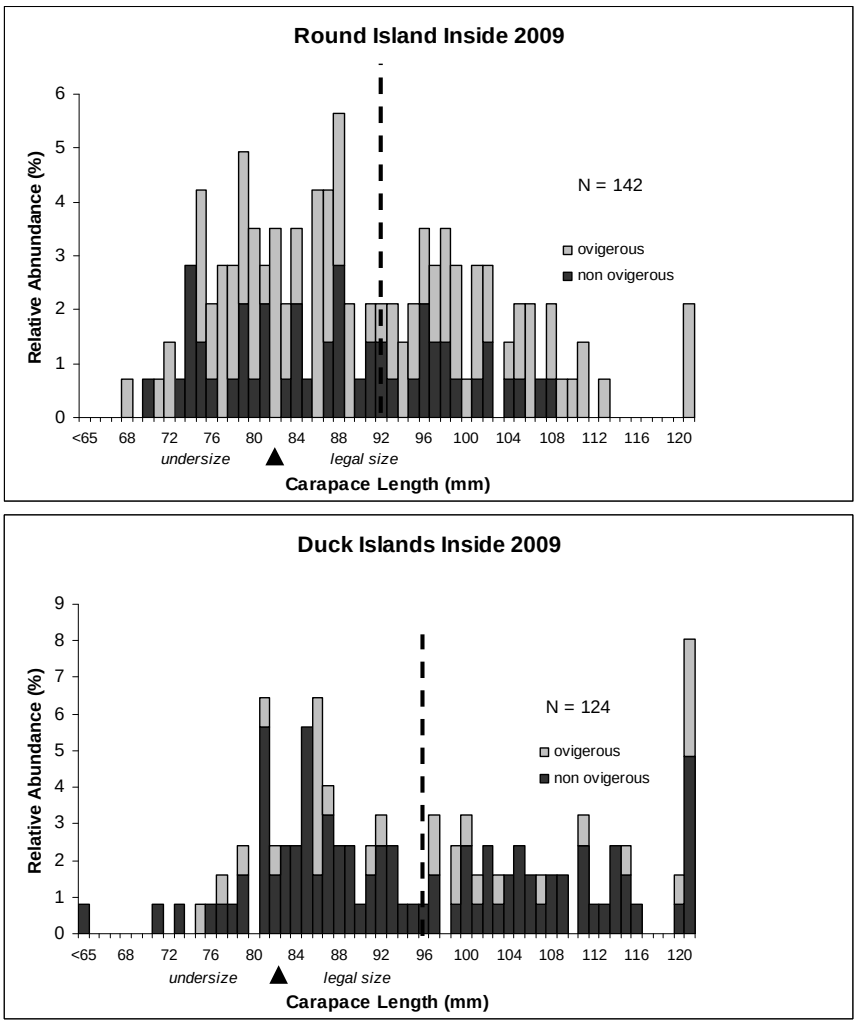

Figure 3.8: Relative abundance (%) of female lobsters inside the Round Island MPA and Duck Islands MPA sites in 2009; (▲) represents the minimum legal size and (-------) represents the mean CL.

Figure 3.9 shows the mean carapace lengths of lobsters inside and outside the MPAs in 1997 and in recent years (2004-2011). Detailed statistical analysis of the 1997 and 2004-2007 data is outlined in Janes (2009). In 1997 there were no significant differences in mean size between each MPA and adjacent reference area. Between 2004 and 2007, there were significant differences in mean sizes inside and outside the MPAs. From 1997 to 2007 there were significant increases in the mean size of lobsters inside the MPAs. In more recent years continued differences can be seen between lobsters inside the MPAs compared to those in the adjacent commercially-fished reference area. One exception is evident at Round Island. The similarities in female mean size inside and outside the MPA could be

due to movement of lobsters, and/or the effect of V-notching. Some modifications to the monitoring program are being implemented to explore this further.

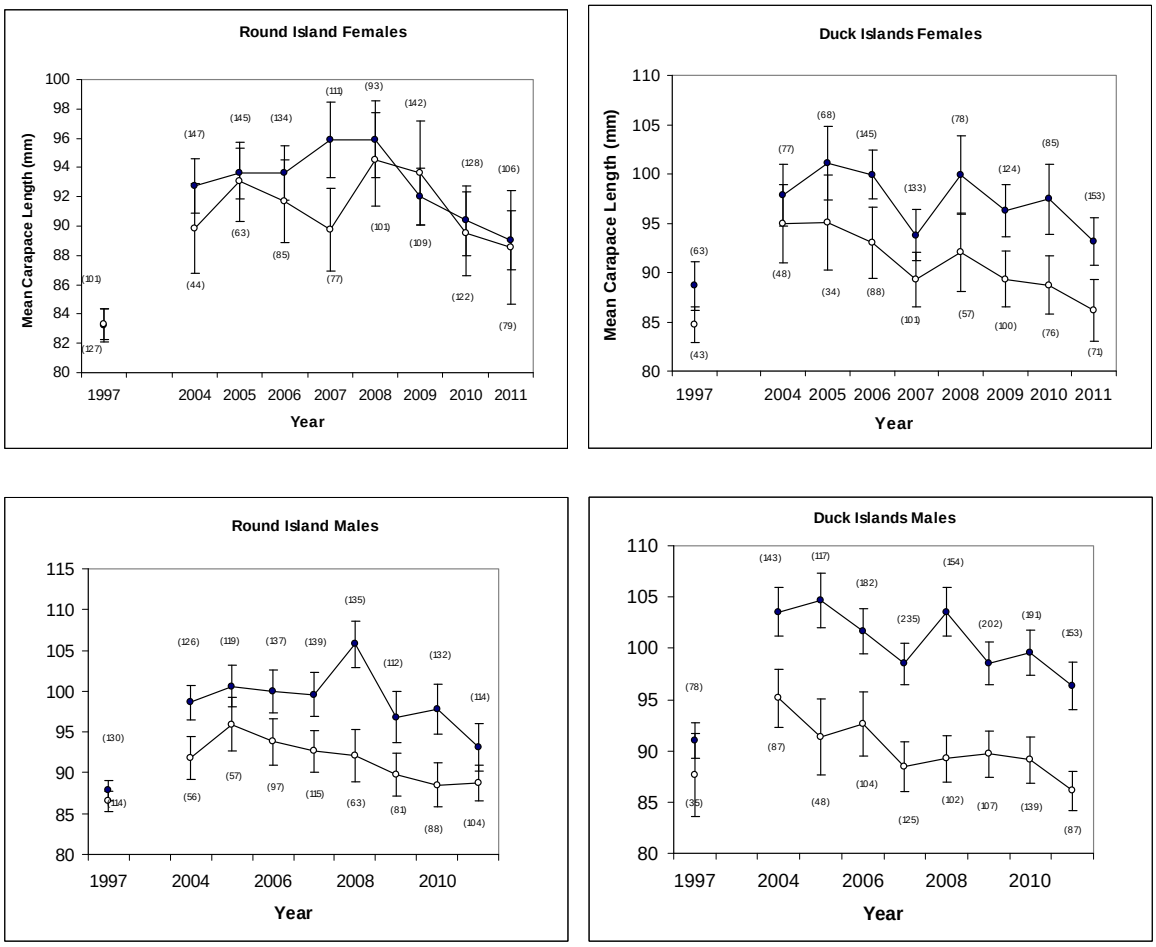

Figure 3.9: Mean carapace lengths of male and female lobsters with 95% confidence intervals for Round Island and Duck Islands MPAs (●) and adjacent open areas (○) in 1997 and 2004-2011.

For MPA and reference populations at both sites the proportion of ovigerous females was calculated as the sum of ovigerous females divided by the sum of all females. Results are presented in Figure 3.10. In each year the proportion of ovigerous females is higher inside the MPAs as compared to the adjacent commercially-fished areas. Statistical analyses have not yet been carried out on these data.

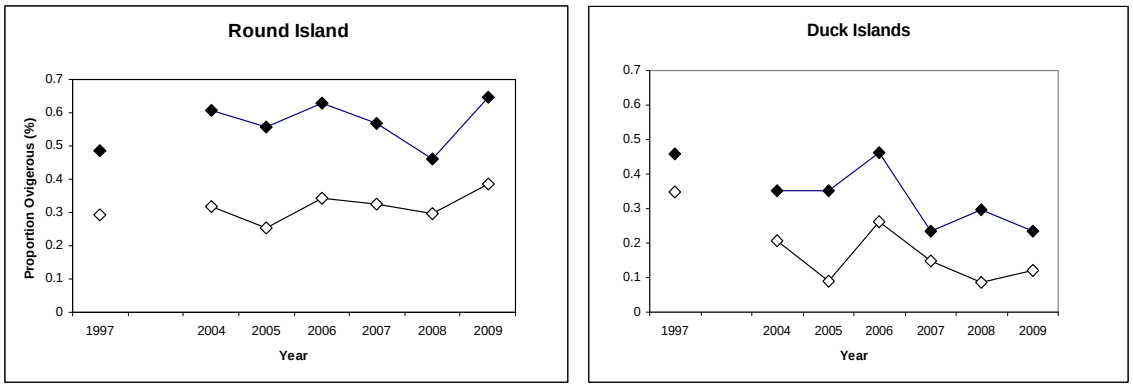

Figure 3.10: Proportion of ovigerous females inside (●) and outside (○) Round and Duck Islands MPAs in 1997 and 2004-2009.

Analysis of tagging data was conducted to examine lobster movement across MPA boundaries. Preliminary results indicate small numbers of lobsters are moving across the MPA boundaries (2.7%) and that movement out of the MPAs is more common than movement to the inside. In addition, the majority of individuals moving across the MPA boundaries are large lobsters (≥ 100mm CL). These results indicate less movement than the rate of 8.7% which was reported by Rowe (2001).

In the future, data from the spring/summer tag return program may be utilized to further explore movement patterns into and out of the MPAs. Currently the tag return program is used to check the validity of the fall sampling (tagging) data. Both these data sets could potentially also be used to look at growth of lobsters inside the MPAs, but this is not a priority of the MPA monitoring program at present.

The current population structure inside the MPAs consists of a higher abundance of large lobsters, including ovigerous females, and a broader range of animals representing larger sizes and a significant presence of very large lobsters (≥120 mm CL) compared to adjacent commercially fished areas outside the MPA. This finding is corroborated by the increase in mean carapace length of both male and female lobsters inside the MPAs since 1997. In recent years the proportions of ovigerous females are higher inside the MPAs compared to outside areas. Ten years following the closure the changes in population structure inside the MPAs show increased size and proportion of ovigerous females, representing an area where increases in egg production and biomass may translate into enhanced recruitment and 'spillover'. Therefore, it appears that the MPAs are helping to enhance a viable population of American lobsters, thus meeting the conservation objectives.

3.4 EASTPORT MPA LOBSTER SCIENCE REGIONAL ADVISORY PROCESS

A Regional Advisory Process (RAP) was held in January of 2011 to obtain science advice on the Eastport MPA lobster monitoring program. This RAP supported the management plan review process and focused on a scientific review of the Eastport MPA monitoring indicators, protocols, and strategies. Results from lobster monitoring (as described in Sections 3.1 - 3.3) were reviewed by scientists from DFO and MUN, as well as fish harvesters from the area. The Science Advisory Report (SAR) will be available soon,

(Fisheries and Oceans In Prep) and includes conclusions and recommendations that were put forward during the meeting.

Current monitoring activities are considered appropriate to evaluate the Eastport MPA against its key regulatory Conservation Objective (CO). Outside the MPAs, logbook data provides an index of fishery performance, and may be useful in estimating population size, while commercial at-sea-sampling data provides information on population structure, including size, sex ratio and the incidence of V-notching. Fall research sampling/tagging provides information on comparative size and population structure. Tagging activities also provide information on the movement of lobsters. Although information collected was sufficient for measurement of current indicators used to monitor the MPA's CO, enhanced protocols and/or further analysis of the available data were recommended.

Recommendations for enhancing future monitoring protocols included:

- Adding traps targeting small and large lobsters during fall sampling.
- Establishing enhanced reference sites based on habitat characteristics for fall sampling.
- Improving recording of capture location for fall sampling and commercial at-sea sampling sites.
- Comparing Eastport at-sea sampling data to data from other at-sea sites.
- Improving tracking of lobster movement.

Recommendations for enhancing the analysis of existing data included:

- Estimating total egg production/reproductive potential/fecundity inside the MPA versus the outside as an indicator of recruitment (fall tagging).
- Estimating lobster abundance and density.
- Plotting data using counts instead of percentages.
- Clarifying appropriate area for monitoring: MPAs/adjacent area/EPLMA (see Regulatory Conservation Objective related to maintaining a viable lobster population).

Further research is required to:

- Improve monitoring of large females, and enhance understanding of the effects of V-notching on the Eastport lobster population (*e.g.*, male/female sex ratio, reproductive success).
- Determine carrying capacity and density–dependent effects in the MPAs.
- Establish reference levels for the Eastport lobster population to provide a benchmark against which to better determine population status in future assessments.
- Understand prevailing oceanographic conditions to develop effective protocols for the study of larval drift.

Following the advisory process, additional advice and guidance was solicited from Memorial University of Newfoundland (MUN). Further recommendations on the monitoring program and additions to protocols (including statistical analyses) were provided (Wilke and Stanley 2011).

From both these assessments, several changes were made to the lobster science monitoring program in 2012, including: addition of descriptive statistics; addition of four reference sites for the fall sampling program; statistical analysis of CPUE data; addition of experimental traps targeting the very small and very large lobsters during the fall sampling; and GPS mapping of at-sea sampling and fall sampling areas to ensure consistency of future research projects in the area. Following the advisory process, the regulatory conservation objective for the Eastport MPA was changed to highlight the EPLMA as the area where monitoring takes place in the MPA (see Section 2.0).

4.0 OTHER PROJECTS

4.1 LOBSTER LARVAL STUDIES

During the summer of 2007 researchers from MUN collected data on larval distribution and settlement of juvenile lobster. Lobster larvae are pelagic and spend 4 – 6 weeks as semi-passive drifters in the upper portion of the water column. During this time they may be transported hundreds of kilometers, but may also be retained locally, depending on oceanographic circulation patterns and larval behavior. It is important to examine larval presence, as well as larval drift patterns, to determine likely destinations of larvae being produced within the MPAs.

Neuston tows were also conducted at this time to collect larval lobster inside and outside the Round Island MPA. These tows were conducted at 5 sites: Round Island (2 sites), White Islet, Little Harbour, and North Broad Cove. Each site was sampled on 6 different occasions in July and August of 2007. Larval lobsters were present in 19 of 29 tows. The greatest numbers of larvae were found at Round Island on 4 of 5 sampling occasions, and the largest number captured in one tow was 88 (at one of the Round Island sites). This data can be used to measure larval drift (Jones *et al*. 2008a).

4.2 DRIFTER STUDY

Researchers at MUN conducted studies on larval drift using grapefruit. On August 14, 2007, ten grapefruit were released in a line perpendicular to the eastern shore of Round Island to examine larval drift patterns. Two groups of grapefruit (3 per group) were then released perpendicularly from the original transect, extending out for approximately 30 m. The start position of each grapefruit was recorded using a hand-held GPS unit and the position of each grapefruit was recorded two additional times, until they could no longer be located. These steps were repeated on the west side of Round Island. An additional 68 grapefruit were released on August 16, 2007, and marked with appropriate contact information. In addition, signs were placed throughout the community asking individuals to report recovered grapefruit (Jones *et al*. 2008a).

Although researchers had difficulty tracking grapefruits after one hour following release, several community members reported additional drifters in the following weeks. Grapefruits were sighted north and northeast within approximately 10 km of the Round Island MPA in Newman Sound.

4.3 NEWLY–SETTLED LOBSTER

In order to measure the distribution and abundance of newly-settled lobster, MUN researchers deployed settlement trays and conducted suction sampling in and around the Round Island MPA. In July 2007, surveys of the substrate were conducted using an underwater camera in order to determine appropriate sites for settlement trays and suction sampling. Fifty settlement trays were distributed among four sample sites, inside and outside the closed areas, in mid July. Trays were retrieved and processed in late-October. During the same time suction sampling was conducted at these sites. Rock crabs and toad crabs were the most prominent species found in both sampling procedures, and there were no juvenile lobster obtained from settlement trays or suction sampling (Jones *et al*. 2008b).

4.4 LOBSTER SAMPLING INSIDE MPAs (SUMMER)

To examine potential differences in the population between summer and fall, MUN researchers sampled lobsters inside the Eastport MPAs in July of 2007. Twenty-five commercial lobster traps were placed in the Duck Islands MPA and twenty-one traps were placed in the Round Island MPA between June 21, 2007 and July 4, 2007. Trap locations were chosen by experienced lobster fishers with the objective of catching the greatest numbers of lobster possible. Traps were hauled every 1 to 4 days, depending on weather and boat availability. Individual lobsters were measured and sexed, and the presence of eggs and/or V-notch was noted. At-sea sampling methods were provided by DFO-Oceans Division (see section 3.1.2 for methods) (Jones *et al.* 2008a).

Population structure results were similar to those reported during the fall sampling (tagging) program. Mean sizes of lobster measured in the summer were greater than those estimated during the fall sampling. For a detailed description of results, see Jones *et al*. 2008a.

5.0 WOLFFISH MONITORING

Fish harvesters have reported the presence of small numbers of wolffish around the Eastport Peninsula. In 2007 and 2008 information packages on the threatened wolffish were distributed to local fish harvesters and researchers. The packages provided identification keys and people were asked to report location of wolffish if any were sighted. Similar campaigns were undertaken in subsequent, years. In addition, harvesters on the MPA Advisory Committee and those participating in the sampling programs were asked

about sightings of these species. Despite a large effort no sightings have been reported to date.

6.0 ENFORCEMENT AND MONITORING

To help ensure effective monitoring of the Eastport MPAs additional surveillance of the area is important, especially during vulnerable times of year. Service Level Agreements (SLAs) have been signed between the Conservation and Protection and Oceans Divisions of Fisheries and Oceans Canada each year since 2007. This agreement states that the number of patrols in the Eastport area will be increased during the spring and summer into early fall. These months were identified by the Eastport MPA advisory committee as times when the area is most vulnerable to poaching activity. This agreement is renewed on an annual basis subject to available resources.

Under the SLA approximately 78 patrols (59 vessel and 19 aircraft surveillance) of the MPAs were completed between 2007 and 2011. During these patrols several inspections were conducted; only a few minor violations found, with one written warning issued under MPA regulations. No charges have been laid under the MPA regulations to date.

7.0 FUTURE PLANS

The Eastport Marine Protected Areas management plan was subject to review in 2010. All aspects of the plan were reviewed by advisory committee members and other interested parties. Public consultations will be held in the coming months in order to finalize the plan.

Following the management plan review, the Regional Advisory Process, and advice from academia, the science monitoring program was changed to more effectively and efficiently assess the conservation objective. In future versions of this monitoring report, detailed descriptions of new indicators, protocols, strategies and results will be presented. As the MPA program subscribes to adaptive management, future versions of this monitoring report can be developed as necessary.

8.0 REFERENCES

Collins, R.K. 2010. Long-term effects of marine reserve protection on the population structure, density, and reproductive potential of the American lobster (*Homarus americanus*) in Bonavista Bay, Newfoundland. M.Sc. Thesis. Memorial University, St. John's, NL. 210 p.

DeAngelis, B.M., Cooper, R., Clancy, M., Cooper, C, Angeli, T., Olszewski, S., Colburn,W., and Catena, J. 2010. Impacts of V-notching the American lobster. J. Shellfish Res. 29(2): 489-496.

Fisheries and Oceans Canada (DFO). 2009. Assessment of American lobster in Newfoundland. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/026.

Fisheries and Oceans Canada (DFO). 2007. Eastport Marine Protected Areas Management Plan. Government of Canada, July 2007.

Fisheries and Oceans Canada (DFO). 2004. Socio-Economic Overview of Eastport Area of Interest (AOI), Newfoundland. Executive Summary; Oceans Management Section, Oceans Program Division, May 2004.

Fisheries and Oceans Canada (DFO). In Prep. Science Advisory Report. Review of Eastport Marine Protected Area Monitoring Indicators, Protocols and Strategies.

Janes, J. 2009. Assessing Marine Protected Areas as a conservation tool: a decade later, are we continuing to enhance lobster populations at Eastport, Newfoundland? Canadian Technical Report of Fisheries and Aquatic Science 2823.

Janes, J. 2005. Lobster Data Analysis: Eastport and Leading Tickles MPA. Contract submitted to Fisheries and Oceans Canada on January 13, 2005.

Jones, K.M., Burdett-Coutts, V., Schneider, D.C., and P.V.R Snelgrove. 2008a. Lobster population in open and closed areas: An examination of larval and adult life stages. Final report to Oceans and Habitat Management Branch, Fisheries and Oceans Canada, February 2008.

Jones, K.M., P.V.R Snelgrove and D.C. Schneider. 2008b. Newly-settled juvenile lobster in open and closed areas: Exploring recruitment to the benthos. Final report to Oceans and Habitat Management Branch, Fisheries and Oceans Canada, February 2008.

Rowe, S. 2001. Movement and harvesting mortality of American lobsters (*Homarus americanus*) tagged inside and outside no-take reserves in Bonavista Bay, Newfoundland. Can. J. Fish. Aquat. Sci. 58: 1336-1346.

Rowe, S. 2002. Population parameters of American lobster inside and outside no-take reserves in Bonavista Bay, Newfoundland. Fish. Res. 56: 167-175.

Statistics Canada. 1996. Census of Canada.

Wilke, K.M., and Stanley, R. 2011. Advice on the utility of indicators for monitoring the effectiveness of the Eastport Marine Protected Area (MPA) in maintaining a viable lobster population. Final Report to Ecosystem Management Branch, Fisheries and Oceans Canada, December 2011.