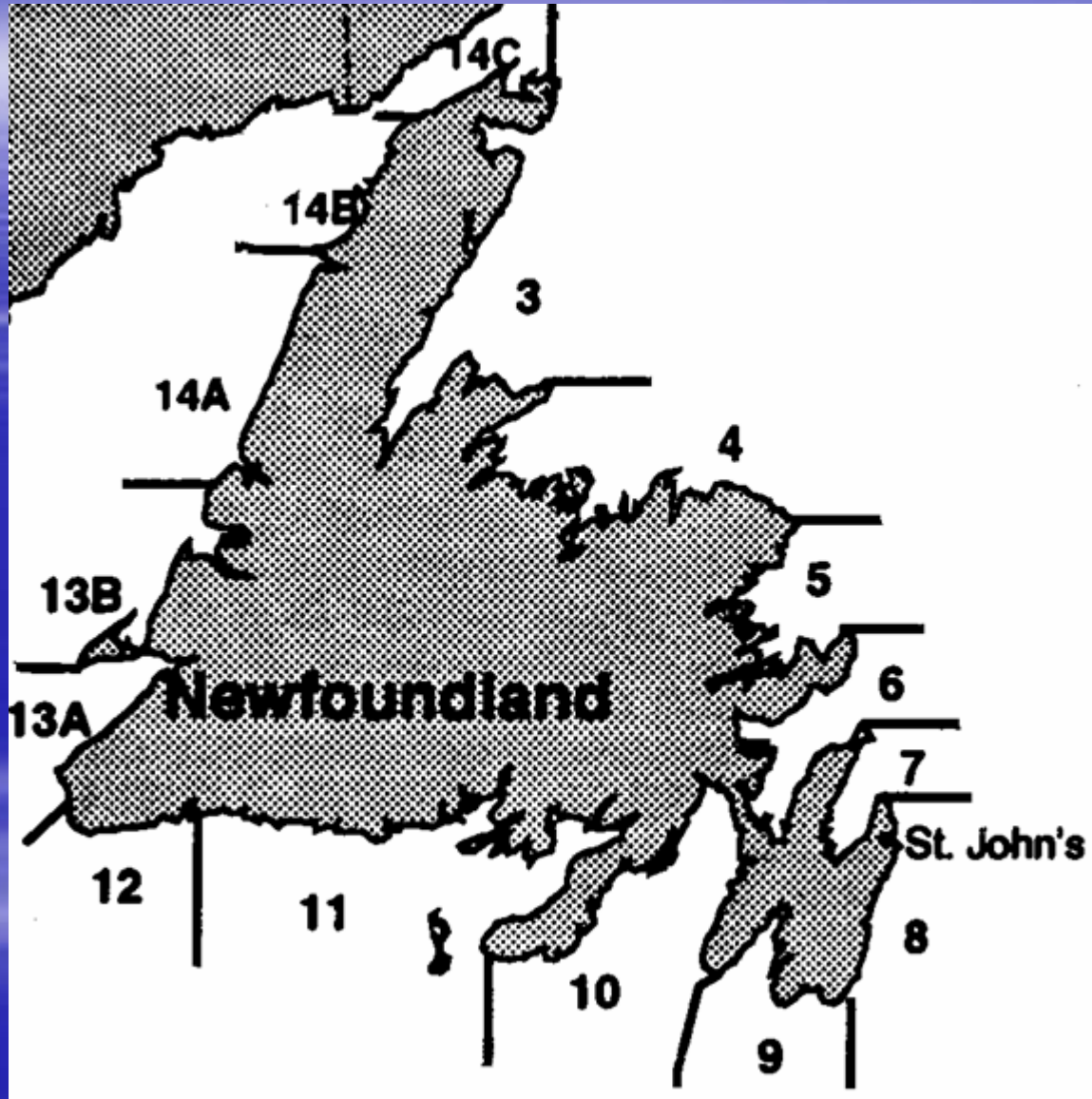
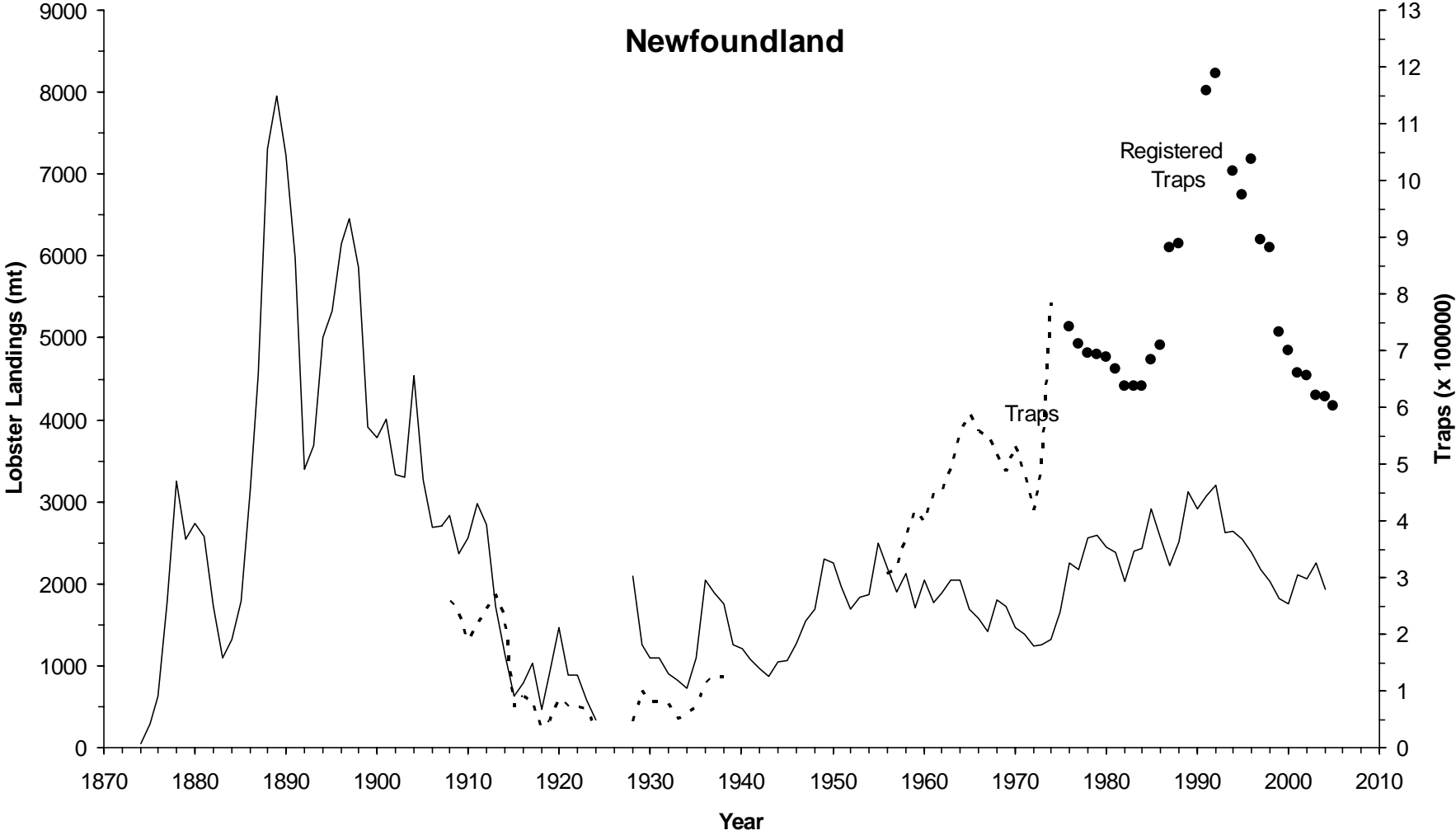


# American Lobster in Newfoundland

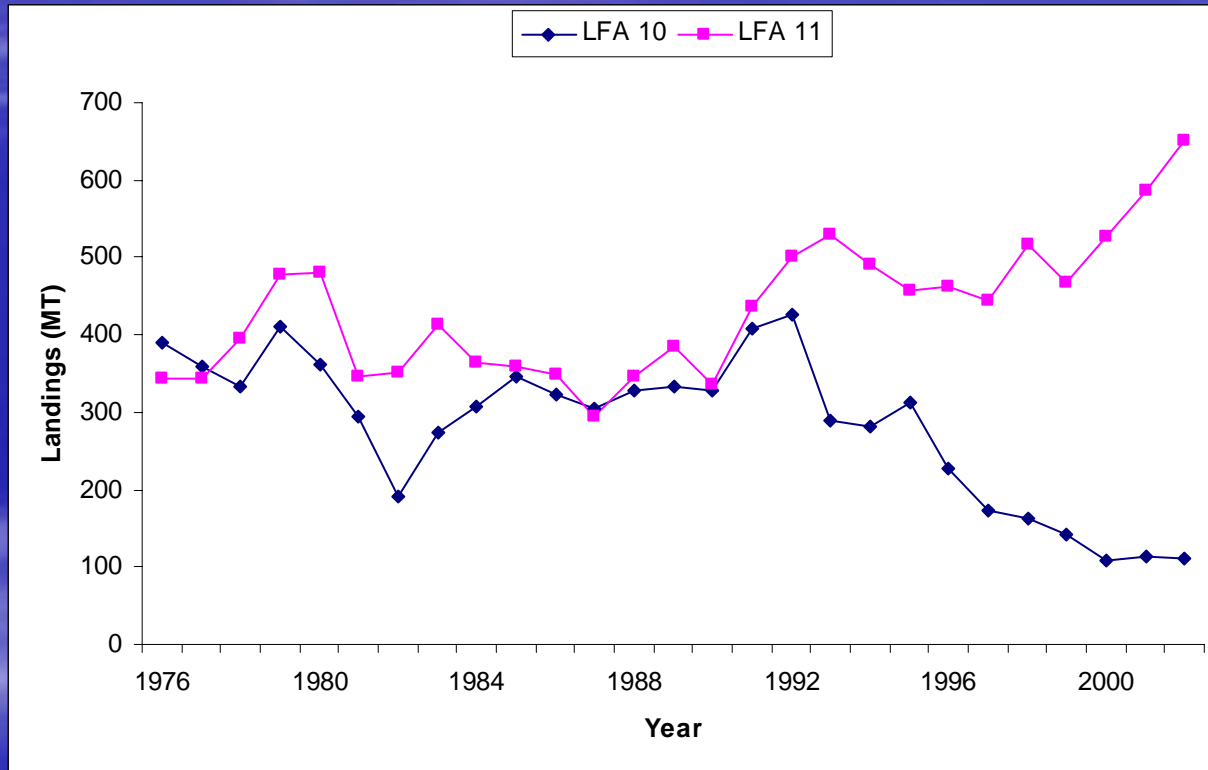
Science Overview and  
Perspectives



# Newfoundland



# Anomalies? LFA 10 vs. 11



# Biology of Newfoundland Lobsters

- Lobsters distributed nearshore, at depths of up to 40 or 50 m
- Major life history events occur in July-Sept, following Spring fishing season
- At 81 mm, the old MLS, roughly half of females become functionally mature and extrude eggs during the summer. Given the fact that exploitation rates are so high in NL, this meant that many females had to survive an intense fishery prior to becoming ovigerous.
- Estimates suggest that egg production by undersize females accounts for 60 - 80% of total egg production for NL
- Larvae remain planktonic for 6-10 weeks prior to molting to stage IV
- It takes 8-10 years for a NL lobster to reach minimum legal size, now set at 82.5 mm CL

# FRCC review

- Measures to increase egg production, reduce exploitation/effort, improve stock structure and minimize waste
- Major tools from various toolkits...
  - Increase minimum carapace size
  - Reduce exploitation rate
  - V-notch berried females
  - Introduce maximum size limit
  - Close fishing areas

# Response to FRCC report

- Increase in minimum legal size in May 1998, to 82.5 mm CL (which was to result in a 56% increase in E/R)
- 25 % reduction in licenses between 1998 and 2001; reduction in trap limits in certain areas
- 1998 Integrated Management Plan (IMP) called for a 25% v-notching rate, which was to account for a 35% increase in E/R
- Maximum size limit introduced on west coast in 1998 IMP
- “Past management measures” to account for 10% increase in E/R
- All above increases in egg production contingent upon constant exploitation rate of 85%

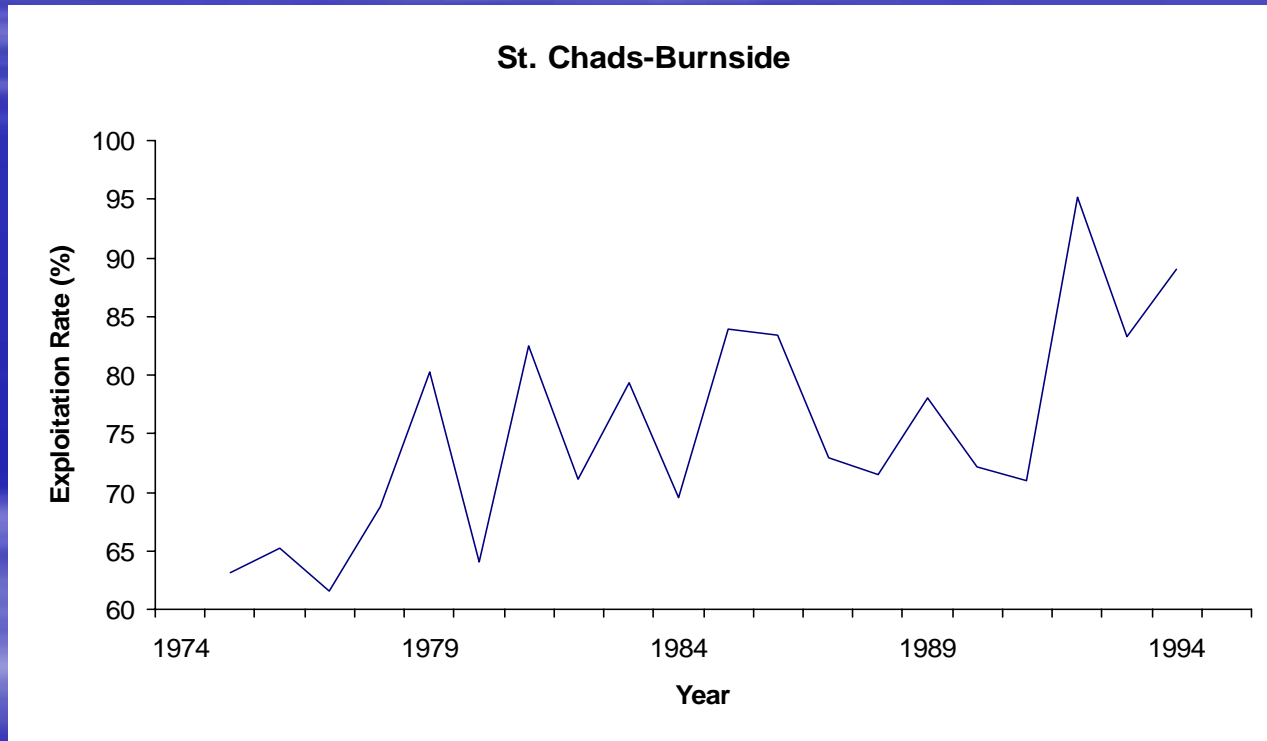
# Science

- Exploitation rates estimated for specific localities assumed to be representative of NL fishery
- Two methods of estimating exploitation currently employed, using either logbooks (Leslie method) or at-sea sampling data (methodology from Caddy, 1977)

# Pre-1995 Exploitation Rates

- Exploitation rates for Comfort Cove and Arnold's Cove
- Comfort Cove (LFA 4) – exploitation rates varied from 77.9% to 93.5% between 1972 and 1980
- Arnold's Cove (LFA 10) – exploitation rates varied from 69.9% to 96.1% between 1971 and 1984

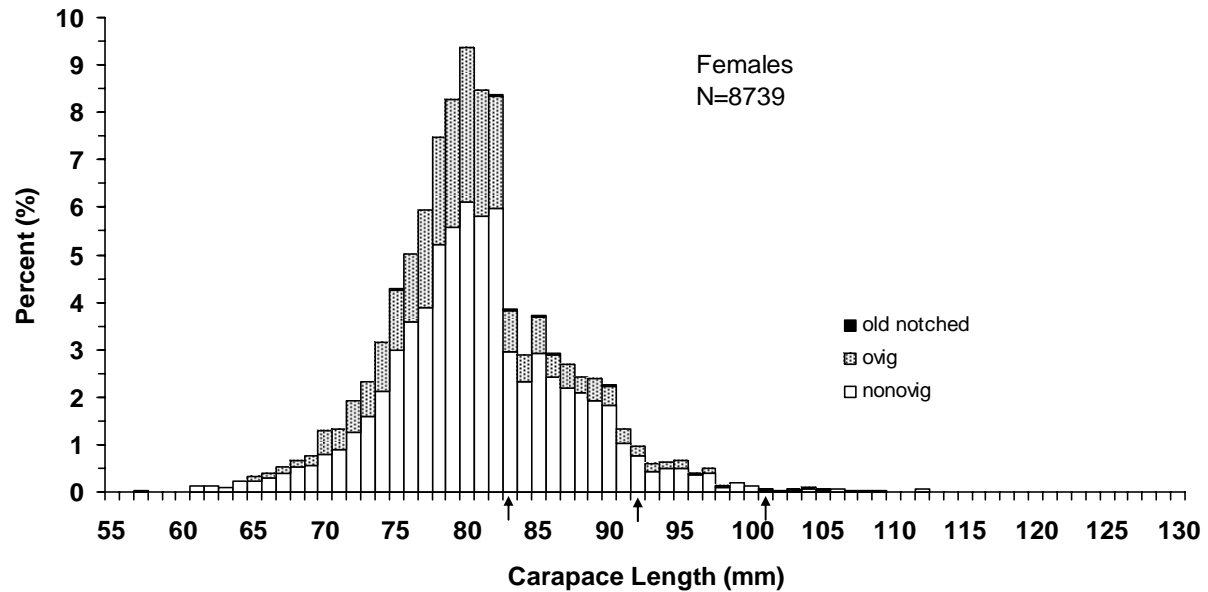
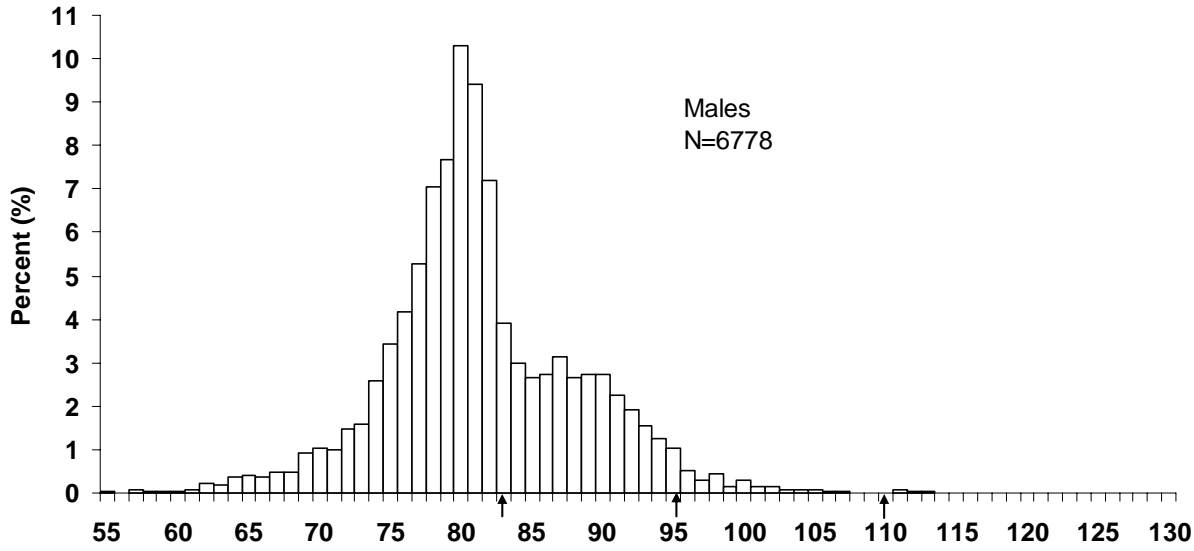
# Tag Recapture Exploitation Rate Estimates from LFA 5 (1975-1994)



# Fortune Bay (LFA 11)

- Exploitation rates - calculated from at-sea sampling data, using intermolt periods derived by Ennis:
- 1999: Males - 99.2%; Females - 93.3%
- 2000: Males - 98.9%; Females - 94.4%
- 2001: Males - 98.3%; Females - 90.9%

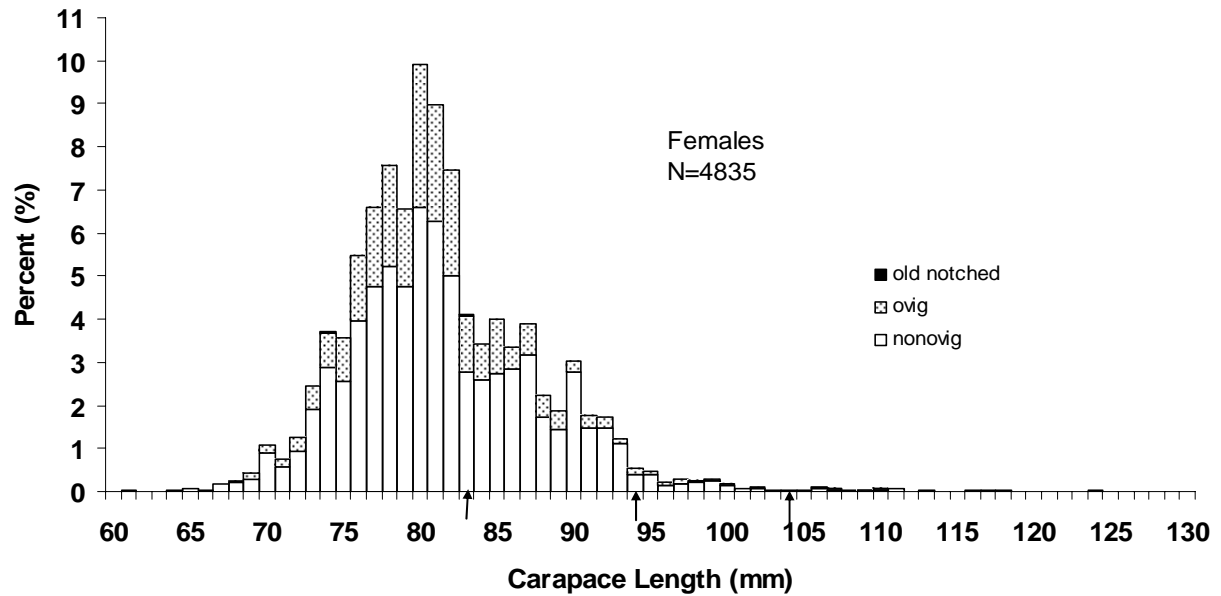
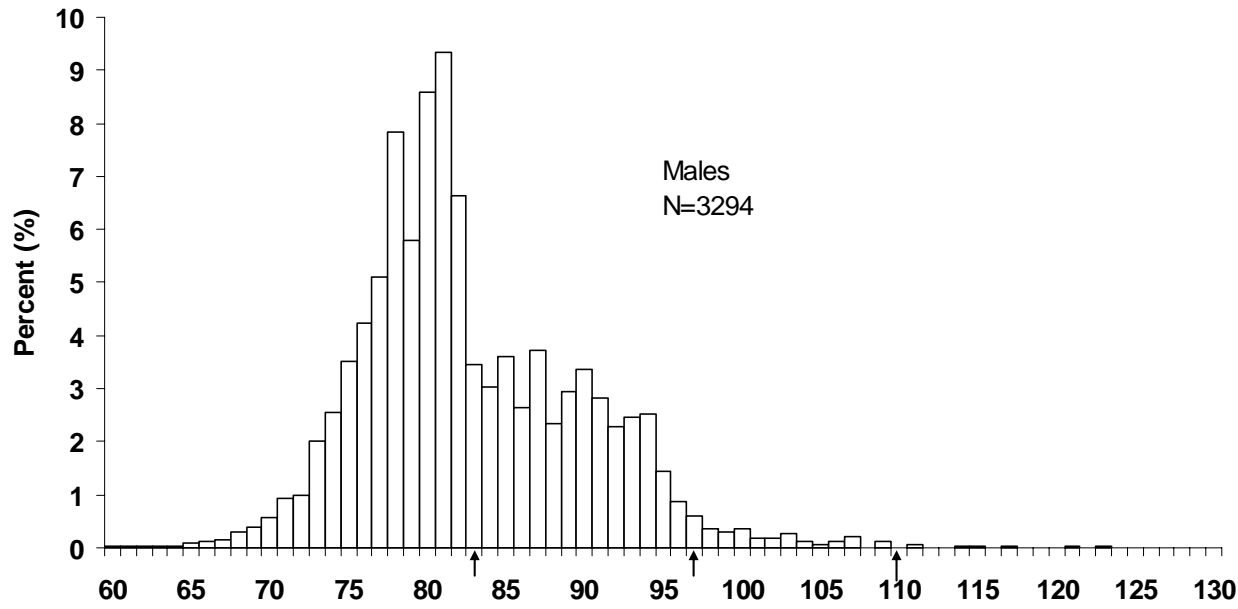
# Fortune Bay At-Sea Sampling - 2001



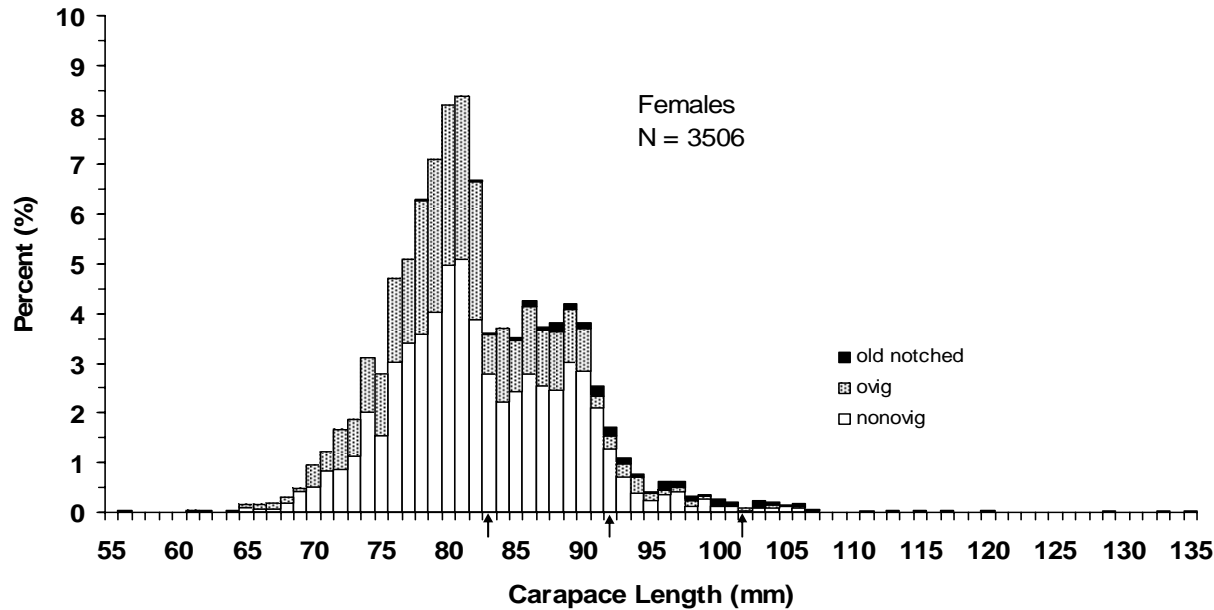
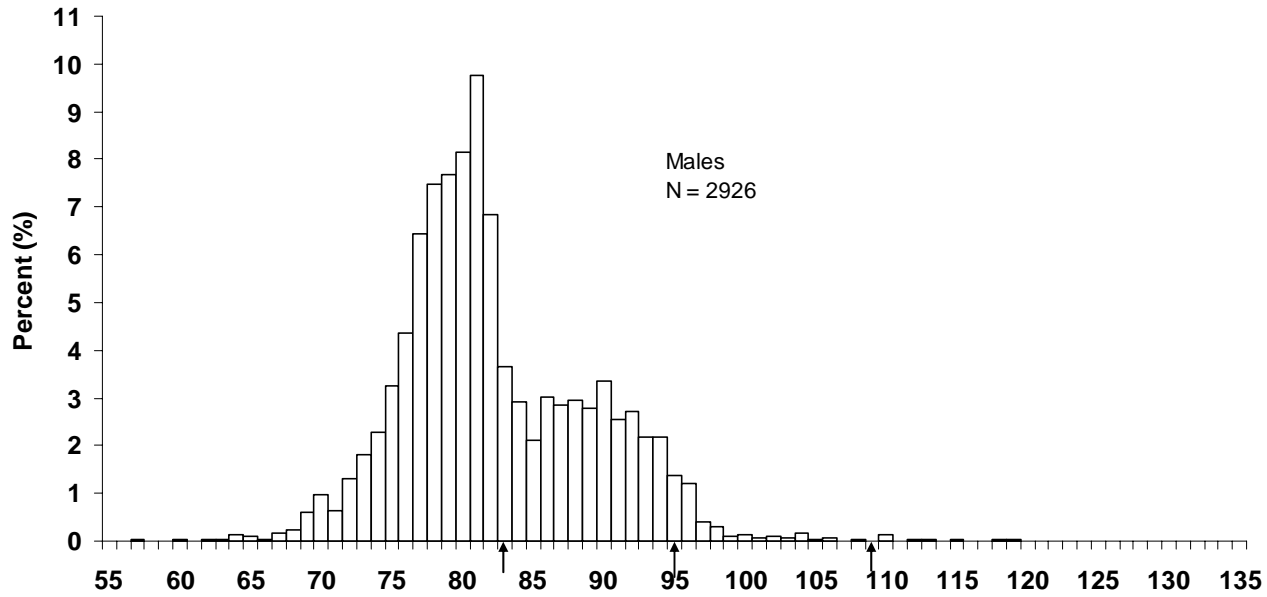
# West Coast (LFA 13A & 14B)

- Exploitation Rates - calculated from at-sea sampling data, using intermolt periods derived by Ennis:
- St. George's Bay (13A) 2001: Males - 94.3%; Females - 92.3%
- St. John Bay (14B) 2000: Males - 99.2%; Females - 95.2%
- St. John Bay (14B) 2001: Males - 98.6%; Females - 87.6%

# St. George's Bay At-Sea Sampling - 2001



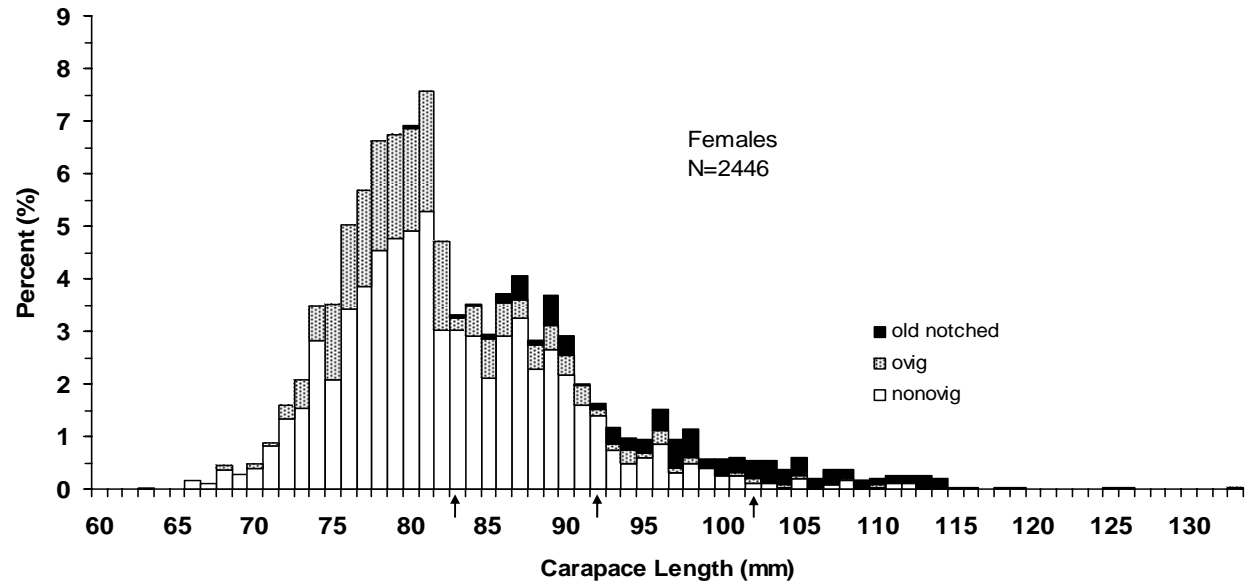
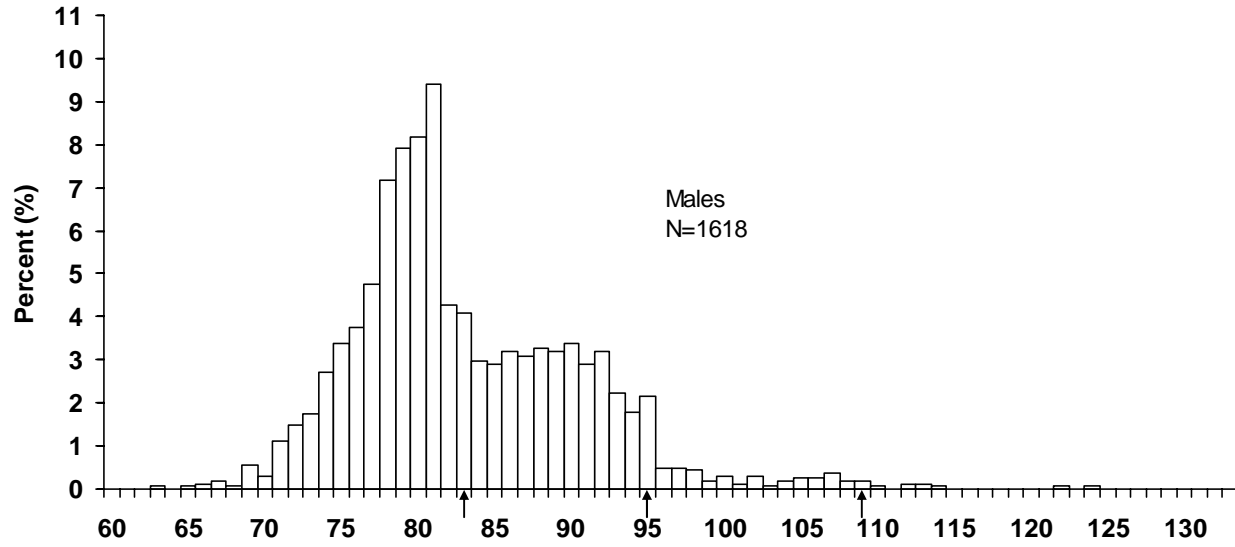
# St. John Bay At-Sea Sampling - 2001



# Eastport (LFA 5)

- Exploitation rates calculated from at-sea sampling data, using intermolt periods derived by Ennis:
- 1998: Males - 96.8%; Females - 94.9%
- 1999: Males - 97.4%; Females - 91.6%
- 2000: Males - 96.2%; Females - 89.2%
- 2001: Males - 97.2%; Females - 88.3%
- From logbook data, exploitation rates from 1997-2001 (excluding 1998) averaged 91.2%

# Eastport At-Sea Sampling 2001



# Eastport Conservation Initiatives

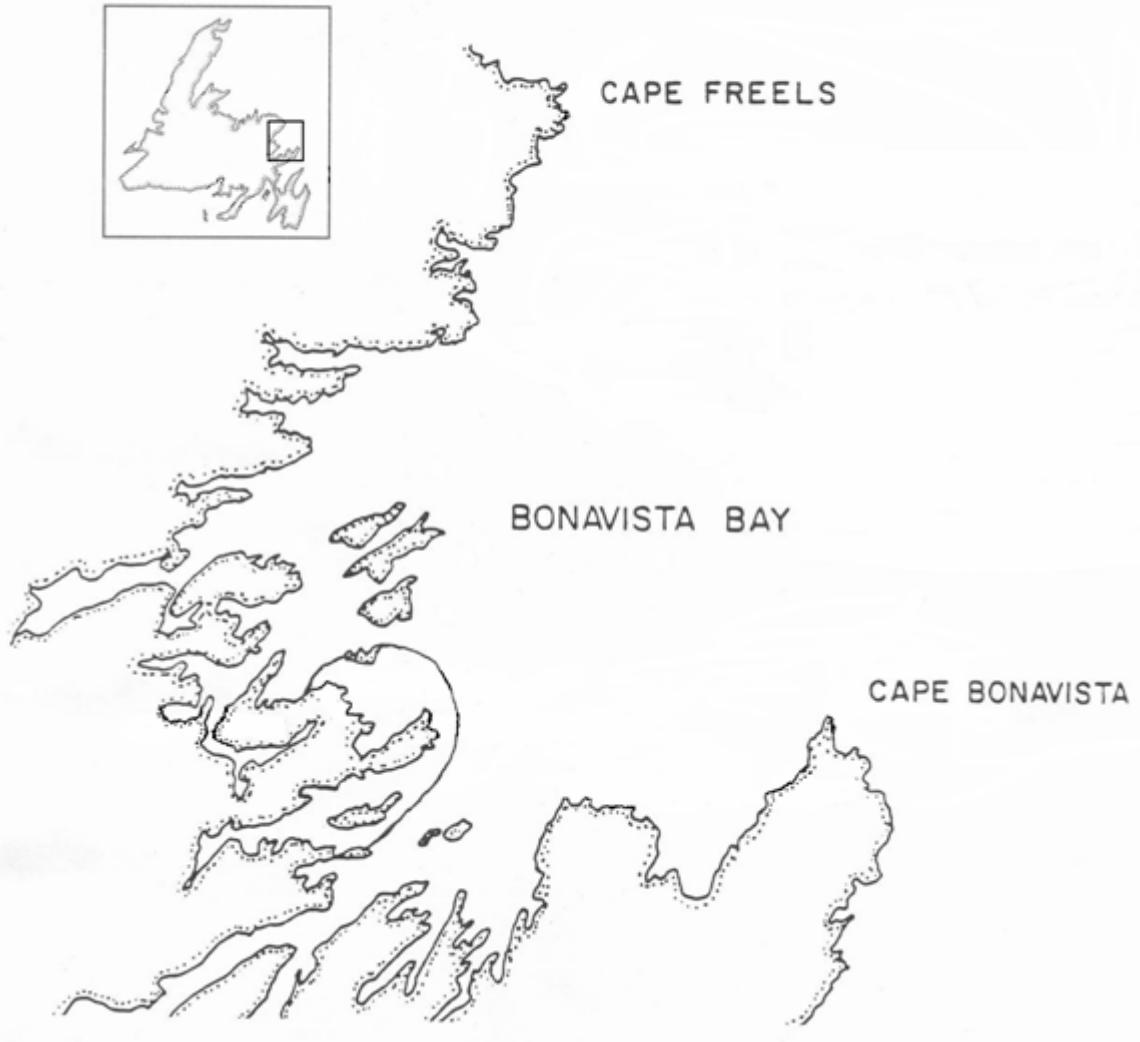
- Eastport Peninsula Lobster Protection Committee established in 1995 in response to FRCC report.
- Involved roughly 50 harvesters from 7 small communities in the area
- In 1996, roughly 1500 ovigerous lobster were v-notched and released
- In 1997, Eastport Peninsula Lobster Management Area was formed, and two small closed areas were established – Duck Islands and Round Island ( ~1.8% of available lobster habitat)



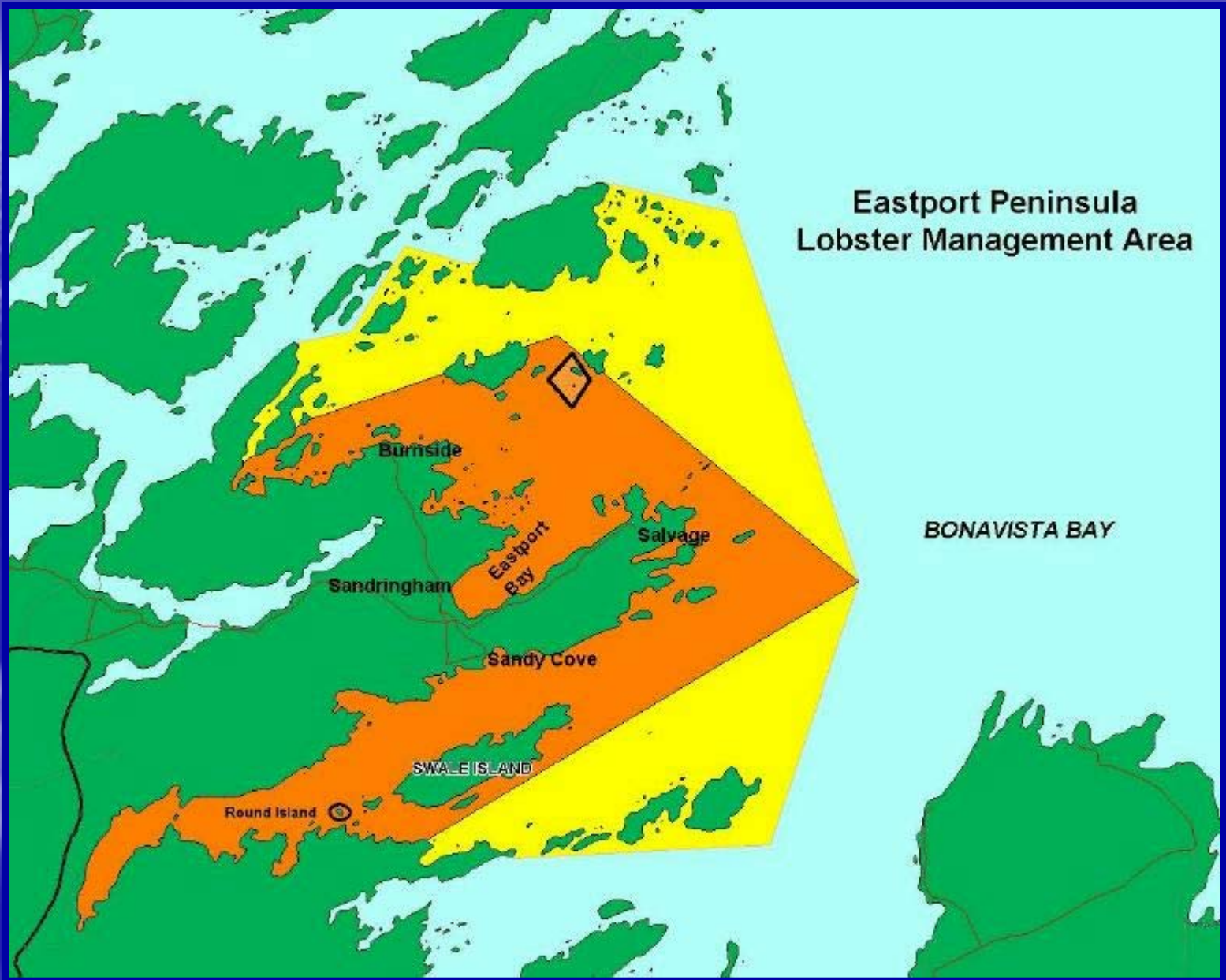
CAPE FREELS

BONAVISTA BAY

CAPE BONAVISTA



**Eastport Peninsula  
Lobster Management Area**



**BONAVISTA BAY**

# Closed Areas/ Fishery Refugia

- Closed areas/fishery refugia can impact target species in multifarious ways
- Primary benefit in the context of fisheries management is the ability to serve as a source of recruitment, exporting larvae across reserve boundaries
- Reserves can enhance local catches via the “spillover” effect, as animals eligible for harvest emigrate from reserve grounds
- Genetic diversity and population structure can be maintained within reserves, counteracting possible deleterious effects of the fishery, such as directional selection for specific sizes or a particular sex

# Eastport Closed Areas - Results

Rowe (2000) - M.Sc. thesis

- Round Island closed area - population density high and stable over time, and female and male size increased, as did the proportion of ovigerous females
- Duck Islands closed area - population density increased dramatically between 1997 and 1998, and male size increased over time, but there was no detectable change in female size or in the proportion of ovigerous females

# Eastport Closed Areas - Results

- Lobster density, male and female size, and the proportion of ovigerous females were greater within the Round Island closed area compared to an adjacent harvested area. At Duck Islands, females and males were larger in size within the closed area but no difference was found in lobster density or the proportion of ovigerous females between the reserve and an adjacent harvested area.
- Tag returns suggest that movement rates from the reserves are low. Over a two year period, less than 10% of those recaptured had moved from a protected area to the adjacent commercial grounds, or vice versa.

# Eastport Closed Areas - Results

Collins (unpublished data):

- Mean size of males and females in both closed areas continues to increase over time
- Sex ratios differ inside reserves as compared to harvested areas (bias toward females in commercially exploited regions)
- Proportion of berried females greater in closed areas

# Eastport Closed Areas - Results

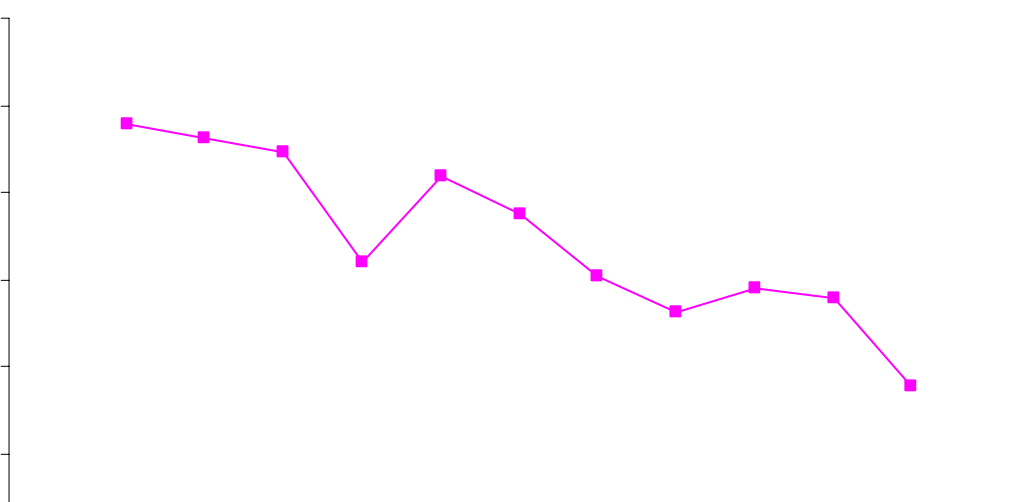
Janes (unpublished data):

- Mean size of males and females in both closed areas continue to increase over time
- V-notching activity appears to be declining in recent years
- Logbook data collected since 1998 suggests that catch rates in Eastport have stabilized over the years, but we have no reference site for comparison

Eastport landings

Landings (kg)

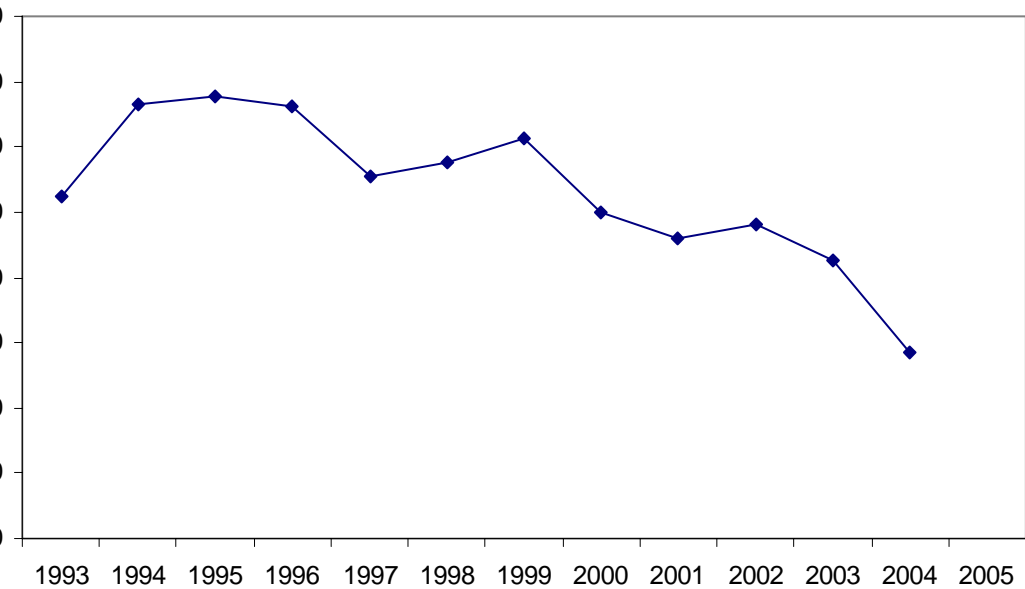
30000  
25000  
20000  
15000  
10000  
5000



LFA 5

Landings (kg)

160000  
140000  
120000  
100000  
80000  
60000  
40000  
20000  
0



Year

1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005

# Other Closed Areas...

- Random Island, Trinity Bay (LFA 6)
- Gander Bay, Notre Dame Bay (LFA 4)
- Leading Tickles, Notre Dame Bay (LFA 4)
- Shoal Point, near Bay of Islands (LFA 13B)
- Trout River (LFA 14A)
- Penguin Islands (LFA 11)
- Logbook, at-sea sampling, juvenile trap sampling and closed areas tagging data collected in 2004 in 5 of these areas

# Effects on Egg Production

- V-notching has not been practiced at the proposed 25% rate, though we have no real means to validate the incidence of notching
- Ennis provided a largely qualitative evaluation of the effects of conservation initiatives on overall egg production in 2003 research document

# Status of E/R Doubling Objective

- “Our capacity to evaluate the extent to which E/R doubling objective has been achieved in NL is extremely limited and largely qualitative”
- Exploitation rate has not decreased despite reductions in licenses; maximum size limit provides limited benefit given extremely high exploitation rates
- V-notching was not practiced widely and, according to recent Eastport data, the program has lost momentum in that area in recent years
- “Most of the progress can be attributed to size limit increase, but some of the E/R benefit...was eroded by an overall increased level of exploitation on the commercially legal component of the population”

# Eastport Conservation and Egg Production

- In 1999, using commercial fishery monitoring (logbooks and at-sea sampling) and closed areas research sampling, an empirical estimate of total egg production was generated, as well as proportion attributable to specific conservation measures

# Eastport Conservation and Egg Production

- Baseline – 71.4%; size limit increase – 9.9%; v-notch – 11.7%; closed areas – 7.1%
- Combined, the three conservation measures provided a 40% increase in egg production over the baseline
- Roughly 82% of baseline egg production is by undersize females

# Ecosystem Considerations

- Predation – Cunners? Herring? Mackerel? Cod recovery? Seals?
- Pollution? Effects of pollution on larval survival or attainment of postlarval stage? (Polycyclic aromatic hydrocarbons? Chlorines? Heavy metals?)
- Food supply?
  - rock crab/spider crab
  - periwinkles
  - polychaetes
  - echinoderms
  - molluscs
- Temperature?

# Collaborative Science and Potential Roles for Industry

- ACOA 2004 - trained fishermen to collect at-sea sampling data and conduct research tagging in aforementioned closed areas
- 2004 FSCP – partnered with FFAW to collect at-sea sampling for St. John Bay, Rocky Harbour, Fortune Bay; logbooks for St. John Bay
- 2005 – Joint project with Oceans to aid fishermen in collecting at-sea sampling data and conduct research tagging in Eastport and Leading Ticks; develop a length fecundity relationship for LT in partnership with Memorial University of Newfoundland
- 2005 FSCP - at-sea sampling for St. John Bay, Rocky Harbour, Fortune Bay and Placentia Bay; logbooks for most LFAs; modified trap experiment
- 2006 – Joint project with Oceans to continue research in Eastport and Leading Ticks
- 2006 FSCP – continue, and expand, fishery monitoring, with possible focus on Placentia Bay (LFA 10)