Table 174 Summary of Cumulative Impacts of Proposed Action (Shaded) on Other Fisheries

	Direct and Indirect Impacts of Proposed Action	Past to Present Condition	Non-Fishing Impacts	Impacts from RFFAs	Cumulative Impacts
Proposed Limited Access Program and Permits **Proposed Purse Seine/Fixed Gear Only Area**	Neutral/Low Negative	Low Negative	Potentially Negative	Potentially Negative	**Low/Potentially Negative –** cumulative impacts not expected to be significant
Non-Preferred Management Alternatives					
No Action Alternative and Alternative 1	Neutral	Low Negative	Potentially Negative	Potentially Negative	**Low/Potentially Negative**
Alternatives 2-7	Neutral/Low Negative				**Low/Potentially Negative –** Negative cumulative impacts would occur if limited access restricts supply of lobster bait
MSY					
No Action = 317,000 mt	**Neutral**	Low Negative	Potentially Negative	Potentially Negative	**Low Negative**
MSY = 220,000 mt proxy	Low Positive				**Potentially Negative**
Open Access Incidental Catch Permit					
No Action – no permit	Low Negative	Low Negative	Potentially Negative	Potentially Negative	**Negative**
1MT permit	Low Positive				**Neutral/Potentially Negative**
3 MT permit	Positive				**Neutral/Potentially Negative**
5 MT permit	Most Positive				**Neutral/Potentially Negative**
Regulatory Definition of Midwater Trawl Gear					
No Action – no change	No Impact	Low Negative	Potentially Negative	Potentially Negative	**No Impact** – since no direct/indirect impacts, would not contribute to cumulative impacts
Modified per Enforcement OS	Neutral/Low Negative				**Low Negative**
Modified per West Coast/PFMC	Neutral/Low Negative				**Low Negative**
Modified per ECPA	Neutral/Low Negative				**Low Negative**

9.0 DATA AND RESEARCH NEEDS

During the development of this amendment, the Council, in conjunction with the Atlantic States Marine Fisheries Commission as well as the Herring PDT and Advisory Panel, identified the following data and research needs. Addressing current data deficiencies will improve the long-term management of the Atlantic herring fishery.

- Continue commercial catch sampling of Atlantic herring fishery (risk of losing funding after the 2004-2005 season) according to ACCSP/ME DMR protocols.
- Continue to utilize the inshore and offshore hydroacoustic and trawl surveys to provide an independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies, and the herring industry on acoustic surveys for herring should continue to be encouraged.
- Develop tagging and morphometric studies to explore uncertainties in stock structure and the impacts of harvest mortality on different components of the stock. Although tagging studies may be problematic for assessing survivorship for a species like herring, they may be helpful in identifying the stock components and the proportion of these components taken in the fishery on a seasonal basis.
- Identify known herring spawning areas. Establish critical spawning habitat areas or special management zones to protect spawning aggregations of herring and/or demersal egg masses.
- Examine the root causes of the discrepancy between Forward Projection and ADAPT assessments.
- Investigate bycatch and discards in the directed herring fishery.
- Develop a long-term strategy for assessing individual spawning stocks as a basis for more effective management of any heavily exploited portion(s) of the stock complex. Evaluate the merit of acoustic surveys and other techniques to achieve sub-stock complex monitoring.
- Develop economic analyses necessary to evaluate the costs and benefits associated with different segments of the industry.
- Pursue the development of a dedicated pelagic survey technique utilizing hydroacoustic and trawling methods to provide another direct and independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies, and the herring industry on acoustic surveys for herring should be encouraged.
- Reinvestigate the estimation of age-3 herring, the natural mortality rate assumed for all ages, the use of catch-per-unit-effort tuning indices, and the use of NEFSC fall bottom trawl survey tuning indices in the analytical assessment of herring.
- Develop new approaches to estimating recruitment (i.e. juvenile abundance) from fishery-independent data.
- Consider using NEFSC fall survey mean weights at age as the spawning stock mean weight at age in the estimation of biological reference points. Evaluate alternative catch weights at age.
- Investigate alternative methods of estimating mean weight at age used to determine the age composition of U.S. and Canadian landings from the coastal stock complex.
- Conduct a retrospective analysis of herring larval and assessment data to determine the role larval data plays in anticipating stock collapse and as a tuning index in the age-structured assessment.

- Continue resource monitoring activities, especially larval surveys to indicate the relative importance of individual spawning areas and stocks and the degree of spawning stock recovery on Georges Bank and Nantucket Shoals.
- Develop socio-economic analyses appropriate to the determination of optimum yield.
- Evaluate the concept of a minimum biologically-acceptable level biomass (MBAL) for the herring coastal stock complex. Determine the adequacy of present methods and data to determine MBAL if appropriate.
- Evaluate the concept of a fixed spawning stock size or spawning target for the herring coastal stock complex. Determine the adequacy of present methods and data to set a target if appropriate.
- Investigate the effects of averaging maturity rates over blocks of years to help smooth some of the inter-annual variability in the calculation of spawning stock biomass.
- Consider potential discards if fishing mortality increases in the future.
- Possible effects of density-dependence (e.g. reduced growth rates at high population size) on parameter estimates used in assessments should be examined.
- Potential changes in catchability within spring bottom trawl survey indices should be investigated.
- Investigate the validity extremely high recruitment in recent years.
- Organize annual US-Canada workshops to coordinate stock assessment activities and optimize cooperation in management approaches between the two countries.

9.1 TOP PRIORITIES FOR COOPERATIVE RESEARCH

- Develop tagging and morphometric studies to explore uncertainties in stock structure and the impacts of harvest mortality on different components of the stock. Although tagging studies may be problematic for assessing survivorship for a species like herring, they may be helpful in identifying the stock components and the proportion of these components taken in the fishery on a seasonal basis.
- Investigate bycatch/discards in the directed herring fishery through both at-sea and portside sampling.
- Develop and test gear modifications to minimize interactions with non-target species in the Atlantic herring fishery.
- Synthesize predator/prey information and conduct investigations to address information gaps; investigate the role of herring in the Northwest Atlantic ecosystem and the importance of herring as a forage species for other commercial fish stocks; assess the importance of herring as forage relative to other forage species in the region.
- Continue to develop and utilize the inshore and offshore hydroacoustic and trawl surveys to provide an independent means of estimating stock sizes. Collaborative work between NMFS, DFO, State agencies, and the herring industry on acoustic surveys for herring should continue to be encouraged.

9.2 RESEARCH PRIORITIES – FORAGE AND RELATED ISSUES

At its May 17/18 meeting, the Council's Herring Committee discussed issues and concerns related to the importance of herring as one of many forage species in the Northeast Region. From this discussion came several recommendations for research priorities related to forage and another, related concern about the potential for localized depletion of herring, particularly in the inshore Gulf of Maine.

- Research utilizing hydroacoustic surveys; to investigate the size and location of herring schools, the behavior of schools and their ability to reform after being subjected to disturbances from midwater trawling; hydroacoustic surveys lend themselves well to cooperative research;
- Research into better identifying and characterizing discrete spawning grounds for herrings schools; this is especially important because Atlantic herring schools exhibit spawning site fidelity;
- Research regarding the impact of inshore water quality and other environmental factors on the availability of herring and other important forage species in the GOM and other ecosystems;
- Research into understanding the ecosystem effects of the North Atlantic Oscillation (NAO); examining relationships between fish stocks and the NAO;
- Research in cooperation with Canada is important because Atlantic herring is a transboundary resource;
- Utilization of new research technologies like underwater video and photography;
- Efforts to define localized depletion on a spatial and temporal scale.

Establishing a purse seine/fixed gear-only area could provide a research area to further explore factors related to herring distribution, localized depletion, ecological influences, habitat issues, predator/prey interactions, and other issues that may affect the abundance and distribution of Atlantic herring in the inshore GOM. There may be an opportunity to observe the differences in catch rates and fish availability/distribution inside and outside of the area; research differences between purse seines, fixed gear, and midwater trawls; and observe short-term/long-term changes in the ecosystem within the area where midwater trawling is restricted. However, the seasonal movement of herring, the variable nature of their distribution, and their sensitivity to environmental factors like water temperature and food availability are all important factors that likely play a significant role in herring distribution and should be considered accordingly in any research program.