9.0 Information and Research Needs

Information and research needs related to the management of the red crab resource and its fishery are identified in several places throughout this FMP, including, at a minimum, Sections 2.4, 3.4, 3.5, 3.6, 8.1.6, 8.2.5, and Appendix A. A summary of these extensive lists of information and research needs is provided here. In particular, the following issues are identified as priorities for information collection and new research on the resource and fishery.

9.1 Bycatch Issues

Initial reports indicate that there is very little, if any, bycatch of other species in the directed red crab fishery. This initial assessment needs to be tested and, if possible, substantiated. The new reporting requirements proposed to be implemented in the FMP are intended to assist with providing the necessary information to better account for any potential bycatch of other species in the directed red crab fishery. The proposed voluntary subsampling program, if implemented and endorsed by the industry, is intended to provide more robust and detailed data on bycatch, among other things, than can be derived from the VTR data.

A more significant problem than any potential bycatch of other species in the directed red crab fishery is the potential for bycatch of red crabs in other fisheries. Although participants of other fisheries will be able to catch, retain, and land up to the proposed incidental catch limit of red crab (assuming they obtain an open access incidental catch permit), the amount and mortality of red crabs that may be harvested above the incidental catch limit are of concern. Increased attention should be placed on bycatch reporting on VTRs from the offshore monkfish fishery, as this is the fishery with the highest likelihood of significant interaction with the red crab resource. These issues also can be addressed through increased observer coverage and reporting on both red crab and monkfish vessels. Observer coverage is discussed below.

9.2 Observer Coverage

Very little is known about the operations of the directed red crab fishery, except for what has been self-reported by some members of the industry (see Appendix B). Less is known about the operations of other fisheries, such as the offshore lobster fishery, the tilefish fishery, and the monkfish fishery, and their interactions with red crabs. Observer coverage in these fisheries, with particular attention to the catch of other species in the red crab fishery and the catch of red crab in the above mentioned other fisheries should be made a priority for the observer program. As mentioned above, the levels of bycatch of red crab in the offshore monkfish fishery is of particular concern, not only because there may be significant interactions between this fishery and the red crab resource, but also because the mortality of red crabs that may be caught in the offshore monkfish fishery is unknown. Observers should be used to characterize the degree to which red crabs are caught in the monkfish fishery and to attempt to determine the mortality of those crabs, above what are allowed to be landed under the incidental catch limit. Observers should also measure and report on the size of the red crabs being landed in the

directed red crab fishery, as well as those landed as incidental catch in other fisheries.

9.3 Stock Assessment

As mentioned several times throughout the FMP, the current status of the red crab resource is unknown (see Sections 2.4, 3.4, and 8.1.3). The lack of fishery-independent data presents a real challenge to the management system, as we have no current estimates of red crab biomass to be used to determine the present stock condition. This information is critical not only to assess the status of the resource and determine whether or not the species is overfished, but also to understanding and monitoring the effectiveness of the FMP once it is implemented. If NMFS cannot develop and implement a directed red crab survey, it should at a minimum provide funding to external researchers willing to undertake such a survey.

9.4 Rate of Natural Mortality

As described in Section 3.4.2, the rate of natural mortality (M) for the deep-sea red crab is currently unknown. The rate used in the FMP is assumed as such based on ranges of natural mortality estimated for other similar species. Research is necessary to study the Atlantic deep-sea red crab and determine the natural mortality rate for this species.

9.5 Escape Vent Selectivity Study

In this FMP, the Council considered requiring an escape vent in all traps used in the controlled access directed red crab fishery. The intent of requiring an escape vent is to reduce the probability of undersized crabs being retained in the traps and subject to increased mortality due to handling during fishing operations. Although the Council intended to implement an escape vent requirement for all fishing gear used in the directed red crab fishery, there was not sufficient information available at this time to determine the specific size and dimensions that the escape vent should be. There was also not sufficient information for the Council even to determine the need for an escape vent in this fishery. The design of the traps currently used in the fishery may reduce or eliminate the need for an escape vent.

Unfortunately, although this option may have had benefits to the red crab resource, no selectivity studies have been done to determine the appropriate size escape vents needed in this fishery. If the required escape vents were too small, then undersized crabs would be retained and much of the anticipated benefits would be lost. If the required escape vent was too big, then market-sized crabs would also escape and the yield of the fishery would decline. It would be impossible, with the available information, to suggest a proper biologically-based escape vent size. This may not be immediately necessary, as fishermen have reported that a mechanism already exists for the escapement of undersized crabs. The trap design most commonly used in the directed red crab fishery is a rectangular wood and wire trap, and the wood lathes are spaced approximately two inches apart. The fishermen report that this lathe spacing allows small crabs to escape.

NMFS, or another appropriate scientific group (possibly working in conjunction with the fishing industry), should conduct selectivity studies on a variety of escape vent

sizes. Upon completion of these studies and the data being made available, the Council would be able to consider whether additional action is necessary to require a minimum escape vent size and would have the information with which to determine the appropriate size for the escape vent.

9.6 Port Sampling of Landed Crabs (Size Structure)

As described in Section 4.2.2, the FMP will not regulate a minimum allowable size for the red crab landed in either the controlled access directed fishery or the open access incidental catch fishery. The minimum size of crabs currently harvested is approximately four inches in carapace width (CW) and this size is maintained by market constraints. The Council determined that implementing a regulated minimum size of four inches CW at this time would be redundant with existing market constraints and would significantly complicate enforcement and increase the administrative burden both on NMFS and the fishing industry.

There remains, however, the concern that market conditions or other factors could change that would result in smaller crabs being landed and/or processed. Any downward trend in the size of the crabs landed could have significant implications for the sustainability of the resource. The problem with an increase in undersized crabs being landed is that male crabs could start being harvested before they have an adequate opportunity to reproduce. As a result, the Council acknowledges the need to monitor the size of crabs being landed in the directed and incidental catch fisheries, and reserves the right to take action and implement a regulated minimum size via a framework adjustment to the FMP if it determines that the average size of landed crabs is beginning to decline and/or if the number of crabs smaller than four inches CW increases.

The option selected by the Council to deal with this situation was to establish an "operational minimum size" of four inches CW that represents the smallest size crab that should be harvested. Although it would not be a violation to land crabs smaller than this size, the Council intends to use self-reporting, observer coverage and port sampling to track the sizes of red crabs being landed. If the proportion of crabs smaller than the operational minimum size begins to increase, the Council will consider taking appropriate action at that time to regulate a minimum size and ensure the enforceability of such an action.

The Council has proposed a voluntary sub-sampling program in which participating controlled access vessels will report the size of a sample of all crabs harvested. The Council has also requested observer coverage for this fishery (see above). The third component of information necessary to the Council to monitor the size of red crabs being landed is a thorough port sampling program. The Council requests that NMFS implement port sampling in at least three of the primary red crab ports: New Bedford, Gloucester, and Fall River, Massachusetts. A key element of this port sampling program should be the measurement of landed crabs.

9.7 Handling Mortality

"Handling mortality" is the rate of mortality to red crabs that results from being brought to the surface, handled, and returned to the seafloor. In the directed red crab fishery, this is associated with the sorting of the crabs harvested in the traps and the return of females and undersized males. Handling mortality may result from injury to the crabs during handling, being out of the water too long, being subjected to temperature stress from high water temperatures at the surface or rapid temperature changes, predation while in the water column, or settlement to different areas of the bottom where survival is lower. There are no precise estimates of the magnitude of handling mortality, but high handling mortality would indicate that a large percentage of the discarded females and small males would die even though they are returned to the sea and not landed. Mark/recapture studies performed under typical fishing conditions should be designed and implemented in order to better estimate handling mortality.

9.8 Habitat Issues

The habitat research recommendations include the need for expanded life history information that will allow for the comprehensive identification of red crab habitat requirements, including all life history stages, as well as habitat-related information that defines the interrelationship between the species, its environment and the food web. Improved information is also needed on adverse impacts from both non-fishing and fishing activities. A specific research and information need associated with this FMP is to identify the potential impacts of a deep-water trap fishery on a variety of benthic habitats, including the habitats contained in the deep-water canyons. This would essentially be an extension of the Eno et al. (1999) report, but focused on deep-water habitats of the Northeast U.S., including the canyons, most likely subjected to fishing by the red crab fishery.

9.9 Other

There are many other general and specific things we need to learn about the deep-sea red crab resource. We need to know more about the distribution of the species at all life stages, the variability and trends in population abundance and dynamics, and a way to adequately sample larval stages. We need better information about the dispersal patterns of the larval stages and where they settle. Further research is also needed on: (1) age-size relationships; (2) lengths of intermolt periods for all life stages; (3) yield per recruit; (4) upslope and lateral migrations; (5) genetic comparisons of the Northwest Atlantic and Florida/Gulf of Mexico populations; (6) when and where females primarily spawn; (7) the possibility of sperm storage by females; and (8) male mating effectiveness by size.