Mid-Atlantic Fishery Management Council
Five Year (2012-2016) Research Plan
Draft

The Magnuson Stevens Reauthorization Act of 2006 requires that each Council, with the assistance of its Scientific and Statistical Committee (SSC), develop a five-year research priority plan. To facilitate this process, the Mid-Atlantic Fishery Management Council (MAFMC) examined the research needs which have been identified in numerous stock assessments, Council FMP/Amendment documents and through the Council's Research Set Aside Program. In addition, the NE portion of the NMFS Strategic Plan for Fisheries Research and the research needs list which formed the basis for proposed changes to marine recreational fisheries statistics in the US as part of the Marine Recreational Information Program were evaluated. The Council, in consultation with its SSC, identified the top research needs for each of its managed species based on documented research needs contained in the sources described above. In addition, the Council and SSC identified research needs common to all species which are of high priority to address future assessment and fishery management needs.

General Research and Information Needs

- Collect accurate size and age composition of commercial and recreational catch (especially the discarded component of the catch) to develop catch at age matrices for all managed stocks; estimate mortality of discards by gear type
- Implement novel supplemental surveys to derive fishery independent indices of abundance (where appropriate; see species specific needs below)
- Develop assessment models to support fishery management control rules for data poor stocks (i.e., use fishery dependent data)
- Build the regional capacity within governmental agencies and academia to undertake management strategy evaluations of MAFMC managed stocks to evaluate management performance
- Develop bio-economic models to support fishery management
- Establish a framework for risk analysis of alternative harvest policies
- Incorporate ecosystem level data (predator/prey interactions, trophic dynamics, etc.) into single and multi-species assessment and management models
- Investigate effects of climate change on ecosystems and fisheries they support
- Review and improve capacity for social and economic impact analyses, including updated data on fisheries organization and structure, participation, community linkages; for regular FMP work and at scales appropriate for ecosystem-based management
- Quantify uncertainty in biological reference points

Species Specific Research Needs

Bluefish: 1) Evaluate amount and length frequency of discards from the commercial and recreational fisheries, 2) collect data on size and age composition of the fisheries by gear type and statistical are, 3) initiate fishery-dependent and fishery-independent sampling of

offshore populations of bluefish during the winter months (consider migration, seasonal fisheries, and unique selectivity patterns resulting in the bimodal partial recruitment pattern; consider if the migratory pattern results in several recruitment events); and 4) develop bluefish index surveys (proof of concept), including abundance/biomass trend estimates for the offshore populations in winter.

Tilefish: 1) investigate the effects of hook size and other fishing practices (i.e., bait type soak time, etc.) on catchability of tilefish in the longline fishery, 2) collect data on spatial distribution and population size structure and, 3) explore the influence of water temperature and other environmental factors on the trend in the commercial fishery CPUE index of stock abundance.

Surfclams: 1) develop a forward-projecting, age-structured stock assessment model based estimate of abundance and investigate model formulations that accommodate spatial heterogeneity, 2) consider using year-, region- or episodic natural mortality rates, 3) consider the potential impacts of climate change on the natural mortality of the surfclam resource given recent trends, 4) determine factors that control recruitment success in surf clams (i.e., predation or environmental factors), and 5) determine how much of Georges Bank is suitable habitat for surfclams, and if depletion and selectivity experiments done in the mid-Atlantic are applicable to the Georges Bank region.

Ocean Quahog: 1) Carry out simulations to determine optimum proxies for Fmsy and Bmsy in ocean quahogs, given their unusual biological characteristics, 2) improve estimates of biological parameters for age, growth (particularly of small individuals), and maturity for ocean quahogs in both the EEZ and in Maine waters, 3) investigate model formulations that accommodate spatial heterogeneity and 4) Additional age and growth studies are required to determine if extreme longevity (e.g. 400 years) is typical or unusual and to refine estimates of natural mortality. Similarly, additional age and growth studies over proper geographic scales could be used to investigate temporal and spatial recruitment patterns.

Summer flounder: 1) expand the collection of otoliths on an ongoing basis to include all components of the catch-at-age matrix, particularly for fish larger than 60 cm (~7 years; could provide a better indicator of stock productivity), 2) conduct inter-lab aging calibration studies between NEFSC and state agencies. 3) develop a reference collection of summer flounder scales and otoliths to facilitate future quality control of summer flounder production aging, 4) collect information on overall fecundity for the stock (egg condition and production) to serve as an indicator of stock productivity, 5) investigate trends in sex ratios and mean lengths and weights of summer flounder in state agency surveys catches, 6) evaluate selectivity patterns in trawl gear as a function of mesh size, and 7) evaluate current summer flounder management measures, especially in the recreational fishery as they relate to sex specific mortality.

Black sea bass: 1) evaluate alternative indices of stock abundance, 2) validate ageing methods (scales v. otoliths) and initiate routine aging of black sea bass in survey collections to investigate the magnitude of year effects, 3) tagging studies should be

initiated to obtain return rates over longer periods, 4) at -sea samples need to be obtained to improve understanding of the timing of sex change over years in order to study the potential influence of population size on sex switching (may have implications for overfishing BRPs), 5) evaluate management approaches appropriate for species with protogynous life histories, and 6) conduct stock identification research to identify population subgroups and the extent of mixing.

Scup: 1) evaluate indices of stock abundance, 2) expand age sampling of scup from commercial and recreational catches, with special emphasis on the acquisition of large specimens, 3) conduct biological studies to investigate factors affecting annual availability of scup to research surveys and maturity schedules, 4) improve estimates of discards and discard mortality for commercial and recreational fisheries and, 5) explore the utility of incorporating ecological relationships, predation, and oceanic events that influence scup population size on the continental shelf and its availability to the resource survey into the assessment model.

Atlantic mackerel: 1) explore patterns in consumption as an additional index of abundance, 2) collaborate with industry to explore the spatial and temporal pattern and variability in catch to evaluate issues of abundance and availability.

The SSC also endorsed the following research recommendations developed during the 2010 TRAC Assessment: 1) explore opportunities for the development of alternative indices of abundance, 2) attempt to develop estimates of total stock abundance, 3) initiate broad scale international egg surveys covering potential spawning habitat that is consistently representative of the total stock area, including the shelf break. Investigate potential to conduct work in cooperation with commercial fishing industry (priority: high, long term), 4) explore spatial distribution of stock relative to the mixing of the northern and southern 'contingents' of mackerel i.e. tagging, genetics, chemical assay, microchemistry of otoliths (priority: high, medium-long term), 5) explore influence of environmental factors on spatial distribution of the stock e.g. rate of mixing and distribution of stock relative to the survey area (high priority, short term),6) extend predation estimates to include DFO data and entire predator spectrum (marine mammals, highly migratory species), 7) examine methodology for incorporating consumption estimates in the assessment, 8) quantify the magnitude of additional sources of mortality in Canada including the bait fishery, recreational catch and discards (high priority; short term), 9) exploration of bottom trawl characteristics for catchability of mackerel ,10) participate with industry in investigating the contemporary overlap of survey stock area, commercial fishery, and mackerel distribution and explore historical databases for the same purpose to better understand interpretation of abundance indices (survey, cpue) (medium term), 11) collaborate with industry to investigate alternative sampling gear (i.e. jigging) to survey adult abundance (long term), 12) explore MARMAP database relative to spatial distribution of survey indices, 13) investigate alternative assessment models that incorporate spatial structure (i.e. northern and southern contingents, different age groups), 14) explore alternative assessment models that incorporate covariates, and 15) initiate a technical TRAC WG in order to advance and monitor progress of research recommendations.

Butterfish: 1) explore the utility of incorporating ecological relationships, predation, and oceanic events that influence butterfish population size on the continental shelf and its availability to the resource survey into the assessment model, 2) explore the use of an age-based model or other approaches for future assessments, and 3) a study of growth, morphometrics, distribution and other biological attributes of inshore and offshore components of the butterfish population should be conducted.

Illex: 1) collect demographic information on growth, mortality, reproduction by sex, season, and cohort, 2) consider a length-based assessment with a sub-annual time step, undertaking cooperative research with the fishing industry, 3) expand investigations into oceanographic correlates with trends in recruitment and abundance, 4) investigate range and range dynamics at depths >185 m., 5) refine between-vessel survey calibration estimate for *Illex* and consider a size-based calibration 6) analyze the change in availability of *Illex* to the survey and fishery, resulting from long-term changes in climate or other oceanographic factors and, 7) consider an *Illex* index standardization for the NEFSC trawl survey.

Loligo: 1) explore alternative weightings of semi-annual surveys other than simple averaging, 2) expand age and growth studies to better estimate average growth patterns and to discern seasonal productivity/catchability patterns, 3) improve the spatial resolution, coverage and accuracy of commercial catch data and 4) explore the utility of incorporating ecological relationships, predation, and oceanic events that influence *Loligo* population size on the continental shelf and its availability to the resource survey into the assessment model.

Spiny Dogfish: 1) revise the assessment model to investigate the effects of stock abundance, sex ratio and size of pups on birth rate and first year survival of pups, 2) initiate a large scale [international] tagging program consisting of conventional external tags, data storage tags, and satellite pop-up tags to help clarify movement patterns and migration rates, 3) investigate the distribution of spiny dogfish beyond the depth range of current NEFSC trawl surveys, possibly using experimental research or supplemental surveys, 4) initiate aging studies for spiny dogfish age structures (e.g., fin spines) obtained from all sampling programs (include additional age validation and age structure exchanges) and conduct an aging workshop for spiny dogfish, encouraging participation by NEFSC, NCDMF, Canada DFO, other interested state agencies, academia, and other international investigators with an interest in dogfish aging (US and Canada Pacific Coast, ICES), and 5) investigate population genetic structure with emphasis on identifying discreet breeding populations and the extent of mixing.