Program Review of the Northeast Fisheries Science Center Northeast Cooperative Research Program

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September 2016

"It seems to me that collecting the data we need to manage risks could be achieved, in part, by harnessing the knowledge of the people who actually catch the fish. They are out there on the ocean day after day and they often have a much clearer insight into the state of the marine environment they work in than anyone else. Inevitably, though, this has to be about a lot more than gathering reliable data. It is also about building trust between the scientists and the various other stakeholders, and making sure than everyone has confidence in the process of assessing stocks and rebuilding fisheries…..

…..you cannot obtain a degree in common sense at any university throughout the world (you seem to be able to get one in just about everything else!)…."

Prince of Wales, 6th World Fisheries Congress, Edinburgh, Scotland, 2012.

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Executive Summary

This document reports on an independent review of the performance of the NEFSC's Northeast Co-operative Research Program (NCRP). The review examined approx. 150 documents and interviewed 98 people throughout the northeastern USA, including NCRP staff, managers, scientists from NEFSC and other universities and agencies, fishermen (here I use the Northeast's convention of a masculine gender for this term) and their representatives, staff and members of the 2 Fishery Management Councils, and state fisheries staff. Several consistent themes emerged during the review which form the basis of this report and the associated recommendations. These themes concerned the understanding that people have of co-operative research, the NCRP's main projects and functions, the use of data from these programs, the NCRP's oversight of certain funding, communication issues, the structure and staffing of the group and potential synergies between the NCRP and the Fisheries Sampling Branch (FSB) in their new division.

The NCRP is at the interface of one of the most important relationships in the Northeast's very complex fisheries landscape – that between the NEFSC and the fishing industry. The NCRP is basically responsible for not only improving this relationship but also for making it produce scientific information to manage fisheries. Whilst these two roles are significant in themselves, it is expected that the work of the group will become even more important (and more extensive) over the next 5 years as the NEFSC's new Strategic Plan is implemented. This is because many of the plan's foci and aspirations require enhanced working relationships with the fishing industry. The NEFSC therefore needs the significant experience and expertise in building relationships with the fishing industry that resides in the NCRP group to infiltrate throughout other parts of the NEFSC that currently interact less with industry. The demands on the NCRP are therefore quite significant, unique among NEFSC's branches, and likely to grow in the near future. To meet these challenges, the NCRP needs to be focussed, influential, well-managed and appropriately resourced.

This review found that "Co-operative Research" and the NCRP meant quite different things to different people: some saw co-operative research as any research involving the fishing industry (whether or not the NCRP, or indeed any part of NOAA, were involved); others saw the NCRP simply as that group within the government that administers (and largely decides on) funding applications; others saw the group in terms of their projects like Industry-based surveys, the Study Fleet, enhanced biological sampling, etc.; still others identified co-operative research as an "attitude" that should pervade most research activities in the region; and some even indicated that they "had no idea" what co-operative research meant nor what the NCRP did. Whilst this review mainly focusses on the NCRP itself, it nevertheless tries to incorporate this range of understandings.

In terms of projects and functions, this review found that the main projects being conducted by the NCRP include the Study Fleet program, particular Industry-based Surveys, the Fishermen's Logbook and Data Recording System (FLDRS), support for other electronic reporting initiatives

(electronic Vessel Trip Reporting - eVTRs) and Enhanced Biological Sampling (mainly for NEFSC's Population Biology Branch). And its key functions include its role in building relationships with the commercial (and, more recently, the recreational) fishing sectors, improving trust and respect between the NEFSC and fishermen, and oversight of the administration and approval of certain funding processes. In doing all the above, the NCRP has demonstrated significant success over a lengthy period of time.

This review found that the cost-effective expansion of the Study Fleet, FLDRS and other eVTR initiatives to as many and diverse commercial and recreational vessels as possible should be a key objective of the NCRP in the near and medium term, assisted by other appropriate branches in the NEFSC such as the FSB and DMS. Furthermore, the recently stated intention for the NEFSC to increase the use of fishing vessels to do survey work will clearly require the services of the NCRP, and the Enhanced Biological Sampling work should continue to provide important material for improving estimates of key parameters in stock assessments. However, in doing all this work, the NCRP staff need to bear in mind a perception held by a few stakeholders that they work independently from the rest of the NEFSC and minimize such opinions as much as possible.

In terms of functions, this review suggests that the NEFSC separate out from the NCRP the (somewhat) tangential function it provides in oversighting and approving certain funding processes (especially the Research Set Aside processes), effectively freeing up staff to work on the high priority (and expanding) work required for the development of industry-based data collection systems – to which the group are uniquely suited. Instead, a small, separate office within the NEFSC should be established to create and administer a known, named committee (or board) with appropriate industry and government representation (and independently chaired), whose function would be to make final decisions on the funding of RSA-funded projects and track their performance. Furthermore, all RSA projects (and, indeed all contracted projects and grants) should have clear periodic milestones throughout their life, against which payments are made following the satisfactory completion of progress reports. And of course final payments should only occur after the completion and acceptance of final reports, the provision of the raw datasets produced and the meta-data that describes them.

The biggest problem identified in this review, by almost ALL people interviewed, concerned the minimal use of data from the program in routine stock assessments - particularly tow-by-tow catch and effort data, sometimes augmented with bottom temperature data, from the Study Fleet and its FLDRS program. This minimal use of such data is contributing to distrust throughout industry of the stock assessments done and, in turn, the management decisions that derive from them. Such issues are also having consequences for the NCRP's projects themselves by causing participants to lose interest or leave the program, or only staying involved due to the payments received. The following steps may assist in alleviating such issues:

- NEFSC's Population Dynamics Branch should more fully consider various techniques to incorporate industry-based data into stock assessments including Risk-based assessments,

Bayesian techniques, data-weighting procedures, randomized subsampling of tow-by-tow data, simulation testing and other methods.

- The NCRP should provide industry-collected data to the Population Dynamics Branch and other scientists as quickly as possible, in its rawest form and after adhering to stringent and rigorous data collection protocols which scientists in the Population Dynamics Branch and other users should assist in developing.
- Other scientists in the NEFSC should examine Study Fleet and FLDRS programs as mechanisms to obtain data for their work. In particular, scientists working on such things as rare events at sea – eg. sightings of protected species, unusual locations/times of spawning events, atypical larval blooms, temperature and climate anomalies, etc. could potentially use the opportunities provided by the NCRP.
- The utility of the NCRP in providing data for ecosystem research has been demonstrated previously (eg. the bottom temperature information) and such opportunities should continue to be explored and used by appropriate scientists throughout the Center.
- The eVTR data portal available to fishermen should be improved as a reporting tool to not only allow fishermen to interrogate their own data but, more importantly, to allow NOAA scientists and managers to see raw data and/or summaries across vessels in particular fisheries, in very quick time. Such users will then not only appreciate the current value of this information but also, more importantly, be able to work with NCRP to modify subsequent data collection designs and so add value and utility to the information gathered.
- The NEFSC should convene a dedicated, annual workshop involving all NEFSC scientists (especially those in the Population Dynamics branch), all NCRP staff (the 3 FTEs as well as the group of very impressive contracted staff), appropriate GARFO fisheries managers, and facilitated by a strong chairperson (either a senior NEFSC staff member or an independent). The objectives of the workshop will be to: (i) elucidate the NCRP's industry-based data gathering operations; and (ii) identify individual scientists and NCRP staff to form small teams/partnerships charged with developing projects using industry-gathered data that would address particular high-level goals of the Center - where the scientist would develop a sound statistical design for the work, and the NCRP staff member would be responsible for determining how, where and when it can be put into place and on which fishing vessel(s). At this point the identified industry partner(s) would join the team. The teams should then provide proper, documented outlines of the research for prioritization and approval by NEFSC's leadership. Next, these projects should be explained (and endorsements sought) to industry groups, Management Councils, funding bodies and NGOs as appropriate. After this, the projects should be executed and the data analysed by the team's scientist for use in stock assessments or other outputs. And this whole process should be repeated annually.

This review identified certain problems concerning communication about the NCRP within and outside the NEFSC. The above workshop/partnering process should lead to a significant

improvement in the former - at least in terms of NEFSC staff understanding what the NCRP does and, more importantly, could potentially do. To improve the understanding of the NCRP's work by external stakeholders, the NEFSC should ensure that those parts of the NCRP's data sets that ARE used for management are communicated to appropriate stakeholders using targeted outreach systems. Additionally, particular success stories about occasions where data from the program have been incorporated, or even just considered, in fisheries management should be espoused - again using appropriate outreach tools. Examples may include particular stock assessments (like the process undertaken for butterfish – even though the data may not have affected the actual outcome), various Conservation Engineering solutions from the CEN, the Enhanced Biological Sampling work, etc.

In terms of the NCRP's structure and staffing, this review found that, whilst there is no urgent need to do anything drastic right now, as the needs of the Strategic Plan are implemented and the NCRP's role expands, the geographical separation of the permanent FTE's should be addressed. In addition, a restructuring of the entire group into more strategically organised, function-based teams will probably become necessary as it grows, with a logical partitioning involving various Field Services (commercial and recreational) groups that are geographically-based, and a Database/IT/Training/Outreach Services group that could be shared with the FSB. There is also a clear need to locate at least 1 FTE and one or more field staff in the Mid-Atlantic region (probably at Sandy Hook) in order to develop co-operative research in the area, address the needs of the Management Council and the growing priority associated with the engagement of recreational fishermen. In addition, some analytical support is needed for the NCRP (and probably the FSB and other branches in the NEFSC) to examine methodological questions concerning statistically adequate coverages and levels of replication. Such work would probably be most efficiently handled by a Center-wide initiative which could, initially focus on the NCRP's industry-based programs. Finally, succession planning for the group should be borne in mind as the NEFSC leadership re-organises the rest of the Center and identifies roles for its senior people. And the latter will also need to become a focus for the new Divisional Director of the group.

The development of ad-hoc projects by contracted staff in the NCRP, with minimal scientific oversight or supervision should be replaced with the proposed establishment of teams/partnerships with NEFSC scientists. And to ameliorate the sense that there exists little scope for advancement or development of those staff, tighter supervision by the 3 permanent employees should occur as well as the provision of appropriate training, courses, opportunities to attend conferences, etc. In any case, the partnering of these people with other scientists should provide opportunities for significant, on-the-job scientific mentoring, and perhaps even the opportunity for them to undertake part-time Masters or PhD projects based on the research done (this will also assist with succession planning).

Several potential synergies between the NCRP and the FSB in the new division were identified. These included: the NCRP leaning on the FSB's experience and knowledge of most fishermen in the region to identify suitable candidates for the expansion of co-operative research; FLDRS and

eVTR information could be used to assist in the logistics of observer deployments; the FSB's experience with Electronic Monitoring and developing tablet-based technologies should meld with NCRP's efforts with the eVTR/FLDRS systems to develop the "holy grail" of industry-based data collection: a simple, hand-held, real-time data collection tool whose data are validated by random, periodic subsampling of video from EM cameras; and finally, the new division should provide opportunities in terms of sharing Administrative, IT, field training and outreach support – which may be best done by combining all appropriate support staff into a dedicated, intra-divisional support team.

In conclusion, this review found that the NCRP's experience and expertise in building relationships with the fishing industry should be considered a major asset as the NESFC implements its Strategic Plan over the next 5 years. If the various changes identified here are made, one should begin to see (in a relatively short time) a shift in momentum within the Center with respect to using industry-based information. In so doing, in addition to improving the scientific information available to manage fisheries, there should follow improvements in the trust and respect garnered from the fishing industry for NEFSC science, in the respect scientists have for information that comes from the industry and, ultimately, an increase in industry's acceptance and ownership of fisheries management decisions in the region.

Background and Conduct of this Review

This document reports on an independent review of the performance of the Northeast Fisheries Science Center's (NEFSC) Northeast Co-operative Research Program (NCRP). This program has organised collaborative fisheries research among government-based, and non-government-based scientists and the fishing industry in the New England and Mid-Atlantic regions since 1999. This has occurred under 2 overarching goals: (i) to enhance the scientific data underlying fisheries management decisions in the region; and (ii) to improve communication and collaboration among fishers, fishing communities, scientific and management agencies.

The NEFSC recently released its Strategic Science Plan 2016-2021 which has several themes, foci and targets that are relevant to the NCRP. In fact, a significant portion of the Plan depends on the region having a well-run NCRP that works with the fishing industry and other partners to deliver the scientific information needed to manage fisheries.

NEFSC therefore felt it prudent, and timely, to undertake an independent review of the program to assess not only if it is operating as efficiently as possible, but how it can be used and (if necessary) enhanced to assist with the aspirations of the NEFSC's Strategic Plan.

The specific goals of this independent review are to:

(i) assess the internal management and coordination of the NCRP to determine its progress, performance and achievements, and
(ii) develop recommendations to improve the efficiency of the program's delivery of high quality science for stock assessments and fisheries management while also improving the relationship between fishing communities and the government in the region.

In particular, the review examines how:

(i) NCRP delivers its scientific information,
(ii) engages with the fishing sector and other partners, and
(iii) integrates with other NEFSC scientific programs.

The first stage of this review resulted in an inception report to provide NEFSC with a starting point. It came after a consideration of background information supplied by the NCRP and preliminary discussions with NEFSC staff. A total of 90 documents were examined which included a variety of information about the program's current and completed projects, scientific papers and reports using data from the program, previous reviews done, outreach articles, funding spreadsheets, etc. The inception report was completed in June 2016 and provided initial information about the review, preliminary findings and a proposed direction forward for the remainder of the review - which was subsequently accepted by senior staff at the NEFSC.

The next stage of this review was the main fact-finding step which involved interviews and meetings in the Northeast during July 2016 with as many relevant stakeholders as possible. These meetings were held in Narragansett, Kingston, Falmouth, Woods Hole, Gloucester, New Hampshire, Scituate, Newhaven, New Bedford, Point Judith and other places. Several phone hook-ups with people were also held while in the US and also back in Australia. In addition, many more documents were gathered and read during this period (a total of around 150 documents and files were examined).

98 people were personally interviewed for this review, most in person, some in groups with only a few by phone. Some people were interviewed more than once. Some asked for complete anonymity, some asked that their comments remain anonymous. So to respect those wishes, and for the sake of uniformity, I do not provide any names in this report. However, the affiliations of those people interviewed were: 12 NCRP staff, 30 other NEFSC staff, 7 from the Greater Atlantic Regional Fisheries Office (GARFO), 26 fishermen (note that I use the Northeast's convention of a masculine gender for this term) and other fishing industry representatives (from New Hampshire, Massachusetts, Rhode Island and the Mid-Atlantic), 5 New England and Mid-Atlantic Fisheries Management Council staff and/or members, 13 non-government/university researchers, 4 State government staff and 1 Environmental Non-Government Organization (NGO) representative.

During the course of this review, several themes emerged that gradually became regular in their occurrence and led me to be quite confident that I was getting a reasonably accurate impression of key issues. These issues form the basis of this report and the associated recommendations.

Introductory Comments

The quote from the Prince of Wales that sits at the beginning of this document encapsulates (perhaps because of the lofty perspective of its owner) a very logical and (probably) inevitable truth – that the management of the world's fisheries must (and will) rely on the information that comes from those who are most familiar with them – the people who engage (at the most intimate level) with fisheries stocks every day.

Now, from Prince Charles' lofty perspective, we must descend into the minutiae that characterizes real fisheries management – the interplay between our current generation's need to exploit seafood and humanity's need to do so sustainably or, in other words, forever. And perhaps the most famous (or infamous, depending on one's point of view) example of this struggle concerns the fisheries of the northeastern USA.

The management of fisheries in the Northeast is, without doubt, one of the world's most complex, having evolved over centuries under a unique array of influences including a wide diversity of fishing vessels and methods, a wide variety of species that have booms and busts, significant public scrutiny, media attention, politics, litigation, and a rich and colourful 400 year history. There are also a host of entities involved in this landscape including commercial and recreational fishermen, fishing industry groups, government-based state and federal agencies, managers, scientists, Management Councils and Sectors, universities, funding bodies, politicians and NGOs.

With such a background, it is not surprising that there are many diverse and, quite often, strained relationships among these entities, with the major ones usually involving, in some way, the federal government (i.e., GARFO and/or the NEFSC). And the most important, frequent and strained relationship is that between these agencies and the fishing industry, be it individual fishermen and/or the various groups and associations that represent them. Because the scientific arm of the federal government in the region (the NEFSC) plays a key role in fisheries management and therefore how fishermen conduct their operations, the relationship between the fishing industry and the NEFSC is one of (if not THE) most important in the region.

The NCRP finds itself at the interface of this vital relationship because it is viewed as the group responsible for not only improving the relationship between the NEFSC and the fishing industry but also for making it produce quality scientific information to underpin fisheries management. Whilst these two current roles for the NCRP are significant in themselves, even more of a challenge is the pivotal role that the group will be expected to play over the next 5 years as the NEFSC's new Strategic Plan is implemented. This is because many of that plan's foci and aspirations require enhanced working relationships with the fishing industry. The demands on the NCRP are therefore significant, unique among NEFSC's branches, and likely to grow a great deal in the near future. To meet these challenges, the NCRP needs to be focussed, influential, well-managed and appropriately resourced. This review makes an attempt to identify ways that improvements can be made to the NCRP which will assist it in meeting these challenges.

Understanding Co-operative Research

This review mainly concerns the performance of the NCRP. But during its course, it became apparent that the term "Co-operative Research" meant different things to different people in the region. Some saw co-operative research as any research program that involves the fishing industry (whether or not the NCRP, or indeed any part of NOAA, were involved) and therefore included projects done by universities, individual scientists, students, NGOs or any non-industry entity. Other groups, especially those applying for funding from the rather quirkily named Research Set-Aside (RSA) programs, saw the NCRP simply as that group within the government that administers (and largely decides on) funding applications. Others (especially fishermen and most NCRP staff) saw the group's main function as running its own programs such as Industry-based surveys, the Study Fleet, the enhanced biological sampling services for the Center, etc. Others identified co-operative research as not necessarily being a separate "program" or branch within the NEFSC but rather an "attitude" that should pervade most research activities in the region. Still other groups that included (quite surprisingly) staff from within the NEFSC, indicated that they "had no idea" what co-operative research meant nor what the NCRP did.

So …… depending on one's stakeholding and interaction with the NCRP, particular stakeholders in the region had quite different understandings of co-operative research and the roles and functions of the NCRP. Whilst this review mainly focusses on the NCRP itself, I nevertheless tried to incorporate the above range of understandings.

NCRP's main projects and functions

The NCRP conducts several research projects throughout the Northeast and is also responsible for fulfilling certain key functions. The main projects underway include the Study Fleet program, various Industry-based Surveys, the Fishermen's Logbook and Data Recording System (FLDRS), support of other electronic reporting initiatives (i.e., electronic Vessel Trip Reporting - eVTRs) and Enhanced Biological Sampling (mainly for the NEFSC's Population Biology Branch). The staff (which is comprised of 3 FTEs and 9 contracted people) assist in several projects with various other branches of the NEFSC and external research partners. The key functions of the NCRP include its role in building solid relationships with commercial (and, more recently, recreational) fishing sectors in the region, improving trust and respect between the NEFSC and fishermen, and oversighting the administration and approval of certain funding processes (the latter function is discussed in a separate section of this report). In doing the above (and other completed) projects and functions, the NCRP has enjoyed significant success over a lengthy period of time. I discuss the main examples below:

Projects:

The NCRP's (now completed) project, the Conservation Engineering Network (CEN), established a variety of projects to develop, test and implement gear-based solutions to particular bycatch issues in the Northeast. Since the formal program finished, its legacy is a variety of bycatch reduction technologies available in the region, with some implemented as mandatory and others voluntarily used. Furthermore, the program has established a significant number of fishing gear experts in the region who continue to work on bycatch issues as they arise. While some people interviewed suggested a re-ignition of the CEN, this is probably not warranted at this time because, as noted above, the former CEN achieved its goal of establishing the necessary expertise and experience, in industry, academia and other agencies, that are now available to tackle issues as required.

The current FLDRS work involves numerous fishermen electronically recording data on retained catches of target species, retained bycatch species and discards on a tow-by-tow basis. This is clearly an excellent initiative providing (in relatively short time frames – ie. shorter than paper-based VTRs) catch and effort data at particularly fine spatial and temporal scales. And the catch data collected from this program and the eVTR program, at least at an aggregated level, are used in stock assessments as estimates of catch (replacing similar data provided by paper-based VTRs). There are also other successful uses of such data – including, for example, the identification of "hotspots" of key species (such as river herring) which inform fleets about where and when not to fish, and the combination of such data with bottom temperatures and other ecosystem parameters to assist in Ecosystem-based Fisheries Management (EBFM).

eVTR will, no doubt, eventually replace paper-based VTRs as the main way catch and effort data are collected in the region. Indeed, many see an ideal future where such a system, in combination

with validation of the reported data using video cameras, would yield a low cost, accurate, fishery-dependent data collection regime, augmenting the data collected by human observers. The only real negatives associated with this work concerns its current coverage (a relatively small number of vessels use the technology) and the minimal use of much of the detailed data collected in stock assessments (discussed in the next section of this report).

The Study Fleet is regarded by many as a great success, even though only a relatively small (approx. 35) number of operators are actually contracted. The program supplies excellent information on a variety of parameters – some of which have been vital for revising certain stock assessments (e.g., for butterfish, scup and bluefish). An additional, subtle, but very important side-benefit of the Study Fleet program was articulated most eloquently by a fisherman: that the fishermen involved in such programs obtain significant personal development and education and therefore enable them to become future leaders in the industry, members of committees and Councils and, overall, better citizens. Clearly, the cost-effective expansion of this program (on both commercial and recreational vessels) should remain a key objective of the NCRP in the near and medium-term, assisted by other appropriate branches in the NEFSC like the FSB and DMS.

Likewise Industry-based Surveys (like the Northeast Area Monitoring and Assessment Program – NEAMAP, the "Sentinel" longline/jig groundfish survey and the cusk longline survey) have proven to be quite important in filling spatial, temporal and selectivity gaps that traditional fishery independent trawl surveys (such as those done by the NOAA ship Henry B. Bigelow) do not cover. And it was recently announced that the use of industry vessels to do such surveys may increase significantly in coming years, which obviously will require the services of the NCRP.

The Enhanced Biological Sampling work done by the NCRP and its cadre of fishermen is a vital program for the NEFSC's Population Biology team where particularly important samples of species in key places and times are collected. These provide better estimates of parameters for stock assessments and ecosystem modelling such as those concerned with reproductive biology, stock delineations, diets, etc. Clearly this work represents a unique opportunity to provide such material, is working well, and should continue to do so.

Functions:

With regard to the NCRP's functions in establishing good industry relationships and greater trust and respect between the NEFSC and fishermen, it is apparent that the staff have excelled in facilitating, over a long period, very good relationships with many fishermen in the region in key ports. In fact, most fishermen and industry representatives interviewed were glowing in their praise of the NCRP staff and how they established and maintained such relationships. It is therefore clear that to achieve the NEFSC's Strategic Plan's goals to increase trust and respect from industry, as well as increase the use of their data, the Center will need to take full advantage of the experience and expertise in relationship-building that resides in the NCRP. There are only 2 disappointing aspects with regard to the NCRP's relationship-building:

Firstly, the main focus of the enhanced relationships between the NCRP and the fishing industry concerns those (relatively) few commercial fishermen directly engaged in the NCRP's projects (ie. the Study Fleet, the FLDRS work and the Industry-based Surveys). This means that there exists a perception of the existence of two groups of fishermen with respect to the NCRP – those that are "in" and those that are "out". A variety of reasons were posited for this situation – such as funding limitations, staffing levels, logistics, favouritism, history, fishermen's finances, geography, and combinations of these. (Indeed, there is a study by the University of New Hampshire indicating a geographical trend in fishermen's reasons for engaging in the Study Fleet - where operators in Maine and New Hampshire - with smaller, less profitable boats - saw it mainly as a source of income, while those in Massachusetts and Rhode Island were more involved for the influence that such engagement can have on fisheries science and management.) But whatever the reason(s) for the engagement or non-engagement of individual fishermen, greater inclusiveness of as many and diverse operators as possible in such programs is needed if positive relationship-building between the NEFSC and industry is to expand.

A second issue regarding the NCRP's relationships with industry concerns a perception by a few interviewees that the NCRP operates somewhat separately from the rest of the NEFSC. And, obviously, it would benefit the NCRP (and the NEFSC as a whole) to minimize such perceptions.

Minimal use of data from the NCRP

The above section outlined several of the NCRP's project and functions, and illustrated the importance of the group's experience and expertise for the NEFSC as it implements its Strategic Plan. This section examines the most common problem identified in this review, by almost ALL people interviewed: the minimal use of data from the program in routine stock assessments - particularly tow-by-tow, catch and effort data, sometimes augmented with bottom temperature data, from the Study Fleet, and data from FLDRS.

Because fishermen know that changes in fisheries management, and in particular the setting of Annual Catch Limits, come directly from NEFSC's stock assessments, they believe that the use of industry data in such processes would improve their quality and rigour. And the current minimal use of such data is contributing to distrust throughout industry of the stock assessments done and, in turn, the management decisions that derive from them. Such issues are also said to be having consequences for the NCRP's programs themselves by causing some participants to lose interest or leave the program, or only staying involved due to the payments received.

A regular point made in many interviews used the butterfish stock assessment work as an example of how industry-based data can (and should) be used to inform stock assessments. This work involved the application of fine-scale study fleet catch and effort data with bottom temperature information to improve the assessment for this "choke" species which then led to an increase in permitted squid landings. However, some in the Population Dynamics Branch noted that, whilst these data were used, it actually made little difference to the assessment. Whether the latter is the case or not matters little, however, as the key point, from an industry perspective, is that their data found its way into a routine scientific assessment which, ideally, they would like to see happen for many (if not all) species. If this were done, fishermen believe that a far more accurate picture of the status of stocks will be obtained and therefore lead to greater estimates of abundance of certain species, higher catch limits and reduced problems associated with "choke" species whose low limits curtail their ability to land other species. Because of the frequency (and voracity) of such comments, its identification and amelioration became a key focus of this review.

Several reasons were given for the minimal use of industry-based data which can be summarized as: (i) the Population Dynamics Branch's preference to use datasets from the fishery independent surveys and observer program (with their own particular limitations) rather than industry-based data which may be biased and/or inaccurate; and (ii) the slow and/or non-provision of industry-based data to the Population Dynamics branch by the NCRP.

The following is a set of steps that may assist in this regard.

Firstly, the Population Dynamics Branch could more fully consider various techniques to incorporate industry-based data into stock assessments. Risk-based assessments, Bayesian techniques, data-weighting methods, randomized subsampling of tow-by-tow data, simulation

testing and other methods have all come a long way in recent years. Indeed they are becoming quite common-place throughout the world as jurisdictions use industry-based data to assist in stock assessments. And my cursory examination of this situation in the Northeast suggests that, while some attempts at using such tools may have occurred in the past, they are not being routinely considered - even though the models should be able to quite readily incorporate them.

But notwithstanding this, it is also incumbent upon the NCRP (and its cadre of fishermen) to provide industry-based data to scientists in the Population Dynamics Branch as quickly as possible, in its rawest form and after adhering to stringent and rigorous data collection protocols which the Population Dynamics scientists and others at the NEFSC have assisted in developing. That is, it is difficult to suggest that one part of NEFSC use industry-based data if those data are not collected and provided in a timely and scientifically rigorous fashion.

But the latter is not just a task for the NCRP. The Data Management Services Branch also need to be involved – particularly in improving the data portal available to fishermen and other current (and potential) users of eVTR data. I examined this tool in a fisherman's home and, whilst it was slow and not very user-friendly, with relatively little work it could be made into a good reporting tool – not only allowing fishermen to obtain summaries and reports of their own data but, more importantly, to allow NEFSC scientists and GARFO managers to obtain raw data and/or summaries across vessels in particular fisheries – all within days of collection. By examining such information, NEFSC scientists would not only gain an appreciation of its current value but also, more importantly, be able to work with the NCRP to modify subsequent data collection designs and so add value and utility to the information gathered.

In addition to increasing the use of industry-collected data by the Population Dynamics Branch for stock assessments, other uses of the data collected by NCRP and its cadre of fishermen should be explored within the NEFSC more broadly. For example, it was very surprising when talking to some people in the NEFSC for my interviews to become reversed – where significant time was spent with me explaining what the NCRP did and how it may be able to assist their work. There is clear potential for industry data to provide information about rare-events at sea – such as sightings of protected species, unusual locations/times of spawning events, atypical larval blooms, temperature and climate anomalies, etc. Another use is the wealth of data that the NCRP can provide on various physical and biological parameters that the Ecosystem branch are using (and could potentially use more of) to inform EBFM. In other words, there exists clear potential for industry-gathered data to be used by many scientists within the NEFSC in a variety of ways – not just by Population Dynamics scientists for stock assessments.

In terms of potential ways to address the current minimal use of NCRP data, I suggest that NEFSC consider the following steps:

- Convene (within a month or so) a dedicated workshop involving <u>all</u> NEFSC scientists (especially Population Dynamics scientists), all NCRP staff (the 3 FTEs as well as the impressive group of contracted staff), appropriate GARFO fisheries managers, and

facilitated by a strong chairperson (either a senior NEFSC staff member or an independent).

- The first part of this workshop should involve the NCRP presenting on current and potential activities of the programs' industry-based data-gathering operations.
- Next should follow an overarching goal-setting discussion (led by a member of the NEFSC leadership) elucidating the sorts of long-term, strategic, Center-wide goals to which the NCRP's work could contribute.
- Next should follow discussions (ideally in smaller break-out groups) of possible uses of the data gathering opportunities that the NCRP currently, and more importantly, could potentially provide that would assist in achieving the goals identified.
- As these opportunities are explored, individual NEFSC scientists and NCRP staff should be formed into small teams/partnerships charged with developing these opportunities into actual projects via ongoing iterative, one-on-one discussions among themselves during and in the days and weeks after the workship. In such partnerships, the scientist should be responsible (right from the start) for developing a sound statistical design for the work, and the NCRP staff member should be responsible for determining how, where and when it can be put into place and on which fishing vessel(s). At this point the identified industry partner(s) would join the team (for trawl fisheries, this may involve a linkage with NTAP). In addition, if and when appropriate, a relevant fisheries manager should also join the team.
- As for any research project, the team should provide proper, documented outlines of the research to be done, including it background, priority, objectives, methods, format of expected results, how the data will be analysed and used, and dated milestones against which performance can be monitored.
- And of course this documentation for all such projects should then be prioritized and, if appropriate, approved by NEFSC's leadership.
- Following this internal process and the bedding down of these teams/partnerships, the outputs (in terms of the projects developed and approved) should be explained (and endorsements sought) in briefings to industry groups, Management Councils, funding bodies and NGOs if and as appropriate.
- Next, once approved (and funded), the projects should be executed and the data collected go to the team's scientist for analysis and use in stock assessments or other outputs.
- This process does not end there. Rather, the whole process should be repeated at least annually so that, within just a few years, the whole Center shifts its momentum towards working more collaboratively with the fishing industry instead of independently.

It is worth noting that the above is simply broadening and formalizing the model used in some of the NCRP's success stories – where particular partnerships between individual NEFSC scientists and the NCRP resulted in good scientific and management outcomes (eg. the enhanced biological sampling work, the river herring work and assessments for scup, bluefish and butterfish).

Advantages with this collegiate approach are several. It should lead to: (i) an expansion throughout the whole NEFSC of the philosophy of doing research in co-operation with industry

(which itself is undergoing a generational shift to more technology-savvy operators), instead of such research being viewed as something done by one isolated branch; (ii) a much greater use of industry-based information in models and analyses and therefore improved acceptance of management decisions by industry; (iii) enhanced training opportunities for contracted NCRP staff as they will be mentored by professional NEFSC scientists; (iv) enhanced awareness for NEFSC scientists of the advantages and practicalities of doing industry-based research (which they will learn from their NCRP and industry partners); and (v) a reduction in the current communication breakdowns that seem to be inherent throughout many parts of the NEFSC (the so-called "stove-pipes" that were so often mentioned). But critical to the success of this project-specific, partnership approach will be the acceptance of, and respect for, the process by all line-managers of the staff involved.

Oversight of External Funding

One function of the NCRP that was mentioned earlier concerns its oversight of certain funding processes, in particular the core federal funds provided to the NCRP and the various RSA programs. The latter work running RSA processes has, in recent years, become somewhat tangential to the main projects of the NCRP (the Study Fleet, Industry-based surveys, Enhanced Biological Sampling, etc. – discussed above) as these latter tasks have grown. And, because these latter tasks are likely to continue to increase in coming years as the NEFSC's Strategic Plan is implemented, the oversight role of funding processes like the RSAs will likely continue to become even more tangential to the group's main activities.

As noted earlier when discussing the various understandings of "Co-operative Research" in the region, to many groups, the main (sometimes, the only) role of the NCRP is seen to be running certain funding processes. It is, in fact, seen by many applicants for funding from these sources, and confirmed by senior NCRP staff, that the main decisions about the success (or otherwise) of applications resides with the NCRP Acting Chief. It is easy to identify why this position has this role – basically it was inherited from one of the staff of the group when the scale of funding was quite modest. But it is quite difficult to see how such a role (especially for the RSA programs) still belongs in this group – whose most important skills, experience, expertise and future role in the NEFSC reside in its industry-relationship-building capacity – not running funding processes.

It was also mentioned in many interviews that the scale, complexity, and competitiveness of these funding processes have grown in recent years to such levels (eg the Scallop RSA is now worth around $15 million/year) that, in many people's minds, funded projects are not tracked well, lack accountability over expenditures and do not always deliver good value for money. That is, it appears that there lacks a rigorous process by which the government (and other stakeholders) can ensure that researchers deliver on projects funded by the NCRP and the RSAs. Ideally, all research projects should have clear periodic milestones throughout their life, against which payments are made following the satisfactory completion of progress reports. And of course final payments should only occur after the completion and acceptance of final reports, the provision of the raw datasets produced and the meta-data that describes them.

The oversight, approval and tracking of RSA projects (especially for scallops) are such important issues, and occur at such a significant scale in the region, that they really warrant a more specialist and representative process, and not one that basically relies on just one individual in the NCRP. Furthermore, the NCRP is seen by some external research providers as having a potential conflict of interest with respect to judging projects that may overlap with those being done (or that may be done) by the NCRP itself (or the NEFSC). Whether this is true or not, such a perception compromises the appearance of fairness and accountability. So, whilst the current RSA process that involves open calls, anonymous technical and management reviews, etc. is a good one and well-administered by the NEFSC's Federal Programs Officer, the assessment and summarization of

all this feedback into final decisions regarding applications, in addition to the detailed tracking of the performance of projects, requires greater scrutiny, transparency and accountability.

For the Scallop RSA (at least), therefore, final decisions on funding and the tracking of performance should be oversighted by a known, named committee (or board) with appropriate industry and government representation and independently chaired. Such a committee should also be able to fund projects more strategically via, for example, the partitioning of money for several years for long-term survey-type work – instead of the current 1-2 year life cycle of most projects, as well as trying to synchronize the timing of various funding processes.

Whilst this suggested process should improve the accountability of projects and expenditures, it does mean additional work for the government in establishing and staffing such a process, running the committee, tracking projects, chasing researchers, etc. Which is even more reason to have it run by a separate, small team, effectively freeing up the significant time currently spent on such work by the NCRP for that which they are uniquely suited: the high priority (and expanding) tasks required for the development of industry-based data collection systems.

Communications

A key problem detected during this review involved issues concerning communication about the NCRP within and outside the NEFSC. Within the NEFSC, there were several occasions when, during interviews, scientists did not know much at all about the work of the NCRP, its structure and role, nor any details about where, when and how it engages with the fishing industry. Such a situation contributes to the minimal use of data from the program, curtails its data collection systems from realizing their full potential and therefore should be rectified as soon as possible. And the suggested workshop/partnering process mentioned earlier should lead to a significant improvement throughout the NEFSC in understanding what the NCRP does and, more importantly, could potentially do, for science throughout the Center.

In terms of communication issues outside the NEFSC, many stakeholders only seemed to know about particular subsets of the work done by the group depending on their viewpoint. As mentioned earlier, university-based scientists lack an appreciation of the Study Fleet and Industry-based survey work, yet are quite familiar with the NCRP's role in funding oversight. Whilst many fishermen understand the Study Fleet and Industry-based survey work but very little about the NCRP's role in funding. And, as is the case when incomplete understandings exist, the gaps are often filled with rumour and innuendo.

A first step to improve the understanding of the NCRP's work by external stakeholders is to ensure that those parts of the NCRP's data sets that ARE used for management purposes are adequately communicated to all appropriate stakeholders. That is, whilst many people told me that data from the Study Fleet and eVTRs are not used in stock assessments, a closer look reveals that this is simply not the case. It is true that most of the tow-by-tow, detailed information collected is not used in routine stock assessments, but the catch data from such systems (albeit at an aggregated level) are used directly in assessments, as are the data from the Industry-based surveys and the information that comes from enhanced biological sampling. Some people thought that the Marine Resource Education program (MREP) should do much of this communication and, if that is the case, then it is clearly not doing enough. Better, targeted outreach systems, including short You-tube-like videos that fishermen and other stakeholders can easily see on their phones should reduce the perception that nothing from the NCRP is ever used.

Additionally, particular success stories about occasions where data from the program have led to changes in fisheries management should be espoused - again using appropriate outreach tools (like short videos – not paper mail-outs). Examples include the butterfish assessment, the myriad Conservation Engineering solutions from the CEN, the provision of ecosystem parameters for EBMF and oceanographic work, the enhanced biological sampling program, etc.

There also exists varying levels of understanding about what the NCRP does between the fishermen directly involved in the program (often referred to as the "in club") and those not involved. Such a perceived demarcation among fishermen with respect to something termed "co-operative" research is clearly not ideal and requires attention as soon as possible. There exists at

least two obvious ways to ameliorate such perceptions: (i) expand the size and geographic range of the Study Fleet and other NCRP initiatives – ie. do not always use the same boats to do projects; and (ii) more effectively communicate with all vessels in the fleet(s) about the work underway - not just the relatively small subset directly engaged.

NCRP Structure and Staffing

The NCRP is comprised of a small group of staff in a quite flat organisational structure, led by 3 permanent federal FTEs who are apparently similar in seniority, although one of these, the Acting Chief, is regarded as the leader of the group. Under these 3 permanent staff are 9 contracted field and IT staff. All 12 people in the branch are geographically and strategically spread throughout the Northeast, in order to facilitate the group's engagement with fishermen - this is clearly one reason for the group's success. However, such geographic separation also has its disadvantages, with the contracted staff being relatively unsupervised and, as they say, "left to their own devices" for most of their day-to-day work.

Such a lack of direct supervision of the contracted staff (due to geographic separation and/or the lack of a designated, formal supervisor caused by their contracted status) is a cause for concern as it has, for example, led to situations where such staff apparently identify and develop their own projects with industry that goes through no formal prioritisation or approval process by the NEFSC leadership – just relatively informal approval and endorsement by the NCRP Acting Chief. The development of such ad-hoc projects by such staff, with minimal scientific oversight or supervision, is clearly not ideal and should be replaced with the above proposed system to develop properly designed, prioritized, approved, mentored projects with NEFSC scientists.

The geographic separation of staff and their somewhat loose supervision also presents challenges for communication, team-building, and training opportunities. Such issues, combined with the contracted employment status of the field and IT staff, gives these people a sense that there exists little scope for advancement or development - which could lead to the loss of some of these very impressive people. Solutions to such a situation may, however, be administratively complex because they are technically not directly employed by NOAA even though, for all intents and purposes they are regarded as NOAA staff – and certainly in the eyes of the fishing industry. So, despite the difficulties associated with managing these "external" staff, NEFSC should find some way to better supervise them, as well as provide appropriate training, courses, opportunities to attend conferences, etc. (as occurs in the FSB – see next section). Also, as mentioned above, the partnering of such people on specific projects with other scientists within the NEFSC should also provide opportunities for significant on-the-job scientific mentoring and perhaps even the opportunity for them to undertake part-time Masters or PhD projects based on the research done.

The NCRP's 3 permanent staff do not function as cohesively as one would wish, perhaps because they are based in different locations (and even in different states). Clearly, as the needs of the Strategic Plan are implemented and the NCRP's role expands, this situation will need to be addressed - and could be accomplished most effectively by some co-location of NCRP staff with other Center scientists (and vice versa) - perhaps on a rotating basis.

Another concern is the lack of any clear succession plan for the group. NEFSC leadership needs to bear this in mind as it re-organises the rest of the Center and identifies roles for its staff more

broadly. And, by extension, this will need to become a focus for the new Divisional Director of the group.

Recommending a better structure for the NCRP than its current flat, geographically spread structure is difficult at the present time because, for the most part, it works reasonably well for the main tasks that the NCRP does: the liaison and maintenance of working relationships with a relatively small cadre of fishermen. It therefore would not be wise (at least at the present time) to risk any disruption to such tasks via any sort of drastic geographical consolidation or restructure. However, as the work done by the group increases over the next few years, a restructuring into more strategically organised, function-based teams will probably become necessary. And the types of categories that may be appropriate would logically be based around Field Services (commercial and recreational) that are geographically-based, and a Database/IT/Outreach Services group that could be shared with the FSB in the new Division. However, notwithstanding any sort of internal restructuring within the group, the main emphasis for how individuals function on a day-to-day basis should be firmly embedded in the Center-wide partnerships proposed earlier.

There is one geographical staffing issue that is important to address at the present time however: the lack of a major presence in the Mid-Atlantic region. Many people interviewed from the that region identified the current paucity of co-operative research staff and made clear requests for an increased presence to be built to satisfy the particular concerns and objectives of the Mid-Atlantic Fisheries Management Council. There is therefore a need to locate at least 1 FTE (and ideally one or more field staff) in the region (probably at Sandy Hook) in order to develop co-operative research opportunities in the area, including responses to the needs of the Council and the growing priority associated with the engagement of recreational fishermen in data-collection programs. Whilst the latter is occurring to some extent under the supervision of the Gloucester-based Cooperative Research Coordinator, this work needs to accelerate and should do so with a heightened presence in the mid-Atlantic where more recreational fishing occurs.

During the review, there was some discussion of the need for additional analytical support to provide the NCRP with the means to examine appropriate methodological questions concerning statistically adequate sampling coverages, levels of replication, etc. Such a need is quite important for the NCRP but is not unique for this branch as the work of the FSB (and I am sure other branches within the Center) may benefit from such statistical input. This suggests that such analytical support should become more of a Center-wide initiative rather than one that just resides in the NCRP – although the first focus for such analyses would ideally be the NCRP's industry-based programs.

This review concluded that the current level of human resources in the group is adequate to manage the current numbers of fishermen in the Study Fleet, FLDRS and other projects. Whilst the senior staff of the NCRP noted that they would like additional IT, database, scientific and analytical support within the branch, it should be possible for the current numbers of staff to expand the number and range of fishermen with whom they interact without large increases in resources – providing the recommended changes suggested here are made (ie. the partnerships with other

NEFSC scientists, the separation out of RSA funding oversight, closer supervision of staff by senior FTEs, and taking advantage of the support opportunities that should arise by the combination of the NCRP into the new Division with the FSB (the next section).

Potential Synergies between the NCRP and the FSB

The combination of the NEFSC's FSB with the NCRP into a new division (the Fishery Monitoring and Research Division) offers significant opportunities that should improve fisheries monitoring and fishery-dependent data collection in the region. These include the following:

- As the Study Fleet, Industry-based Surveys and/or other industry-based data collection systems expand over the next 5 years (as the Strategic Plan is implemented), the identification of vessels and captains who may be potential candidates for such work should be assisted by leaning on the FSB's long experience in working with a very broad range of fishermen in the region. That is, the many observers, field staff, debriefers and senior staff of the FSB have a wealth of experience and expertise dealing with, and understanding, most of the fishermen across most fisheries. Working with NCRP staff to identify suitable candidates for co-operative research projects should therefore be a relatively simple, and rewarding, process for the new division. One tool to assist with this could be the establishment of a "match-making" database containing a directory of the characteristics of vessels available for research projects that can be shared throughout the Center and with external research providers.
- The NCRP's FLDRS information could be used to assist in identifying key locations and times for observer coverage in subsequent years. Also, because such data provides close-to real-time information at fine spatial and temporal scales, it may also assist in the logistics of deploying observers.
- The FSB's work in running Electronic Monitoring (EM) trials and developing tablet-based technology for data collection could also meld with NCRP's efforts with the eVTR/FLDRS systems. That is, it should be possible to combine the experience and expertise of the relevant staff in these 2 branches to develop the "holy grail" of industry-based data collection: simple, hand-held, real-time data collection tools whose information is validated by random, periodic subsampling of footage from EM cameras. Such systems are gradually becoming implemented in many fisheries in the world with significant success and cost-effectiveness – especially because they reduce criticisms of industry-collected data as inaccurate or biased. In developing such technologies, it would also prove fruitful to consider the impressive App-based data collection system already used in the crab/lobster fishery by the Commercial Fishermen's Research Foundation – with which FSB staff are familiar. It is clear that such systems will, within a few years, become a mainstream way to collect information on catches and discards in many of the world's fisheries, reducing the scale of human observer programs. And the NEFSC's new division which combines the relevant eVTR, tablet, EM and Observer experience should be well placed to contribute to such advancements.
- In terms of support services, the combination of the FSB and the NCRP into one division should provide opportunities in terms of sharing Administrative, IT, field training and outreach support due to the increased economy of scale that the larger group provides.

That is, both groups have significant administrative support, the FSB are specialists in providing safety and other field training and are pro-active in offering courses and conferences for staff, and the NCRP has several dedicated and quite proficient IT/database staff. It should be relatively simple for the new Divisional Director to allocate such support services across the 2 branches so that collectively they enhance the productivity of both – perhaps by combining all appropriate support staff into a dedicated, intra-divisional support team.

Concluding Thoughts

The NEFSC's new Strategic Plan aspires to have more fisheries science done in co-operation with the fishing industry. This is not just using industry vessels as research platforms but also using fishermen's knowledge and observations as scientific information in empirical model-building and, eventually, in management decisions. To do so, the NEFSC needs the significant experience and expertise in building relationships with the fishing industry that resides in the NCRP group, to infiltrate throughout other parts of the NEFSC that currently interact much less with industry.

This can begin to be done via 2 significant changes in the way the group works: (i) removing from the current NCRP that task which is basically tangential to its industry-relationship-building function (ie. the RSA funding oversight work) in order to allow the group to concentrate on what it (uniquely) does best; and (ii) instigating Center-wide, project-specific partnerships or teams involving NCRP staff and appropriate scientists and the fishing industry. Such a model has worked well in various isolated instances and, whilst a momentum shift towards industry-based research throughout the agency could occur at this current pace of one example at a time, for the Strategic Plan's goals to be fulfilled within its life of 5 years, this shift needs to accelerate. The proposal to establish a formal process to create Center-wide partnerships between NEFSC scientists and the NCRP's FTEs and contracted staff should expedite such a shift.

If this is done, improvements should occur in: the scientific information available to manage fisheries, the trust and respect garnered from the fishing industry for NEFSC science, the respect that scientists have for information that comes from industry and, ultimately, industry's acceptance and ownership of fisheries management decisions in the region.

Summary of Recommendations

The previous pages contain a significant amount of commentary, peppered with numerous recommendations regarding how to improve the NCRP and its operations. This section summarizes these recommendations, beginning with an overarching comment:

- To achieve the NEFSC's Strategic Plan's goals to work with the fishing industry more, increase the use of industry data and improve trust and respect between fishermen and scientists, the NEFSC will need to take full advantage of the experience and expertise in relationship-building that resides in the NCRP.

NCRP's main projects and functions

- The cost-effective expansion of the Study Fleet, FLDRS and other eVTR initiatives to as many and diverse commercial and recreational vessels as possible should remain a key objective of the NCRP in the near and medium term, and assisted by other appropriate branches of the NEFSC like the FSB and DMS.
- The recently stated intention for the NEFSC to increase the use of fishing vessels to do survey work is lauded and will require the services of the NCRP.
- The Enhanced Biological Sampling work done by the NCRP represents a unique opportunity to provide important material for improving estimates of key parameters in stock assessments, is running well and should continue to do so.
- The NCRP staff need to bear in mind (and ameliorate where possible) a perception by some that they stand separately from the rest of the NEFSC.

Minimal use of data from the NCRP

- NEFSC's Population Dynamics Branch should explore more varied techniques to incorporate industry-based data into stock assessments including Risk-based assessments, Bayesian techniques, data-weighting procedures, randomized subsampling of tow-by-tow data, simulation testing and other methods.
- The NCRP (and its cadre of fishermen) should provide industry-collected data to scientists in the Population Dynamics Branch and others as quickly as possible, in its rawest form and after adhering to stringent and rigorous data collection protocols which those scientists and other users have assisted in developing.
- Other scientists in the NEFSC (not just those in the Population Dynamics branch) should examine the Study Fleet program and eVTR/FLDRS data as mechanisms to obtain data on such things as rare events at sea – eg. sightings of protected species, unusual locations/times of spawning events, atypical larval blooms, temperature and climate anomalies, etc. as well as the continuing work on providing information on physical and biological ecosystem parameters that can inform EBFM

- The eVTR data portal available to fishermen should be improved as a reporting tool to not only allow fishermen to interrogate their own data but, more importantly, to allow NEFSC scientists and GARFO managers to see raw data and/or summaries across vessels in particular fisheries, in very quick time. These users will then not only appreciate the current value of such information but also, more importantly, be able to work with NCRP to modify subsequent data collection designs and so add value and utility to the information gathered.
- The NEFSC should also undertake the following steps:
    - Convene (as soon as possible) a dedicated workshop involving all NEFSC scientists (especially those from the Population Dynamics branch), all NCRP staff (the 3 FTEs as well as the group of contracted staff), appropriate GARFO fisheries managers, and facilitated by a strong chairperson (either a senior NEFSC staff member or an independent).
    - The first part of this workshop should involve the NCRP presenting on current and potential activities of the programs' industry-based data gathering operations.
    - Next should follow an overarching goal-setting discussion led by the NEFSC leadership elucidating the sorts of long-term, strategic, Center-wide goals to which the NCRP's work could contribute.
    - Next should follow discussions (in small break-out groups) of possible uses of the data gathering opportunities that the NCRP currently, and more importantly, could potentially provide that would assist in achieving the goals identified.
    - As these opportunities are explored, individual NEFSC scientists and NCRP staff should be identified to form small teams/partnerships charged with developing these opportunities into actual projects via ongoing iterative, one-on-one discussions among themselves during and after the workshop. In such partnerships, the scientist should be responsible for developing a sound statistical design for the work, and the NCRP staff member should be responsible for determining how, where and when it can be put into place and on which fishing vessel(s). At this point the identified industry partner(s) would join the team. In addition, if and when appropriate, a relevant fisheries manager should also join the team.
    - As for any research project, the team should provide proper, documented outlines of the research to be done, including its background, priority, objectives, methods, format of expected results, how the data will be analysed and used, and dated milestones against which performance can be monitored.
    - And of course this documentation for all such projects should then be prioritised and, if appropriate, approved by NEFSC's leadership.
    - Following this internal process and the bedding down of these teams/partnerships, the outputs (in terms of the projects developed and approved) should be explained (and endorsements sought) in briefings to industry groups, Management Councils, funding bodies and NGOs if and as appropriate.

- Next, once approved (and funded), the projects should be executed and the data collected should go to the team's scientist for analysis and use in stock assessments or other outputs.
- This whole process should be repeated at least annually.

Oversight of external funding

- Separate out from the NCRP the (somewhat) tangential function it provides in oversighting and approving the RSA processes, effectively freeing up the group to work on the high priority (and expanding) tasks required for the development of industry-based data collection systems – for which the group is uniquely suited.
- Instead, a small, separate office within the NEFSC should be established to create and administer a known, named committee (or board) with appropriate industry and government representation (and independently chaired), whose function would be to make final decisions on the funding of RSA projects and the tracking of their performance.
- This committee should also be able to fund projects more strategically via, for example, the partitioning of money for several years for long-term survey-type work – instead of the current 1-2 year life cycle of most projects, and attempt to synchronize the timing of various funding processes where possible..
- In addition, all projects funded by the RSAs and the NCRP should have clear periodic milestones throughout their life, against which payments are made following the satisfactory completion of progress reports. And of course final payments should only occur after the completion and acceptance of final reports, the provision of the raw datasets produced and the meta-data that describes them.

Communications

- The partnering process mentioned above should lead to a significant improvement in communications throughout the NEFSC - at least in terms of understanding what the NCRP does and, more importantly, could potentially do, for science throughout the Center.
- Ensure that those parts of the NCRP's data sets that ARE used for management purposes are adequately communicated to all appropriate stakeholders using targeted outreach systems, perhaps including short You-tube-like videos that fishermen and other stakeholders can easily see on their phones. This should reduce the perception that nothing from the NCRP is ever used.
- Additionally, particular success stories about occasions where data from the program have led to key changes in fisheries management should be espoused - again using appropriate outreach tools.

NCRP structure and staffing

- As the needs of the Strategic Plan are implemented and the NCRP's role expands in the region over the next few years, the geographical separation of the program's staff should

be addressed. In addition, a restructuring of the group into more strategically organized, function-based teams will probably become necessary. And the types of categories that may be appropriate would logically be based around Field Services (commercial and recreational) that are geographically-based, and a Database/IT/Training/Outreach Services group that could be shared with the FSB.

- There is a clear need to locate at least 1 FTE (and ideally one or more field staff) in the Mid-Atlantic region (probably at Sandy Hook) to develop co-operative research in the area, including the needs of the Mid-Atlantic Council and the growing priority associated with the engagement of recreational fishermen in data-collection programs.
- Succession planning for the group needs attention and should be borne in mind as the NEFSC leadership re-organises the rest of the Center. By extension, this will need to become a focus for the new Divisional Director of the group.
- The development of ad-hoc projects by contracted staff in the NCRP, with minimal scientific oversight or supervision should be replaced with the above-mentioned development of properly designed, prioritized, approved, mentored projects with other NEFSC scientists.
- To ameliorate the sense that there exists little scope for advancement or development of contracted staff in the NCRP, tighter supervision of these staff by the permanent employees should occur as well as the provision of appropriate training, courses, opportunities to attend conferences, etc. In any case, the partnering of these people with other scientists within the NEFSC should also provide opportunities for significant on-the-job scientific mentoring, and perhaps even the opportunity for them to undertake part-time Masters or PhD projects based on the research done (this will also assist with succession planning).
- There is a need for some analytical support for the NCRP (and probably other NEFSC branches) to examine certain methodological questions concerning statistically adequate coverages, levels of replication, etc. This would be best done via a Center-wide initiative whose first focus would be the NCRP's industry-based programs including the Study Fleet.

Potential synergies between the NCRP and the FSB

- The NCRP should lean on the FSB's experience in working with a very broad range of fishermen in the region to identify suitable candidates for co-operative research. One tool to assist with such a process would be a "match-making" database containing a directory of the characteristics of vessels available for research projects that can be shared not only throughout the Center but also with external research providers.
- The NCRP's FLDRS data (which provides close-to-real-time data at fine spatial and temporal scales) should be used to assist in the logistics of observer deployments.
- The FSB's work in running Electronic Monitoring trials and developing tablet-based technology for data collection should meld with NCRP's efforts with the eVTR/FLDRS systems to develop the "holy grail" of industry-based data collection: a simple, hand-held,

real-time data collection tool whose information is validated by random, periodic subsampling of footage from EM cameras.

- The combination of the FSB and the NCRP into one division should provide opportunities in terms of sharing Administrative, IT, field training and outreach support due to the increased economy of scale. This may be best done by combining all appropriate support staff into a dedicated, intra-divisional support team.