

Summary of Research Needs for a Defensible EIS on the Non-native Oyster

Prepared by the Federal Cooperating Agencies (EPA, FWS, NOAA)
August 31, 2004

The federal Cooperating Agencies have conducted a review of currently funded research on the non-native oyster, *Crassostrea ariakensis*, and have forecasted future steps needed to support a full evaluation of the proposed action and alternatives to achieve an adequate EIS. Associated costs have been estimated where possible, but additional scoping will be required for some items. This compilation is based on information needs and standards identified by the following sources:

- National Research Council (NRC, 2004)
- Chesapeake Bay Program Scientific and Technical Committee (STAC, January 2004)
- Council on Environmental Quality's Regulations For Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR Parts 1500-1508)
- International Council for the Exploration of the Sea (ICES) Code of Practice on the Introductions and Transfers of Marine Organisms (2003, U.S. is a signatory)

SUMMARY

- I. Establish a rigorous, tiered assessment process that includes the following five elements:
 - a. Develop a plan to fully evaluate the proposed action and all alternatives (cost?)
 - b. Identify assessment endpoints and analytical tools early in the process (cost?)
 - c. Hold quarterly workshops to share and apply research findings (\$100,000/year)
 - d. Obtain peer review of research results as they become available (\$24,000/year)
 - e. Conduct ongoing analyses and documentation (\$300,000/year)
- II. Continue to fill existing gaps in basic biological information about *C. ariakensis* (\$2M/year in FY05 and FY06)
- III. Provide for additional work to evaluate potential economic and socio-cultural impacts, particularly focusing on the following six areas:
 - a. Collect baseline economic and socio-cultural data (consult with academic and agency economists on cost)
 - b. Scale up the currently funded UMD socio-cultural project (\$150,000-200,000)
 - c. Utilize economic information from the Virginia Seafood Council Industry Trial (consult with VIMS on cost)
 - d. Obtain better information on public sentiment about a non-native oyster introduction (\$200,000?)
 - e. Obtain input from other states with native oyster populations and viable *C. virginica* fisheries and aquaculture industries (consult with ASMFC on cost)
 - f. Establish an Economics Advisory Group (no additional cost)
- IV. Fully implement all recommendations and guidance of the ICES Code of Practice on the Introduction and Transfers of Marine Organisms 2003, including submission of a detailed prospectus to ICES prior to a decision on the proposed introduction. (no additional cost?)

I. RISK ASSESSMENT AND EVALUATION PROCESS

The risk assessment and evaluation process is iterative in nature. A standard approach involves a succession of tiers, where the initial Tier 1 screening level analysis produces risk estimates with more uncertainty than a risk analysis conducted at a latter tier when more relevant data can be incorporated into the analysis to reduce reliance on conservative assumptions. As an analysis is refined through this iterative process, the risk estimates produced should become more definitive and certain, so that they form a more confident base for decision-making. The degree of refinement required, or how many tiers of analysis must be conducted, is a function of the tolerance of the decision making process to uncertainty in estimating risk and the consequences of making the wrong decision.

Work to date on the EIS can be considered a Tier 1 level of analysis. These efforts include the National Research Council report, which frames out many of the issues to be considered by the EIS, and current work being conducted by Versar, Inc. under contract to Maryland Department of Natural Resources (MDNR). This work is scheduled to be completed by March, 2005.

Full risk assessment at a Tier 3 level would include empirical, project-specific data, as described below in the sections on ‘Biological Information’ and ‘Economic & Socio-cultural Information’. A Tier 3 assessment also provides a baseline against which to monitor project impacts if the proposed action is implemented in the future. The significance of the proposed action suggests that a plan to carry the risk assessment through to a Tier 3 level of analysis is warranted. However, this plan should be developed with the understanding that sufficiently characterized estimates of risks and benefits for specific alternatives may be developed at lower tiers of analysis, depending on the results of the analysis and decision-making needs for that alternative.

➤ **Establish a rigorous, tiered assessment process that includes the following five elements:**

a. Develop a plan to fully evaluate the proposed action and all alternatives

To date, the risk assessment process has been focused on gathering information and developing analytical tools to evaluate the proposed action, to the virtual exclusion of considering how the seven identified alternatives will be fully evaluated in the EIS. The EIS Project Delivery Team (PDT) should develop a plan for how it will accomplish a full evaluation of all the alternatives. These alternatives went through the public scoping process and have been agreed upon by the PDT:

Alternative 1 – No action

Alternative 2 – Expand native oyster restoration program

Alternative 3 – Harvest moratorium

Alternative 4 – Native oyster aquaculture

Alternative 5 – Non-native oyster aquaculture

Alternative 6 – Introduce an alternative non-native species other than *C. ariakensis*

Alternative 7 – Combination of alternatives

b. Identify assessment endpoints and analytical tools early in the process

Ideally, data needs for the EIS assessments would be prioritized on the basis of: 1) identified assessment endpoints and 2) parameters to which the analytical tools (e.g., population

models, economic models) exhibit the greatest sensitivity. In reality, to make progress on the EIS as quickly as possible these efforts are all occurring simultaneously, although not comprehensively. As noted above, little progress has been made on developing assessment endpoints and analytical tools for evaluating the alternatives. For the proposed action, assessment endpoints are currently being developed by Versar, Inc. (MDNR's contractor), but are not yet available for review by the Risk Assessment Advisory Group (RAAG). Versar and the University of Maryland expect to have model construction and sensitivity analyses completed between December 2004 and March 2005 for the population and larval transport models. In the meantime, research funding decisions have been made by NOAA on the basis of guidance from the NRC report, the STAC report, independent technical reviews of project proposals, and Lead and Cooperating Agency representatives. Additional work and modifications to projects underway may be required once the full suite of assessment endpoints and model sensitivity analyses are available.

c. Hold quarterly workshops to share and apply research findings

Scientists funded to conduct research in support of the EIS should meet quarterly to discuss their latest results and identify ways to make that information immediately available for ongoing data analysis and evaluations. NOAA can require attendance by Principal Investigators at quarterly workshops as a special award condition for all projects funded through the agency's FY04 non-native oyster research initiative, to ensure their participation at no additional cost. Additional resources that would be required for such quarterly workshops include:

- Meeting space and meals for 1-2 day workshops (\$20,000 quarterly)
- Travel expenses and stipends for participation of independent, subject-matter experts (\$5,000 quarterly)
- Agency staff time for workshop organization (no additional cost)

d. Obtain peer review of research results as they become available

It is critical to ensure the high quality of information being used in the EIS. In many cases, research findings will be incorporated into EIS evaluations before those results can be published in the peer reviewed literature. Thus, it will be important to provide a mechanism for rigorous, ongoing peer review as information becomes available. Federal agency staff are available at no additional cost to coordinate peer review, but minimal funds should be available to secure the necessary commitment of time by independent reviewers. (\$8,000 quarterly)

e. Conduct ongoing analyses and documentation

As research results become available, there will be a need to create and manage databases of information on specific topics being evaluated in the EIS. Manpower and other resources will be needed to complete thorough assessments of the proposed action and each alternative, and to document these analyses for the EIS. (\$300,000 annually in FY05, FY06, FY07)

II. BIOLOGICAL INFORMATION (see Table 1)

There are seven primary topics for which basic biological information on *C. ariakensis* is needed:

1. Understand *C. ariakensis* within its native geographic range in Asia
2. Potential for population growth and sustainability of *C. ariakensis* in Chesapeake Bay
3. Susceptibility of *C. ariakensis* to known disease-causing parasites and pathogens
4. Interactions between *C. ariakensis* and native oyster species
5. Human consumption risk
6. Potential for *C. ariakensis* to become a fouling nuisance
7. Ecosystem services and functions

Additional detail is provided in Table 1, along with estimated timelines for current and future research on each subtopic. All past and currently funded biological research is shown on Table 1, regardless of funding source (i.e., MDNR, NOAA, EPA). Only essential and high priority information needs are listed; medium and low priority needs are not considered.

NOAA is currently processing awards for the FY04 non-native oyster research initiative. Proposals for research totaling \$6.7M (\$4.7M in year-1) were received in response to the notice of available funding. As part of a rigorous review process, NOAA invited representatives from the Lead and Cooperating Agencies to form the final ranking panel to ensure a tight linkage between EIS project management and research funding decisions. Approximately 40% (13 out of 33) of the proposals have been recommended to NOAA Grants for funding. Due to limited funds, many excellent proposals on topics of importance to the EIS were not funded. Most of the proposals advanced for funding are 2- or 3-year projects.

As demonstrated in Table 1, it is anticipated that the research needed to obtain the essential and high priority information related to basic biology of the non-native oyster can be completed by the end of 2007. However, this estimate should be continually refined in response to the assessment process as described in the previous section. The research timeline may also need to be modified in light of research results. Scientific understanding of a topic typically proceeds from necessarily simplistic initial inquiries to more comprehensive investigations of the relevant factors and processes. A single study is almost never sufficient to obtain significant understanding of a topic that is being addressed for the first time. This is particularly true when the questions involve ecological interactions. It is even more true for research on *C. ariakensis*, which is virtually new to science as the taxonomy of this oyster has been in a state of confusion and species boundaries within its native range in Asia are currently being redefined using genetic techniques.

With sufficient resources within this timeframe multi-year projects could be completed and additional topics not yet addressed could be covered. This research timeline is short relative to the five years of basic biological research called for by the NRC and STAC panels, as emphasized in a recent letter from the STAC Co-Chair (Attachment 1). Thus, the Cooperating Agencies presently view this research timeline as an absolute minimum.

- **Continue to fill existing gaps in basic biological information about *C. ariakensis* (\$2M annually in FY05 and FY06)**

III. ECONOMIC & SOCIO-CULTURAL INFORMATION

At this time, very little is known about the economics of the oyster fishery in the Chesapeake Bay and whether increased oyster production will have cultural and economic impacts. The EIS Project Delivery Team (PDT) should determine what work is needed to accomplish adequate economic and socio-cultural assessments in the EIS, and how to obtain the necessary information to conduct such assessments.

Maryland Department of Natural Resources (MDNR) has independently funded two projects:

- “Economic component of an EIS for proposed introduction of the oyster species, *C. ariakensis*, into the tidal waters of Maryland and Virginia to re-establish a naturalized, reproducing, and self-sustaining population of oysters”. This study is being conducted jointly by the University of Maryland and the Virginia Institute of Marine Science under a \$52,122 contract from MDNR, and involves 3 months of effort by the Principal Investigators (PIs).
- “Cultural analysis for EIS on oyster restoration alternatives”. This \$37,571 study is being conducted by the University of Maryland under contract to MDNR, and involves 5 weeks of PI time.

These two proposals were not subjected to a competitive process or independent technical review prior to funding by MDNR. Economic and cultural experts from EPA and the Army Corps of Engineers provided after-the-fact reviews of the proposals, and concluded that the projects will be informative but inadequate in effort (PI time) and scope to fully address these issues for the EIS.

➤ **Provide for additional work to evaluate potential economic and socio-cultural impacts, particularly focusing on the following six areas:**

a. Collect baseline economic and socio-cultural data

The NRC report recommends the collection of baseline economic and socio-cultural data over a 5-10 year period. The following excerpt from Chapter 10 of the report describes the needed data:

The contemplated actions are likely to engender substantial changes in the economic organization of the fishery and fishing communities. Therefore, the states of Virginia and Maryland should establish programs to collect baseline economic and socio-cultural data. Such data should include economic information on production costs, including capital and labor expenditures, market trends and marketing practices, and changes in economic strategies and decision-making in response to changes in the fishery. Socio-cultural information should be collected on household and community level responses to changes in the oyster fishery, and how such changes modify traditional socio-cultural norms of such communities. The collection of the economic and socio-cultural data should be coordinated to maximize integration and complementarity. The data should be collected at different levels of scale, ranging from Baywide to subregions and communities where existing industry structures (e.g., public versus leased), ecological conditions (e.g., salinity), and harvesting practices (e.g., power dredging versus patent tonging) could result in different socio-cultural and economic consequences.

The cost of collecting baseline economic and socio-cultural data collection should be scoped out with academic and agency economists.

b. Scale up the currently funded UMD socio-cultural project

Increasing the time and scope of the socio-cultural analysis being conducted by the University of Maryland under contract to MDNR will allow the Principal Investigators to test the reliability and validity of results from the current project. The University of Maryland researchers working on this project estimate this scale-up will cost \$150,000-\$200,000 for a 12-18 month project.

c. Utilize economic information from the Virginia Seafood Council Industry Trial

Beginning in 2000, the Virginia Seafood Council (VSC) has been conducting studies to investigate the aquaculture potential of *C. ariakensis*. The current VSC project involves private growers at eight sites in Virginia waters. This industry project is supplemented with \$1M of NOAA funding which provides support for biosecurity and biological monitoring. In 2004 the federal permit for this project was extended from June 30, 2004 to April 1, 2005 in response to a request by the VSC and growers participating in the trial, who reported they needed additional time to bring to market the *C. ariakensis* deployed in 2004. The federal agencies, VSC, and VIMS researchers cooperated to complete a risk assessment, resulting in permit conditions that would allow the project continue with minimal risk of adverse environmental impacts.

The federal agencies have supported this industry trial because of the important economic and biological information it promises to provide. This information must be fully utilized in the EIS. Biological information from the VSC trial will be made available for the EIS as specified by one of the permit conditions. It is less clear whether the economic information will be made available for use in the EIS. While recognizing the sensitive nature of market data in raw form, it should be possible to extract relevant economic information in non-sensitive, summary form for use in EIS assessments. The need is for the growers' financial and marketing data to be compiled and summarized in a useful form that does not compromise the privacy of individual growers. Researchers at VIMS involved with the economic aspects of the VSC trial should be consulted to determine the cost of this work.

d. Obtain better information on public sentiment about a non-native oyster introduction

Comments received during the EIS public scoping process indicate substantial public concern about the proposed introduction. The majority of comments received from general citizens (as opposed to members of the fishery or representatives of special interest groups) were against putting a non-native oyster in Chesapeake Bay. The Chesapeake Bay is a public trust resource with high public visibility both regionally and nationally. Furthermore, there is presently consideration for an Executive Order identifying the Chesapeake as a national treasure. Thus, a decision to introduce a non-native species should weigh, among other factors, how the general public – both within the Chesapeake Bay region as well as nationally – would view such an action.

Additional effort should be made to survey and quantify the sentiments of the general public regarding the introduction of a non-native species. This information will be crucial to the decision-making process, both for informing the ultimate decision and for identifying possible public education needs. The Alliance for the Chesapeake Bay completed this type of public opinion survey within the Chesapeake Bay region at a cost of \$200,000 as part of the Chesapeake Bay Program effort to develop the Chesapeake 2000 Agreement.

e. Obtain input from other states with native oyster populations and viable *C. virginica* fisheries and aquaculture industries

Other Atlantic coast states, especially those with viable oyster fisheries or aquaculture industries based on the native *C. virginica*, have a particular interest in the EIS. These states can also provide significant information for use in the EIS assessments. For example, the Delaware Bay has successfully applied harvest management strategies based on annual stock assessments to maintain both a sustainable native oyster population and a viable industry in the face of disease. In other areas, such as Long Island Sound and Maine, states have assisted the development of successful oyster aquaculture industries. Data from those other regions may be useful in evaluating EIS alternatives. The Atlantic States Marine Fisheries Commission (ASMFC) may be an appropriate body to assist with the collection of relevant information from other Atlantic coast states. In FY04 NOAA provided \$10,000 to ASMFC to begin this type of interaction. ASMFC should be consulted to determine how they might provide further assistance, and to estimate appropriate costs.

f. Establish an Economic Advisory Group

Similar to the Risk Assessment Advisory Group that has been established to provide guidance for the ecological risk assessment effort, an Economic Advisory Group should be formed to steer efforts addressing economic considerations in the EIS. The federal Cooperating Agencies have previously made this recommendation to the PDT, however, no action has been taken in the absence of consensus on the need for such a group.

IV. ICES CODE OF PRACTICE

The International Council for the Exploration of the Sea, through its Working Group on Introductions and Transfers of Marine Organisms, has adopted an internationally recognized “Code of Practice” on the movement and translocation of non-native species for fisheries enhancement and mariculture purposes. The United States is a Member Country of ICES and is a signatory to the Code of Practice.

Two relevant sections of the Code of Practice are excerpted below, with their text given in italics.

II. *Recommended procedure for all species prior to reaching a decision regarding new introductions*

- a) *Member Countries contemplating any new introduction are expected to submit to the Council well in advance a detailed prospectus (see Appendix A) on the proposed new introduction(s) for evaluation and comment.*

- b) *The prospectus should include the purpose and objectives of the introduction, the state(s) in the life cycle proposed for introduction, the native range, the donor location, and the target area(s) of release. The prospectus should also include a review of the biology and ecology of the species as these pertain to the introduction (such as the physical, chemical, and biological requirements for reproduction and growth, and natural and human-mediated dispersal mechanisms) and information on the receiving environment.*
- c) *The prospectus should also provide a detailed analysis of the potential impacts on the aquatic ecosystem of the proposed introduction. This should include wherever possible assessments from previous introductions. This analysis should include a thorough review of:*
 - i. *the ecological, genetic, and disease impacts and relationships of the proposed introduction in its natural range and donor location;*
 - ii. *the expected ecological, genetic, and disease impacts and relationships of the introduction in the proposed release site and projected range, as well as vectors for further distribution;*
 - iii. *economic assessment where appropriate.*
- d) *The prospectus should conclude with an overall assessment of the issues, problems, and benefits associated with the proposed introduction. An evaluation of risks (see Appendix B) should be included.*
- e) *Upon review of the prospectus, the ICES Council will provide comments and recommendations on the proposed introduction.*

III. *If the decision is taken to proceed with the introduction*

This section is relevant to implementation if, upon completion of the EIS, the decision is made to proceed with the introduction. This part of the Code specifies the containment of imported animals in quarantine facilities, and the release of only progeny into the natural environment after certain risk assessment conditions are met. This section also calls for a pilot phase and monitoring program as described in the following text:

- e) *During the pilot phase, the progeny, or other suitable life stages, should be placed on a limited scale into open waters to assess ecological interactions with native species, and especially testing of risk assessment assumptions. Contingency plans, including the removal of the introduced species from the environment, should be ready for immediate implementation.*
- f) *A monitoring programme addressing specific issues (see Appendix D) of the introduced species in its new environment should be undertaken, and annual progress reports should be submitted to ICES for review at meetings of the Working Group on Introductions and Transfers of Marine Organisms until the review process is considered complete.*

- **Fully implement all recommendations and guidance of the ICES Code of Practice on the Introduction and Transfers of Marine Organisms 2003, including submission of a detailed prospectus to ICES prior to a decision on the proposed introduction.**

The information specified for inclusion in the prospectus is essentially the same as that required for a comprehensive EIS. Thus, this ICES requirement could easily be integrated into the latter stages of the EIS process once a Draft EIS has been produced.

Note regarding NOAA budget: The additional capability described in this document was not included in the President's budget and is not a priority of the Department of Commerce. The Department does not support the addition of funds for any project that would result in the reduction of funding for other projects included in the budget.

Table 1. List of research needs to support Biological Assessments in the EIS, as identified by NRC, STAC, and ICES. Only essential and high priority topics are listed. Medium and low priorities are not included in this table.

