

**Review of:**

**“LONG TERM RESEARCH IN THE EASTERN TROPICAL  
PACIFIC, A Proposal from the Southwest Fisheries Science Center  
NOAA Fisheries Service”**

**by**

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**for**

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## EXECUTIVE SUMMARY

In June 2006, the NOAA Southwest Fisheries Science Center (SWFSC) produced a proposal to conduct “Long-term Research in the Eastern Tropical Pacific” to continue studies that were initiated in the early 1970s correlative with fishing operations in the eastern tropical Pacific (ETP) Ocean and with duties established by the U.S. Marine Mammal Protection Act (MMPA) of 1972 and later amendments. This proposal was, in part, derived from a “Final Report on the Scientific Research Program under the International Dolphin Conservation Program Act” that was issued in 2005. That report summarized research that the U.S. Congress had required, by amendments to the MMPA in 1997, that NOAA Fisheries SWFSC conduct between 1997 and 2002 to determine if the chasing and encircling of dolphins during purse-seine fisheries operations in the ETP was having a significant adverse impact on depleted dolphin stocks. The report concluded that three stocks of depleted dolphin had not recovered. It evaluated three hypotheses to account for the lack of recovery and concluded that one hypothesis based on a substantive change in the ecosystem of the ETP was rejected and that another based on complicated population dynamics was not testable owing to a lack of historical data. It also concluded that support for the third hypothesis about population effects of fisheries activity, particularly physiological and stress effects associated with chase and encirclement, was equivocal. The effect of the requirements for research established by the 1997 amendments expired in 2002. The *sua sponte* proposal by SWFSC articulates a number of research studies and administrative protocols to extend the previously mandated studies and the long term studies on dolphin populations in the ETP begun in the early 1970s. If conducted, the research will undoubtedly result in additional valuable information on the biology, ecology, distribution and genetic population structure of marine mammals and of the structure and function of the ecosystem in the ETP. Arguably however, most of the proposed research is beyond the scope of extant political, legal, and management needs and obligations of the U.S. Government. One key residual issue that presents clearly testable hypotheses and that could provide clear, easily interpretable scientific advice to decision makers involves the potential population effects of fishery operations (and particularly chase and encirclement) on the vitality and recovery of the depleted stocks of dolphins. The two prongs of that issue (direct measurement of physical and physiological parameters of chased and encircled dolphins and the short and long-term monitoring of those dolphins after release) are the strongest candidates for support to allow resolution of that outstanding issue. The proposal could be strengthened by reorganizing and prioritizing it with the Data Management as the first element and the Fishery Effects as the second. To the extent that funding may allow, some of the additional elements would be valuable but they need to be more narrowly defined and articulated to be more persuasive about likely success in achieving the ultimate goals.

## BACKGROUND

A large, but uncertain, number of dolphins of several stocks were killed incidental to purse-seine fishing operations, mostly by U.S. flagged vessels until the early 1970s, in the eastern tropical Pacific Ocean (ETP) from the 1950s through the 1980s. The U.S. Marine Mammal Protection Act (16 U.S.C §1361 *et seq*), which prohibits (with minor exemptions and permitted exceptions) the ‘taking’ of those marine mammals that are under the jurisdiction of the U.S. (i.e., in U.S. territorial waters) and by U.S. citizens in international waters, was enacted largely in response to that issue. It required observers to be included on U.S. vessels to monitor fishing practices and dolphin mortality and development of fishing gear and techniques to reduce the incidental capture and mortality of dolphins. Because of declines in dolphin abundance in the ETP, three stocks of dolphins (northeastern offshore spotted dolphin, eastern spinner dolphin, coastal spotted dolphin) were designated as depleted under the U.S. Marine Mammal Protection Act (MMPA) in 1980 (coastal spotted dolphin) and 1993 (northeastern stock of offshore spotted dolphins and the eastern stock of spinner dolphins). Restrictions were also imposed on the importation and sale in the U.S. of tuna that was caught during operations that encircled dolphins. Soon after that, U.S.-flagged vessels and citizens stopped chasing and encircling dolphins to catch tuna in the ETP. Consequently, the U.S. has since lacked jurisdiction over marine mammals in the ETP except to the extent that it may restrict imports of products from other countries whose impacts to dolphin populations may be inconsistent with U.S. domestic law and policy. Several international agreements were subsequently made to further reduce dolphin mortality associated with tuna fishing operations in the ETP, ultimately aimed at allowing tuna to be imported into the U.S. and labeled as ‘Dolphin Safe’ conditioned on documentation that no dolphins were killed or seriously injured during fishing operations where they were chased and encircled with purse-seine nets. The final international agreement, the Agreement on the International Dolphin Conservation Program (AIDCP), came into force on 15 February 1999, after the U.S. Congress amended the U.S. MMPA on 15 August 1997 to enable its commitments articulated in the Panama Declaration of 1995 and as a condition of adoption of the AIDCP by other countries.

The amendments to the U.S. MMPA in 1997 (the International Dolphin Conservation Program required the 16 U.S.C §1414) articulated research that NOAA Fisheries was to conduct from 1 October 1997 through 2001 to survey populations of dolphins in the ETP and to conduct studies of stress in dolphins associated with the chasing and encirclement of dolphins during purse-seine operations. A preliminary report was completed by the NOAA/NMFS Southwest Fisheries Science Center in 2002. Subsequently, the NOAA Assistant Administrator for Fisheries concluded on 31 December 2002 that “...the intentional deployment on or encirclement of dolphins with purse seine nets is not having a significant impact on depleted dolphin stocks in the ETP”. That determination was subsequently challenged legally and then set aside immediately by the U.S. District Court for the Northern District of California. The U.S. Department of Justice appealed the District Court decision on 24 August 2005 and the case is pending in the Ninth Circuit Court of Appeals in San Francisco.

The NOAA/NMFS Draft 2002 report and the subsequent Final Report in 2005 concluded that the three depleted dolphins were not increasing as fast as they might be expected to, under ideal conditions, following virtual elimination of incidental mortality of dolphins during purse-seine fishery operations (similar conclusions also published by Lenart-Cody et al. 2001 and

Gerodette and Forcada 2005). An evaluation of the possible explanations for that pattern focused on three hypotheses about why conditions might not have been ideal. One was that the physical and biological elements of the marine ecosystem in the ETP had changed substantially since the reductions in population sizes and, consequently, could account for the slow recovery. It was initially rejected but later modified in 2005 by a conclusion that the available data were insufficient to allow rejection or acceptance of the hypothesis. Nonetheless, the report's authors articulated a further opinion that they thought that it was unlikely that it could not be rejected. Gerodette and Forcada (2001), among others, also concluded that there had not been a substantial long term change in the marine ecosystem in the ETP. Yet, Gerodette and Forcada (2005) commented further that "Nevertheless, we cannot rule out that ecosystem changes have negatively affected the recovery of the dolphin populations. Sorting through the obfuscation, the consensus conclusions of the analyses and assessments of ecosystem structure and function in the ETP appears to be that there has not been any substantive long-term change and, consequently, that the slow recovery of dolphin stocks must be owing to other factors. The Summary section of the 2005 Final Report further confuses the issue however. It first concludes that there is no evidence of environmental change. It follows that up by suggesting that substantial environmental change is unlikely to have occurred, and then finishes by saying that data are inadequate, the issue is too complicated, and the environment too poorly understood to allow rejection of the hypothesis that the environment has changed

Another hypothesis identified in the 2005 report was that the slow recovery of dolphin populations is do to a possible 'lag period' owing to complication population dynamics. The report concludes that there are no data available to test that hypothesis.

The final hypothesis articulated to account for the slow recovery is that separation of mothers from calves and physiological (i.e., stress) effects of chase and encirclement has compromised dolphin survival and reproduction with correlative adverse population level effects. This was the hypothesis that was required to be tested by the amendments to the MMPA in 1997. The Summary section of the 2005 report concludes that is was not possible to determine whether stress associated with chase and encirclement or other potential fishery effects might account for the slow recovery of populations. The specific section on the stress studies in the 2005 report indicates that the authors expected that the data from the studies would not be sufficient to determine whether impacts to individuals might cause population impacts and whether any population impacts might be limiting population recovery. It concludes that it was indeed not possible to determine the magnitude and scope of any potential impacts. Nevertheless, the report concludes that "However, in the aggregate, the findings for the available data support the possibility that tuna purse-seining activities involving dolphins may have a negative impact on some individuals". Sorting through that and further obfuscation, the conclusion appears to be that there is no substantive evidence to conclude that potential stress associated with chase and encirclement of dolphins in the ETP is either correlated with or casually related to observed trends in dolphin population abundance.

Since the conclusion in 2001 of the studies that Congress required in 1997, there have evidently been no further requirements to conduct additional research and the extant proposed amendments to the MMPA (House of Representatives 2005) have not articulated requirements for further studies. Additional dolphin population surveys were however conducted in 2003 and another set of surveys has just begun (August through December 2006).

The NOAA Fisheries Southwest Fisheries Science Center has now, *sua sponte*, proposed additional research on the ecosystem and marine mammal populations of the ETP.

It is against this background and the documents identified in the bibliography that I have evaluated the "LONG TERM RESEARCH IN THE EASTERN TROPICAL PACIFIC" proposal by the Southwest Fisheries Science Center for the Center of Independent Experts (University of Miami).

## DESCRIPTION OF REVIEW ACTIVITIES

I read and considered the 2005 Final Science Report and the CIE reviews of the 2002 Final Science Report which provided context and background on research in the eastern tropical Pacific Ocean. I also read and analyzed the Long-Term Research Proposal for the ETP that described the SWFSC's approach to evaluating the hypotheses proposed to account for the lack of recovery of depleted dolphin stocks in the ETP. I also consulted other relevant legal instruments and recent scientific publications, some of which are identified in the Bibliography appendix.

In reviewing the SWFSC's research proposal I examined all sections and considered the following specific points for each section and then synthesized my comments generally.

- (a) Was the scope of the proposal adequate and appropriate?
- (b) Were any areas addressed in less, or more, depth than needed?
- (c) Were the approaches proposed unbiased?
- (d) Did the proposal represent Best Available Science? If not, what specifically might be required to meet that designation?
- (e) What were the proposal's strengths and weaknesses? Were there any additional lines of research that appeared promising?
- (f) Overall, were the individual sections well integrated into the proposal as a whole? If not, what might be done to improve integration?

## SUMMARY OF COMMENTS

I reviewed all sections of the proposal and summarize my comments below.

(a) Is the scope of the proposal adequate and appropriate?

The scientific and management motivations for the proposed research derive from the earlier conclusions that several depleted stocks of dolphins in the ETP have not recovered as quickly as might be expected under ideal conditions since previously high incidental mortality was virtually eliminated. Three hypotheses (substantive ecosystem changes, fishery effects including stress associated burdens on survival and reproduction, and complex population dynamics resulting in recovery lags) were previously proposed and addressed to account for these differences in observed versus expected patterns of recovery. The substantive ecosystem hypothesis was rejected, though considerable obfuscation in prior reports, some published articles, and this proposal greatly affect the persuasiveness of proposals that additional studies are needed and that they may or will provide better and more certain tests of the hypothesis. Data are insufficient to test the third hypothesis and it is not clear how additional data on extant populations will improve the testability of this hypothesis, which still otherwise requires substantial historical data. Though the new data will certainly add to basic knowledge about the natural history of the various populations and species, the proposal is not persuasive in any event that this may be a productive area for research with hypothesis testing as a goal. The second hypothesis was specifically addressed during mandated studies in 2000 and 2001. The results were inconclusive about population effects though they did suggest acute and chronic individual effects. The most appropriate scope for further research should consequently focus on this hypothesis, particularly as it will likely continue to be at the center of political and legal dialogue, debate, and diplomatic negotiation, and regulation.

Consequently, the plan for exhaustive population surveys, process cruise, ecosystem studies, and genetic stock evaluations exceed the necessary political and legal scope of extant international and U.S. commitments and obligations, notwithstanding the basic information on the population biology and natural history of marine mammal in the large ETP marine ecosystems that the studies would otherwise provide. It would be wonderful to see the long term studies of those populations be continued to address basic questions of biology, but that type of research program seems beyond the scope and framework of the narrowly defined domestic regulatory and scientific and management duties of NOAA Fisheries absent any direct and substantive involvement of U.S. citizens or vessels in fisheries that affect dolphins there.

Regardless of whether only the research on fisheries effects or all of the proposed research is conducted, the first priority of the research program should be the data management element. That element is listed last and is least developed though the proposal indicates that the data have not been adequately organized previously and a substantively new framework and tactical plan is needed to accommodate new data.

(b) Are any areas addressed in less, or more, depth than needed?

The stock structure in the ETP element is addressed in more depth than justified, particularly regarding large whales and other non-target species. The inclusion appears to be a stretched fishing expedition as there is no U.S. obligation to collect those data. Those data would be useful in deepening a basic understanding of the natural history and ecology of those species but the central issue is whether funds to support those studies of species beyond U.S. jurisdiction should be supported by public U.S. funds and allocated to NOAA Fisheries rather than supported by funds from other private or competitive government sources. There does not appear to be substantive or procedural support for funding those studies. If private funds are available and intended to support these and other elements that appear to be beyond the scope of U.S. government support, then these would indeed likely be productive studies and the SWFSC is competent to carry them out.

The justification for the scope of the element of research on coastal dolphin stocks is not persuasive. The stated goal is to subdivide the populations into smaller groups rather than test hypotheses about whether the interactions among herds or social groups justify stock delineation. Moreover, collection of new genetic data would not seem to help determine the effects of past incidental mortality on coastal dolphins when comparable historical data do not exist. The argument for it is not logically developed nor well presented in the proposal in any event.

The Bycatch Reduction and gear and technology development element is an ongoing effort of the IATTC and the various signatories to the AIDCP. A direct program by the SWFSC was required by the 1997 amendments to the MMPA but the temporal terms of that requirement expired in 2001.

The Assessments of Status and Trends element proposes to start from scratch the analyses of population trends and testing of hypotheses. This is odd given the intensity and dedication of past efforts and the rejection of some hypotheses and the acknowledgement that others are not testable owing to a lack of historical data, which cannot be remedied by collection of new contemporary data. The conclusions based on all earlier analyses were that the depleted stocks had not recovered. The proposal is ambiguous in stating in various places that the stocks have apparently not recovered, or that the recent studies have suggested that the stocks are not recovering, while in other places it states that they are not recovering or that they have not recovered. This obfuscation damages the persuasiveness of any arguments that might be presented for the need to conduct additional assessments. This proposed element argues that the past analyses were not legitimate and that they were not balanced. It seems like a risky thing to suggest.

The Fishery Effects element appears to be the most important and legitimate, but particularly the sub-elements of whether chasing and encircling dolphins have substantive physiological effects on the animals that can compromise their health or reproduction. The two basic general components of this concern are whether there are immediate effects (direct measurement of parameters central to physical and physiological vitality) and short and long term effects (i.e., survival and reproduction as determined from longitudinal monitoring of affected individuals). These two prongs are arguably the most important in addressing the residual hypothesis of whether chase and encirclement of dolphins has been a causal element in the slow recovery of the depleted stocks. They are also the most testable hypotheses. This

section would be better structured to focus on those two prongs and eliminate the more experimental and less testable components (e.g., stable isotopes, blubber steroids).

c) Are the approaches proposed unbiased?

The methods proposed in most elements appear to be appropriate and unbiased. One exception is the sole reliance on Bayesian methods and statistics for the Assessment of Status and Trends element. The authors of the proposal are clearly fans of the Bayesian approach but this should be at least balanced by traditional, widely accepted approaches and statistical methods. This will arguably be particularly important when the conclusions are again addressed in legal fora as the Bayesian approach will not likely meet the current standards for admissibility of scientific evidence in US Federal Courts. It will likely be challenged in any event.

Another exception is the approach to assessing stock structure with molecular genetics. The stated goal of the coastal stock structure proposal is to identify demographically independent populations and suggests that the researchers will endeavor to find genetic justification for dividing groups of sympatric animals up into to smaller and smaller management units. This suggests bias, but it could be easily fixed I think by a change in wording and some articulation of hypotheses that might be tested and appropriate methods to test them.

(d) Does the proposal represent Best Available Science? If not, what specifically would be required to meet that designation, in your opinion?

The proposal appears to represent the Best Available Science regarding the methods to be used for collection and analyses of data (with the exception of including statistical methods and approaches other than or in addition to Bayesian methods alone). But it should be made very clear why changes to past approaches and methods are legitimate for future work as the impression that results from the current presentation is that the previous collection, analysis and interpretation of data did not represent the Best Available Science. I suggest narrowing down the research proposal to the few key elements that can clearly address the residual testable hypotheses that will satisfy the ultimate goal of the research proposal of providing “decision makers with clear, easily interpreted scientific advice”.

(e) Comment on the proposal’s strengths and weaknesses, and suggest any additional lines of research that appear promising.

The proposal’s primary strengths are that it will continue some elements of a long term research program, extend biological studies of some of the most well known species of small cetaceans, and that the studies will be conducted by scientists that are extremely familiar and competent with methods of survey, data collection, and data analysis.

One key weakness is apparent shotgun approach to the proposed studies to wander beyond the scope of needs to address the key questions over which NOAA Fisheries has authority and political, legal, and management needs to address. Another key weakness is that it leaves the reader with the impression that the authors have concluded that methods and extent of data collection, analyses, and interpretation were inadequate or illegitimate and that

everything needs to be done again with different methods and approaches. This is nearly fatal but could be resolved by reorganizing, prioritizing, reducing, and making clearer the various elements of the proposal. Indeed, I think a thorough rewrite of the proposal to remove ambiguities and obfuscation would greatly improve it. Considering the ultimate goal of the proposed research to be “to provide decision makers with clear, easily interpreted scientific advice”, the presentation of the proposal is not persuasive.

#### GENERAL OVERALL COMMENTS, CONCLUSIONS AND RECOMMENDATIONS

- (a) Overall, are the individual sections well integrated into the proposal as a whole? If not, what could be done to improve integration?

I think that the elements of the proposal need to be reorganized according to priority and that the first element should be a well articulated argument for Data Management, followed by the element on Fishery Effects (but focusing on the two prongs discussed above). I think that most of the rest of the elements exceed the extant scope of political, legal, and management needs and obligations. Nonetheless they could be more narrowly tailored and better integrated and expressed to present a compelling argument that the hypotheses that they articulate are testable and that they will generate the clear, understandable scientific advice to which the proposal aspires.

## APPENDIX I. BIBLIOGRAPHY

Agreement on the International Dolphin Conservation Program (AIDCP). In force 15 Feb 1999.

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## **APPENDIX 2. STATEMENT OF WORK**

**Consulting agreement between the University of Miami and Brent Stewart**

### **STATEMENT OF WORK Eastern Tropical Pacific Dolphin Research Plan**

#### **Background**

The topic of the review is the evaluation of a long-term research plan to monitor the abundance and environment of several species of tropical pelagic dolphins that are killed in the purse seine tuna fishery of the eastern tropical Pacific (ETP), and the evaluation of reasons for the apparent lack of recovery of depleted stocks. The Southwest Fisheries Science Center (SWC) has been conducting research in the ETP since the 1960's. Research topics through the 1980's ranged from assessing direct dolphin mortality in the fishery to an examination of fundamental aspects of biology and life history, monitoring the numbers and types of dolphins being taken, conducting sighting surveys of dolphin abundance from ships to estimate abundance and trends over time, and collecting data and samples on a broad range of attributes of the physical and biological environment.

In a 1997 amendment to the Marine Mammal Protection Act, Congress directed the National Marine Fisheries Service to undertake a research program to determine, by the end of 2002, whether the fishery was having a "significant adverse impact" on depleted dolphin stocks in the ETP. The research program that the SWC designed included four components: abundance estimation, ecosystem studies, stress and other fishery effect studies, and stock assessment. This research culminated in a Final Science Report (FSR) in 2002 and thirty-four separate science papers to provide information for answering the question posed by Congress. The FSR contained the following primary conclusions: (1) northeastern offshore spotted dolphins were at 20% and eastern spinner dolphins at 35% of their pre-fishery levels of the late 1950's, levels largely unchanged since the 1970s; and (2) neither population is recovering at a rate consistent with these levels of depletion and very substantial reductions in reported kills. Data on the possible causes for the continued depletions were too sparse to be conclusive on possible ecosystem effects, but existing information did not support the occurrence of the 70% reduction in effective carrying capacity that would be required to cause the dolphin stocks to remain stable at such low levels. Data and results on possible indirect fishery effects also were inconclusive, but did disclose a common pattern of separation of cows and nursing calves. More data and studies are needed to bring closure to questions surrounding the lack of substantial progress toward recovery by these severely depleted dolphin stocks. The long-term ETP research proposal describes a program of action directed at this closure.

## **Reviewer Responsibilities**

The Center of Independent Experts (CIE) shall provide four expert reviewers. Each reviewer's duties shall require a maximum of seven days of effort, including time to read relevant documents and to produce an individual written report consisting of their comments and recommendations. No travel is required, so each reviewer shall work from their home location. Each reviewer's report shall reflect his/her area(s) of expertise, and no consensus opinion (or report) will be required. Further, each reviewer shall only comment on sections within his/her area of expertise.

Expertise needed to review the proposed long-term research plan, including its methods, scope and priorities, includes the following: (1) cetacean biology, (2) line transect-based abundance estimation and stock assessment modeling, (3) biological oceanography and pelagic marine ecology, and (4) population identity – stock structure.

Documents supplied to the reviewers shall consist of the (1) Long-Term Research Proposal in the ETP, (2) 2002 Final Science Report, and (3) CIE reviews of the Final Science Report. The reviewers shall become familiar with the research plan and the background documents.

### Specific Reviewer Tasks and Schedule

1. Read and consider the 2002 Final Science Report and CIE reviews of the Final Science Report that provide context and background on research in the eastern tropical Pacific Ocean.
2. Read and analyze the Long-Term Research Proposal for the ETP that describes the SWC's approach to resolve the cause(s) of the apparent lack of recovery by depleted dolphin stocks in the ETP.
3. Specific points to be addressed (at minimum) for sections within each reviewer's area of expertise:
  - (a) Is the scope of the proposal adequate and appropriate?
  - (b) Are any areas addressed in less, or more, depth than needed?
  - (c) Are the approaches proposed unbiased?
  - (d) Does the proposal represent Best Available Science? If not, what specifically would be required to meet that designation, in your opinion?
  - (e) Comment on the proposal's strengths and weaknesses, and suggest any additional lines of research that appear promising.
4. Specific points to be addressed (at minimum) for all sections:
  - (a) Overall, are the individual sections well integrated into the proposal as a whole? If not, what could be done to improve integration?
5. No later than August 1, 2006, submit a written report<sup>1</sup> to the CIE that addresses the points in items 3 and 4 above. See Annex I for additional details on the report outline. Each report

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<sup>1</sup> Each written report will undergo an internal CIE review before it is considered final.

shall be sent to Dr. David Die, via email at [ddie@rsmas.miami.edu](mailto:ddie@rsmas.miami.edu), and to Mr. Manoj Shivlani, via email at [mshivlani@rsmas.miami.edu](mailto:mshivlani@rsmas.miami.edu).

## **ANNEX I: REPORT GENERATION AND PROCEDURAL ITEMS**

1. The report should be prefaced with an executive summary of comments and/or recommendations.
2. The main body of the report should consist of a background, description of review activities, summary of comments, and conclusions/recommendations.
3. The report should also include as separate appendices the bibliography of materials provided by the Center for Independent Experts and a copy of the statement of work.

Please refer to the following website for additional information on report generation:  
[http://www.rsmas.miami.edu/groups/cimas/Report\\_Standard\\_Format.html](http://www.rsmas.miami.edu/groups/cimas/Report_Standard_Format.html)