

INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

SCIENTIFIC ADVISORY BOARD

7TH MEETING

LA JOLLA, CALIFORNIA (USA)
30 OCTOBER 2009

DOCUMENT SAB-07-03

WORK PLAN

The Scientific Advisory Board (SAB) reviewed its previous workplan at its 6th meeting in October 2008 in La Jolla, California (USA). Revisions to the Plan made at that meeting are reflected in Appendix A, the current Work Plan to be reviewed at the 7th meeting of the SAB. The ongoing work being done in each topic is summarized below.

A. REVIEW OF RESEARCH

1. Prevalence and significance of cow-calf separation

This has been a particularly active area of research. Previous studies have indicated that newborn calves (less than a month old) would be the most vulnerable to separation from their mother, and calves less than a year old would be at risk. Ongoing research by the U.S. National Marine Fisheries Service (NMFS) has expanded this topic to examine potential fetal mortality caused by fishery operations. NMFS expects to submit two manuscripts in 2010 on this topic for publication: 1) an analysis of calf swimming position and 2) an analysis of late-term pregnancy in dolphins, in both cases discussing the implications of the results of the analysis for dolphin mother-calf separation during attempted evasion of tuna purse-seiners in the eastern tropical Pacific (ETP).

2. Life history and fishery-related stress effects studies

A study by IATTC and NMFS scientists of the movements and diving behavior of spotted dolphins has been published (Scott and Chivers 2009). Two papers on spinner dolphin reproduction and age distribution have been published by NMFS scientists (Larese and Chivers 2008; Larese and Chivers 2009). NMFS has also developed a method to diagnose reproductive status of both male and female dolphins from the blubber attached to most skin biopsy samples (Kellar *et al.* 2006; 2009), and biopsy samples collected between 1999 and 2006 indicate, according to the NMFS study, a female pregnancy rate of 11.8% (Kellar *et al.* In prep.), which is significantly lower than the pregnancy rate determined from fishery-killed females collected between 1973 and 1992. Further, preliminary analyses from the NMFS study indicate a negative relationship between fishing effort and pregnancy rates. NMFS has also published a paper (Cramer *et al.* 2008) that argues, on the basis of aerial photogrammetric measurements of dolphin herds, that the reproductive output of spotted and spinner dolphins has declined over time.

The SAB recommended reinstating a dolphin life-history sampling program by observers to look at trends in vital rates. Funding has not yet been obtained to collect new samples from dolphins taken in the fishery, however.

Cramer, K. W. Perryman, and T. Gerrodette. 2008. Declines in reproductive indices in two depleted dolphin populations in the eastern tropical Pacific. *Mar. Ecol. Prog. Series* 369:273-285.
http://swfsc.noaa.gov/uploadedFiles/Divisions/PRD/Programs/ETP_Cetacean_Assessment/Cramer%20et%20al%202008.pdf

Kellar, N.M., M.L. Trego, C.I. Marks, and A.E. Dizon. 2006. Determining pregnancy from blubber in three species of delphinids. *Mar. Mammal Sci.* 22:1-16.

<http://www.blackwell-synergy.com/doi/full/10.1111/j.1748-7692.2006.00001.x?prevSearch=authorsfield%3A%28trego%29>

Kellar, N.M., M.L. Trego, C.I. Marks, S. Chivers, K. Danil, and F.E. Archer. 2009. Blubber testosterone: A potential marker of male reproductive status in shortbeak common dolphins. *Mar. Mammal Sci.* 25:507-522.

<http://www3.interscience.wiley.com/cgi-bin/fulltext/122287683/PDFSTART>

Kellar, N.M., M.L. Trego and F.E. Archer. In prep. Pregnancy patterns of spotted (*Stenella attenuata*) and spinner dolphins (*S. longirostris*) in the eastern tropical Pacific and their correlations with the purse-seine tuna fishery.

Larese, J.P., and S.J. Chivers. 2008. Age estimates for female eastern and whitebelly spinner dolphins (*Stenella longirostris*) incidentally killed in the eastern tropical Pacific tuna purse-seine fishery from 1973-82. *Journal of Cetacean Research and Management* 10(2):169-177.

Larese, J.P., and S.J. Chivers. 2009. Growth and reproduction of female eastern and whitebelly spinner dolphins incidentally killed in the eastern tropical Pacific tuna purse-seine fishery. *Canadian Journal of Zoology* 87(6):537-552.

<http://article.pubs.nrc->

cnrc.gc.ca/RPAS/rpv?hm=HInit&journal=cjz&volume=87&calyLang=eng&afpf=z09-038.pdf

Scott, M.D., and S.J. Chivers. 2009. Movements and diving behavior of pelagic spotted dolphins. *Marine Mammal Science* 25(1):137-160.

<http://www3.interscience.wiley.com/cgi-bin/fulltext/121481244/PDFSTART>

3. Review of currently available estimates of abundance for dolphin stocks

At its 6th meeting, the SAB recommended to the Meeting of the Parties that dolphin Stock Mortality Limits (SMLs) be updated because more abundance data are available since 1990 that are less biased (Gerrodette *et al.* 2008). Current SMLs are based on abundance estimates from 1986-1990, estimates which are now known to underestimate at least one of the major stocks, the eastern spinner dolphin. SMLs are conservatively calculated from minimum abundance estimates (N_{min}), and the SAB adopted the recommendation of the [Technical Workshop on Calculating \$N_{min}\$](#) to use a logistic model that incorporates all the available data from 1986 through the most recent survey, and not just the narrow 1986-1990 time period.

The IATTC staff has recalculated N_{min} estimates and SMLs for spotted and spinner dolphins, incorporating the most recent abundance estimates, and this analysis is reported in Document SAB-07-05. These revised minimum abundance estimates were used to calculate new SMLs.

Gerrodette, T., G. Watters, W. Perryman, and L. Ballance. 2008. Estimates of 2006 dolphin abundance in the eastern tropical Pacific, with revised estimates from 1986-2003. NOAA Tech. Memo. NMFS NOAA-TM-NMFS-SWFSC-422. 39 pp.

<http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-422.pdf>

4. Stock assessment of coastal spotted dolphins

The Gerrodette *et al.* (2008) abundance estimate for 2006 was 278,155 coastal spotted dolphins (CV = 59.0%); the exponential rate of change (r) for this population was 30.7% during 1986-2006 and 7.7% during 1998-2006. Because these high growth rates are biologically improbable, it is more likely that the early estimates were artificially low because the surveys were focussed on estimating abundances of northeastern spotted dolphin and eastern spinner dolphins and were not designed to adequately cover the coastal areas. An AIDCP-sponsored coastal ecosystem survey designed to get accurate estimates of coastal spotted dolphins was planned for 2007, but was postponed due to lack of funding. The U.S. plans to work closely with the other AIDCP Parties to coordinate this cruise for a future year.

Gerrodette, T., G. Watters, W. Perryman, and L. Ballance. 2008. Estimates of 2006 dolphin abundance

in the eastern tropical Pacific, with revised estimates from 1986-2003. NOAA Tech. Memo. NMFS NOAA-TM-NMFS-SWFSC-422. 39 pp.

<http://swfsc.noaa.gov/publications/TM/SWFSC/NOAA-TM-NMFS-SWFSC-422.pdf>

5. Ecosystem effects

The NMFS and IATTC are currently working on multi-species population models that incorporate ecosystem data. A study of the tuna-dolphin association has been conducted using tracking, food habits and observer and environmental data (Scott *et al.* in review). Net-tow samples collected in the late 1960s (EASTROPAC cruises) and museum specimens collected prior to the climate shift will be compared with samples collected during the 1986-1990 and 1998-2006 cruises. A paper linking climate change to community structure in the ETP was published in 2009 (Vilchis *et al.* 2009). NMFS and IATTC staff are collaborating on a series of papers on multi-species models to describe the ecosystem impacts of different purse-seine set types and evaluate the impacts relative to the unfished ecosystem state and policy and management objectives. The first of these papers is currently in preparation (Gerrodette *et al.* In prep.)

Gerrodette, T., G. Watters, R. Olson, S. Reilly and W. Perrin. In prep. Ecosystem effects of different modes of purse-seine fishing in the eastern tropical Pacific Ocean.

Vilchis, L.I., L.T. Ballance, and W. Watson. 2009. Temporal variability of neustonic ichthyoplankton assemblages of the eastern Pacific warm pool: Can community structure be linked to climate variability? Deep-Sea Research I 56:125-140.

http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6VGB-4T8HHBY-1-N&_cdi=6034&_user=1206786&_orig=browse&_coverDate=01%2F31%2F2009&_sk=999439998&_view=c&_wchp=dGLbVlW-zSkWA&md5=50134409830edf38658a1c1c8b88c074&ie=/sdarticle.pdf

6. Mortality estimates

The staff of the Venezuelan national observer program, in cooperation with the staff of the IATTC, has developed a new data form to collect information on crew activities related to dolphin mortality: 1) additional rescue efforts, and 2) diver efforts. These data are being analyzed and being compared to dolphin mortality data to determine their potential effects.

The IATTC staff has also conducted a NMFS-funded port sampling program that monitors the unloadings of purse-seine vessels of less than 363 tons of carrying capacity to examine whether unobserved dolphin sets may be being made by smaller vessels. This program will conclude when funding is exhausted, which is expected before the end of 2009.

7. Population modeling

Mark Maunder, of the IATTC staff, has modeled dolphin population growth rates based on series of abundance estimates for 1986-2006, and these analyses are presented in Document SAB-07-05. The models indicate that the two stocks for which the most data are available, the northeastern spotted and eastern spinner dolphins, are increasing at a rate of about 2%. The other two stocks modeled, the western/southern spotted and whitebelly spinner dolphins, are also increasing. Table 1 presents the abundance estimates (N) extrapolated to the year 2010, a corresponding calculation of N_{min} , and the stock mortality limit (SML) that would result from these calculations.

TABLE 1. Abundance estimates for 2010 (N), minimum abundance estimates (N_{min}), and per-stock mortality limits (SML = 0.1% of N_{min}) based on a logistic model incorporating estimates from the 1986-2006 NMFS surveys.

Species and stock	N	N_{min}	SML
Spotted dolphin (<i>Stenella attenuata</i>)			
Northeastern	911,177	793,466	793

Western/Southern	911,830	881,256	881
Spinner dolphin (<i>Stenella longirostris</i>)			
Eastern	790,613	655,562	655
Whitebelly	711,883	666,852	666

8. Development in gear technology and fishing techniques to improve dolphin release.

The Mexican tuna-dolphin program in Ensenada continues to test the use of *alerones* (net panels) to improve the backdown procedure.

9. Capture of mature tuna not in association with dolphins.

Hypotheses to explain the tuna-dolphin association have been tested in a paper by Scott *et al.* that is currently under review. During this study, spotted dolphins and yellowfin tuna were simultaneously tracked to gather information about the tuna-dolphin bond. It was discovered that large yellowfin tuna are not always associated with the dolphins, and that they swim at about the depth of the thermocline. Larger sample sizes are required, however, to determine under what circumstances the tuna-dolphin bond is formed and broken, and help predict where and when large yellowfin may be found not in association with dolphins.

It was recommended at the 6th meeting of the SAB that this study be continued and the IATTC staff has written a proposal to do this (SAB-07-04). Such a study will require a purse-seine vessel to capture both dolphins and tuna in the same set and a research vessel to track the animals. Using the capture and tagging techniques used in 1992-1993, tuna would be tracked using pressure-sensitive acoustic transmitters to monitor their depth and location, while the dolphins would be similarly monitored using radio transmitters and time-depth recorders. An archival-tag tracking study of bigeye, yellowfin, and skipjack tunas by Schaefer *et al.* (2009) provided information on horizontal and vertical movements that can also shed light on this question.

Schaefer, K.M., D.W. Fuller, and B.A. Block. 2009. Vertical movements and habitat utilization of skipjack (*Katsuwanu pelamis*), yellowfin tuna (*Thunnus albacares*), and bigeye (*Thunnus obesus*) tunas in the equatorial eastern Pacific Ocean, ascertained through archival tag data. Pages 121-144 in Nielsen, J.L.; Arrizabalaga, H.; Fragoso, N.; Hobday, A.; Lutcavage, M.; Sibert, J. (eds.). Tagging and Tracking of Marine Animals with Electronic Devices. Reviews: Methods and Technologies in Fish Biology and Fisheries, Vol. 9. 400 pp.

Appendix A. SAB Work Plan for 7th Meeting, October 2009.

Research Topics	Proposed Studies	SAB Recommendations
1. Prevalence and significance of cow-calf separation.	A) Aerial photogrammetry B) At-sea observations C) Spatial distribution of chase time	A-C) Conduct research to discover evidence of cow-calf separation during chase.
2. Life history and fishery-related stress effects studies.	A) Life history studies 1) Reproductive parameters/ vital rates 2) Food habits 3) Trophic interactions B) Stress effects 1) Necropsy studies	A-B) Resume sampling program to conduct studies on these topics.
3. Review of currently available estimates of abundance for dolphin stocks.	A) Review current abundance estimates	A) Review updated N_{min} estimates.
4. Stock assessment of coastal spotted dolphins	A) Genetics and taxonomy research B) Historical mortality, abundance, and status of any new stocks	A-B) Maintain on Work Plan.
5. Ecosystem effects.	A) Trends in other EPO cetaceans B) Ecosystem models C) Effect of large-scale changes in 1970s D) Carrying capacity and R_{max} for dolphins	A-D) Maintain on Work Plan.
6. Mortality estimates.	A) Historical mortality estimates. B) Potential unobserved sources of mortality 1) Comparison of observer programs 2) Class-5 vessels 3) Other fisheries	A) Maintain on Work Plan. B) Monitor ongoing comparisons for IRP*.
7. Population modeling	A) Model effects of unobserved mortality B) Other population models	A) Expand NMFS simulation studies to prioritize research. B) Maintain on Work Plan.
8. Development in gear technology and fishing techniques to improve dolphin release.	A) Net panels B) Net profilers	A-B) Maintain on Work Plan.
9. Capture of mature tuna not in association with dolphins.	A) Simultaneous tracking of dolphins and tuna B) Survey of acoustic detection devices aboard purse seiners	A) Recommended research proposal. B) Add to Work Plan.

* Pending consultation with the Parties regarding confidentiality issues.