AGREEMENT ON THE INTERNATIONAL DOLPHIN CONSERVATION PROGRAM

48th MEETING OF THE PARTIES

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DOCUMENT AIDCP-48-02

AIDCP UNFUNDED RESEARCH PROJECTS

SUMMARY

As of December 2023, the AIDCP has a budget surplus of US$ 2,194,101, mainly because in recent years a number of vessels have paid for services (*e.g.*, onboard observers) that were not fully utilized (Document AIDCP-48-01). This surplus can be spent on scientific research projects of interest to, and in support of, the AIDCP, among other options. This document presents two research proposals which would strengthen two tasks considered by the IATTC staff as an immediate priority in the scientific research of dolphins in the ETP: continuing research on dolphin cow-calf separation during purse-seine operations and resuming the monitoring of dolphin population status in the eastern tropical Pacific Ocean (ETP). The first proposal consists of extending the ongoing IATTC research on dolphin cow-calf separation onto a phase 3 which would allow increasing the sample size and spatial coverage of the study (SAC-15 INF-O). The second proposal develops from the discussions during the 2nd IATTC workshop for monitoring stock status of ETP dolphin populations (WSDEL-02-RPT) and aims to investigate the feasibility of Close-kin mark-recapture (CKMR).

The funding required for each of the two studies is shown in Table 1.

TABLE 1. Cost of proposed research projects, in US$

1.	Cow-calf separation – phase 3	220,000
2.	Close-kin mark recapture – phases 1 and 2	305,000
	Total	525,000

Scientific Experiment to Evaluate Dolphin Cow-calf Separation during Purse Seine Fishing Operations in the Eastern Tropical Pacific Ocean - Phase III	
Links to IATTC Strategic Science Plan (to be prepared by the staff)	
Objectives	● Continuation of the work conducted during phase I and II of the mother-calf study in the ETP (SAC-15 INF-O). ● Increase sample size during all fishery phases ● Improve the variance estimator for mother-calf separation ● Improve the capacity to follow calves and mother-calf pairs for longer periods of time
Background	● Spinner and pantropical spotted dolphins associate with yellowfin tuna in the ETP, leading the tuna purse-seine fishery to take advantage of this association by setting nets on dolphins to catch the tuna beneath them. ● Measures to reduce dolphin bycatch have significantly decreased dolphin mortality by over 99% compared to historic levels. ● However, dolphin populations have not recovered as predicted, suggesting that cryptic and unobserved sources of mortality may be occurring and preventing population recovery. ● For the past two decades it has been postulated that one such source may be mother-calf separations during fishery interactions, leading to calf mortality. ● However, some argue that, in mammals, mothers are generally reluctant to leave their young, making such separations unlikely. ● There are limited field observations available to either support or refute the hypothesis that mother-calf separation occurs. ● The aim of this overall project is to use unmanned aerial vehicles (UAVs) to determine: (i) if mother-calf pairs become separated during chase, encirclement, and/or backdown; and (ii) if/how mother-calf separation may be affecting population growth. ● Two phases of this project have already been completed: a two-staged pilot study and the main study. - The first stage of the pilot study occurred off the south of Portugal, for the testing and proficiency of the UAV methodology and technology. - The second stage of the pilot study and main study (Phase II) occurred aboard Mexican purse-seiners during August 2023 and May 2024, respectively. ● A total of 30 days of data collection and >70 hours of flight time have already occurred off Mexican purse-seiners to collect UAV imagery during all phases of the fishery (chase, encirclement, and backdown).
Relevance for Management	● This project will generate a separation coefficient representing the maximum potential for permanent mother-calf separation. ● The data collected from the proposed Phase III of the mother-calf project will improve the precision of the separation coefficient estimator by increasing the sample size and expanding the geographic variability of the study. ● This will improve estimates of how calf mortality resulting from separation could impact the population.
Pros	● Highly professional, multi-lingual team with ample experience aboard ETP purse-seiners. ● Majority of the equipment already purchased during Phase I and II. ● Research protocols already developed.

	● Increased sample collection and broadened geographic scope of results.
Cons	● Extension of the end date for the full mother-calf study.
Duration	2025 (1 year)
Workplan (project staging)	● Conduct a third trip aboard an ETP purse-seiner to collect UAV imagery during the chase, encirclement, and backdown ● Analyze full set of data from all three trips ● Prepare scientific reports, manuscripts, and presentations
External collaborators	● University of Alaska Southeast (UAS) ● AIMM
Deliverables	● Improved estimates of mother-calf separation, by calf age, and a measure of precision on those estimates ● Sensitivity analysis to produce estimates of impact of separated calf mortality on dolphin stocks ● Management recommendations to mitigate mother-calf separation ● Reports to the AIDCP, SAC and to the IATTC ● Publications in peer-reviewed journals ● Presentations at scientific conferences
Budget (US$)	**Phase III:** $220,000

Sampling feasibility (Phase I) and genetic panel development (Phase II) for CKMR on dolphins in the eastern tropical Pacific Ocean	
Links to IATTC Strategic Science Plan (to be prepared by the staff)	
Objectives	**Phase I** 1. Determine number of skin-swab samples from live dolphins that are possible to collect from each set to calibrate time-scale of obtaining sample size goals. 2. Examine quality, quantity, and contamination levels of DNA taken using three different sampling methods. 3. Assess the potential to epigenetically age animals from different tissue samples. **Phase II** (once Phase I completes, if successful) 4. Field test skin swabbing. 5. Collect 50-100 samples from mortalities across the population's range. 6. Develop a high-throughput genetic panel. 7. Test the genetic panel on skin swabs.
Background	Close-kin mark-recapture (CKMR) is a promising method for improving assessments of multiple species of dolphin in the ETP. Being reliant on genetics-based kinship assignment to estimate population parameters, a full-scale CKMR project requires a large number of tissue samples containing high quality and uncontaminated DNA. Constraints related to feasibility and human/animal welfare may impede collection of high quality tissue samples, which would preclude the application of CKMR; alternatively, if these constraints can be overcome, then it may be possible to collect vital information related to stock structure, kinship, and even age from a single tissue sample, which would help facilitate the use of CKMR to monitor dolphin populations in the ETP. Phase I of this project will inform sampling design for CKMR by assessing the number of tissue samples that can be collected from live dolphins from each purse seine set, as well as the utility of samples collected using two different methods that meet the necessary criteria for feasibility and welfare. In addition, the potential to apply epigenetic aging to dolphin tissue will be assessed. The outcome of Phase I will help us assess the feasibility of sample collection for CKMR and, if sampling is deemed feasible, optimize sampling protocols prior to potential application of this promising method. If Phase I is successful, then Phase II of the project will lay the groundwork for scaling up sampling and genotyping efforts. A team of three researchers will join purse seine fishermen and groundtruth the estimates of feasible sample collection from Phase I while honing the skin swab sampling protocol. Simultaneously, biopsy samples will be collected from mortalities on purse-seine sets across the population's range, and these samples will be used to develop a high-throughput genetic panel that targets DNA regions that are informative for kinship and stock structure. Finally, the genetic panel will be tested and honed using the skin swab samples. Following Phase II, the resources and protocols will be in place for large-scale application of CKMR. It is crucial that sampling is minimally disruptive to fishing operations and safe

	for the researchers and dolphins, so we have included multiple steps for testing and refining the sampling protocol. More generally, we have several checkpoints in place for this project to ensure that funds are used judiciously and effort is not wasted. As such, Phase II will not commence unless/until Phase I is deemed successful.
Relevance for management	CKMR has the potential to provide estimates of key management quantities that have been challenging to obtain for dolphin populations using alternative methods, including estimates of absolute adult abundance, natural mortality rates, population trend (potentially), and other quantities. If CKMR is deemed feasible for dolphins in the EPO, then the method can provide a baseline estimate of population abundance and a relatively low cost way to track population trends into the future.
Pros	- CKMR has the potential to estimate key population parameters that are vital for population assessments. - Following initial investments in project setup (this proposal) and a baseline abundance estimate, the costs and efforts required for continued population monitoring with CKMR are quite reasonable. - The proposed project includes multiple phases and checkpoints to ensure judicious application of funds, time, and effort.
Cons	- Though the sample collection methods proposed are minimally invasive to the animal, some contact with individual dolphins is required to collect samples for CKMR, which may disturb the animals and pose safety risks for humans (though the proposed methods go to great length to minimize both). - Sample collection may delay fishing operations. However, we have included multiple stages of sample collection and protocol honing to calibrate methods and sample size expectations to keep disruptions as minimal as possible.
Duration	Phase I: 1 year Phase II: 1.5-2 years
Workplan **(project staging)**	**Phase I** - Review existing drone footage to assess the likely number of dolphin skin swab samples that can be realistically collected during a purse seine set. - Compare DNA quality, quantity, and contamination levels from three different tissue types, all collected from natural mortalities (n=3-10, depending on what is feasible): o Skin swab o Shallow biopsy o Regular biopsy - Compare the potential to age animals epigenetically using the above three tissue types. A tooth will also be extracted from each sampled dolphin for age ground-truthing. **Phase II** - Field test and hone skin swab sampling protocol. - Collect biopsy samples from 50-100 mortalities across the population's range. - Use whole genome resequencing to develop a high-throughput genetic

	panel that is informative for kinship and stock structure. - Apply the genetic panel to the skin swab samples collected during field testing and hone the panel as needed.
External collaborators	
Deliverables	SAC reports etc…
Budget (US$)	**Phase I:** $60,000 **Phase II:** $245,000 **Total:** $305,000