

IUCN CONTRIBUTIONS TO THE ECOSYSTEM ANALYSIS COMPONENT OF THE PACIFIC ISLANDS OCEANIC FISHERIES MANAGEMENT PROJECT

Report to: Andrew Hurd, IUCN Global Marine Programme, Gland, Switzerland

Prepared by: David Bowden, IUCN Consultant at the Institute of Zoology, London, UK

Date: 13 September 2006

SITUATION REVIEW AND ANALYSIS

The purpose of the present document is to review the current status of IUCN-led activities under the Ecosystem Analysis component of the OFM project^a. The following sections describe the current situation, summarise the stated commitments of IUCN to the OFM project, the range of options explored by IUCN to fulfil these commitments following the postponement of the DOQ collaboration, and the immediate priorities for moving forward.

***DSV Alucia* and Deep Ocean Quest**

In mid-2005 the operators of the privately owned diving support vessel *Alucia*, Deep Ocean Quest (DOQ)^b, invited IUCN to develop a research itinerary for their vessel in the western Pacific over 4 months in 2007. In collaboration with Dr. Alex Rogers at the Institute of Zoology, London, IUCN subsequently developed a science plan for biological sampling of seamounts in the western tropical Pacific as an integral element of the GEF-funded Pacific Islands Oceanic Fisheries Management (OFM) Project. Under the working title of the *Tui Delai Gau Expedition*, this plan consisted of four back-to-back research cruises to study seamounts in Fiji, Tonga, Western Samoa, Tuvalu, and Vanuatu. The science objectives of these cruises divided into two broad categories of research: surveys of the diversity and distribution of seabed (benthic) organisms on seamounts, and studies of the influence of seamounts on water-column (pelagic) primary productivity and on the vertically-migrating zooplankton of the deep scattering layer (DSL)^{1,2}.

These objectives were ambitious but were developed to exploit fully the capabilities of the *Alucia* and the available sea time. Furthermore, it is central to the present situation that the research programme was planned on the basis of DOQ's offer to make the R/V *Alucia* available without charter fee. Thus, IUCN's budget for the project did not include vessel costs and the overall cost for this contribution to the OFM was extraordinarily low for the quantity and quality of data it had the potential to deliver. On this basis, while there was always an element of risk involved in the arrangement, it would have been unreasonably cautious of IUCN not to act on the DOQ offer.

During a major refit of the *Alucia* in New Orleans in 2005, the vessel and its associated equipment were damaged as a result of hurricane *Katrina*. The hull was believed to be sound,

^a IUCN is also involved in the Policy Component of the OFM Project. Work under this Component was scheduled to begin upon completion of the scientific research cruises. However, this phasing is now being re-evaluated in light of the information contained in this document and a new workplan for activities will be developed in the 4th Quarter of 2006.

^b The *Alucia* was formerly operated by the French marine research institute IFREMER as *DSV Nadir* and in its current ownership is linked to a private company called Deep Ocean Quest (DOQ). In communications since 2005 "DOQ" has been used to denote the team running the *Alucia*.

however, and in late 2005 the *Alucia* was towed to a shipyard in Seattle where the refit was resumed. IUCN were informed that the planned date for completion of the refit would now be set back to mid-2006: still in time for the proposed collaboration on the OFM *Tui Delai Gau* cruises in 2007. However, when IUCN spoke to DOQ's project manager for the *Alucia* refit in June 2006, it became clear that work had come to a halt and that the vessel would not be operational in time to participate in the OFM before 2008 at the earliest. At this point, IUCN decided it had no choice but to proceed on the assumption that the agreement with DOQ would not come to fruition during the period of the OFM project. Without immediate funds to charter an alternative vessel of comparable specification, it was also clear that the extensive research plan drawn up for the *Tui Delai Gau* cruises would probably now be unachievable and hence that the planned activities led by IUCN under the OFM project would have to be re-evaluated.

Planned commitments by IUCN to the Ecosystem Analysis Component of the OFM project

The primary focus of the OFM project is to provide information that will enable the sustainable management of trans-boundary fisheries for tuna and other pelagic fish species in the western central Pacific. Within this objective, the OFM seeks to improve understanding of wider ecosystem-scale processes which influence the distribution and abundance of commercial fish stocks and the effects of fishing on other species and habitats in the region. The IUCN commitments to the OFM are contained in subcomponent 1.3 of the OFM Project Document:

p. 41, paragraph 2

"The project will provide support to give effect to the adoption of the principles of the ecosystem approach in the new arrangements for transboundary oceanic fish stock assessment in the WTP LME^c. ... Through collaboration with IUCN, the ecosystem analysis will be broadened to support the first systematic efforts in the region to look at seamount-related aspects of an ecosystem-based approach."

p. 51, paragraph 2

"... IUCN and SPC/OFM will collaborate to undertake specific activities to obtain information on the ecology of, and fishery impact on, seamounts as a habitat of special concern. ..."

"The IUCN will arrange a research cruise to undertake underwater survey work at selected seamounts to determine benthic biodiversity. ... The results of the research cruise/benthic biodiversity surveys will be included in awareness-raising activities to complement information about fisheries and seamounts. ..."

"This information will allow assessments of the need for, and the utility of, seamount-specific management measures. Moreover, it is anticipated that the results of the project will enable the scientific assessment of specific proposals regarding the management of ecosystem impacts and the efficacy of specific classes of management measures such as marine protected areas (MPAs)."

These commitments contribute to intended outputs summarised in the OFM Project Executive Summary under the headings:

Output 1.3.2: Collection and analysis of information on seamounts in the WTP warm pool

Output 1.3.3: Model-based analysis of ecosystem-based management options

The IUCN-led activities, therefore, would provide wider knowledge on the general ecology of seamounts, particularly in relation to the influence of seamounts on the distribution and feeding ecology of pelagic fish stocks and the potential effects of commercial fish-stock exploitation on seamount benthic communities. Although the project document specifically

^c Western Tropical Pacific large marine ecosystem

mentions only surveys of benthic biodiversity, the science proposal developed by IUCN includes a large pelagic component as outlined above (page 1, para 1). The key focus of this pelagic research is to assess the influence of seamounts on local biological productivity in terms of two hypothesised mechanisms: the local enhancement of primary production through topographically-induced upwelling effects¹, and the ‘trophic-focussing’ of zooplanktonic organisms in the deep scattering layer (DSL) through a combination of passive lateral advection and active diurnal vertical migration². By investigating the mechanisms by which seamounts cause locally enhanced biological production, this pelagic research would link directly to studies of the feeding ecology of commercially important fish species associated with seamounts and thus to the main components of the OFM project.

Of the extensive seamount sampling programme proposed by IUCN, it is the pelagic element, rather than the benthic, which is of most direct relevance to the central aims of the OFM and which is likely to generate the more important data for incorporation into the ecosystem model outputs of the OFM project. Thus, while the benthic elements of the original proposal are of considerable scientific interest, and could potentially contribute to policy decisions regarding the conservation of marine biodiversity in the Pacific and perhaps globally, the pelagic elements of the proposal must be considered to be of higher priority in relation to the OFM project.

Potential courses of action for IUCN following postponement of the IUCN-DOQ collaboration in 2007

Following the decision on the *Alucia*, the first move by the IUCN team was to investigate the availability of alternative vessels that would be capable of fulfilling core elements of the original sampling plan. This search was undertaken in the hope that, if a suitable vessel could be found, it might yet be possible to raise funding for the charter fee. A range of options, including the French research vessel *Alis*, the New Zealand research vessel *Kaharoa*, the Tongan fisheries training and research vessel *Takuo*, commercial survey vessels chartered from the USA, and the possibilities for collaborating with other research cruises planned in the region were investigated. To date, most of these have proved to be unworkable but one or two remain possibilities. In all cases, the primary constraint is cost but this is increasingly exacerbated by timing: scientific research cruises require an extended lead-in period in order to ensure that the vessel and specialist equipment can be mobilised, and that the scientific personnel can plan around their existing professional commitments. Among the alternative possibilities, IUCN also considered collaborations with other research cruises, and non ship-based research.

The alternative courses of action considered by the IUCN Global Marine Programme following the postponement of the 2007 IUCN-DOQ collaboration are summarised below.

- 1) *IUCN could delay participation in the OFM project until 2008 on the expectation that the Alucia will be operational in 2007.*

If the *Alucia* were to complete sea trials by early 2007, the original cruise schedule in the western equatorial Pacific could take place, one year late, in 2008. The OFM project runs from 2005 to 2010 and ideally data collection would take place in the first years of the project to allow a realistic period for collation and analysis of samples. However, if the vessel could be secured for use in 2008 there would potentially be time to generate worthwhile output, albeit at a reduced level, within the remit of the project. Thus, there remains a possibility that the original plan, using the *R/V Alucia*, might yet be viable within the timescale of the OFM.

From conversations with *Alucia* project manager, Carlos de Paco, IUCN understand that DOQ are confident of completing the refit of the *Alucia* by early 2007. Following sea-trials and delivery to its home port in Costa Rica, the vessel is then scheduled to undertake a programme of short range work-up cruises off the Pacific coast of Central America and on the Cocos Ridge. If the vessel performs satisfactorily during this stage, DOQ anticipate that it will be able to resume the original cruise programme, of which the Tui Delai Gau Expedition formed part, in 2008. This scenario would allow IUCN to conduct many, if not all, of its original research activities planned under the OFM. Consequently, the IUCN is maintaining contacts and goodwill with DOQ so that they are in a position to utilise the *Alucia* should she become available in the future. In light of the progress of the refit to date, however, it must be assumed that this remains a risky option but one that should not be discounted entirely as we should know the status with more certainty in the next three to four months.

2) *IUCN could charter an alternative research vessel.*

This option is heavily constrained by the availability of suitable vessels, the high cost of chartering, and the time required to raise the necessary funding. Furthermore, it is unlikely that any vessel obtained at short notice and with limited funding would be capable of fulfilling the original, very extensive, sampling programme. It will be necessary, therefore, to concentrate only on priority work. The following possibilities have been considered:

a) *N/O Alis*, operated by IRD^d, Noumea, New Caledonia.

This is a well-equipped 28 m marine research vessel capable of deploying a range of benthic and pelagic sampling gears. Although smaller than the *Alucia*, and not equipped with submersibles, the *Alis* would be capable of fulfilling a significant part of the mapping and sampling programme in the original Tui Delai Gau plan. In particular, it would be capable of conducting the acoustic surveys and targeted mid-water trawls required for recording DSL zooplankton dynamics. Being based in Noumea, New Caledonia, the *Alis* would be an obvious first choice replacement for the *Alucia*.

In July 2006, on the recommendation of Dr. Valerie Allain at SPC^e, IUCN attempted to contact Dr. Bertrand Richer-de-Forges at IRD, Noumea, regarding possible use of the *Alis*. To date, there has been no reply to this enquiry, nor to a request made to IRD in France for information on the availability of the vessel. Assistance with improving these communications may be necessary if this possibility is to be pursued.

It is significant that SPC intend to submit a proposal for use of the *Alis* in 2008 to conduct pelagic studies within the OFM project. If this application were to be successful, the vessel would clearly then be ideally placed to conduct the IUCN sampling programme if suitable funding and approval for use of the vessel could be obtained. The timescale for applications to use the *Alis* is for proposals to be submitted to IRD in January of the year preceding that in which cruises would take place. Therefore, there is still potential for the IUCN to raise funding and submit an application for use of the *Alis* in 2008.

^d Institute de Recherche pour le Developpement

^e Secretariat of the Pacific Communities.

- b) *R/V Kaharoa*, operated by NIWA^f, Wellington, New Zealand.

This is another well-equipped 28 m marine research vessel capable of fulfilling a large part of the original Tui Delai Gau programme. Specification is slightly more technically advanced than that of the *Alis* but the overall capability is similar. New Zealand already has commitments to the OFM project including financial contributions from New Zealand Aid, the use of specialist seabed survey equipment and the participation of NIWA scientists in the planned IUCN seamount cruises.

As with the *Alis*, use of the *Kaharoa* would depend on IUCN securing substantial funding for charter of the vessel, and submission of a cruise proposal to the vessel's operators no later than January 2007.

- c) *F/V Takuo*, Tonga Fisheries training and research vessel.

This vessel will probably be used by SPC for longline sampling during the OFM. Although conveniently located and potentially available, neither the design nor the specification of the vessel is suited to the work IUCN intend to do. Specifically, the vessel has no facility for deploying benthic or mid-water trawl gear and has inadequate acoustics equipment for DSL work.

- d) Other vessel on commercial charter.

IUCN has conducted a web-based search of research vessel specifications and itineraries in the Pacific, and has discussed its requirements with Global Seas Vessel Management, Seattle, who act as agents for a large number of commercial survey vessels based in the eastern Pacific. No commercial vessels for which information was available met the required minimum specification and none would have been suitable without some modifications to deck hardware and the installation of specialist acoustics systems. Considering the substantial costs involved in chartering, it was concluded that adapting a vessel designed for another purpose would not be a satisfactory or cost-effective course of action.

- 3) *IUCN could investigate opportunistic collaborations with planned cruises from other research initiatives.*

Given the high cost and limited availability of sea-time on scientific research vessels, this option was never likely to be realistic. In order to secure funding for ship-based deep sea research, participating scientists are under considerable pressure to maximise the use of time and resources during cruises. Schedules are, accordingly, planned with full complements of scientific personnel to enable intensive sampling programmes with minimum down-time. Furthermore, the benthic and pelagic biological sampling involved in the IUCN component of the OFM project would require the shipping of specialised equipment in addition to that required for the primary purpose of the cruise. It was always highly unlikely, therefore, that any existing cruise plan would have the capacity to absorb the extra personnel, equipment, and time demands necessary to conduct a worthwhile sampling programme on seamounts. Nevertheless, lists of research vessels operating in the western central Pacific area through 2007 were compiled (from web searches and contacts at SOPAC^g and SPC) and, where available, schedules and research objectives were evaluated to assess the potential for collaborative work. None were found which offered

^f National Institute for Water and Atmospheric research

^g South Pacific Applied Geoscience Commission

any prospect of accommodating the required research.

- 4) *IUCN could divert its resources into alternative, non ship-based, research activities to facilitate the wider goals of the OFM project.*

This input could be to any of the three major components of the OFM and might include, for instance: the organisation of workshops to coordinate data-integration between work groups; inputs to data-mining and analysis; or the collation and analysis of data which does not require ship-based sampling. A relevant example of the latter might be the use of satellite-derived sea-surface colour data to assess the local influence of seamounts on oceanic primary production³.

For any contribution within this option, it would be essential to consult fully with other partners in the OFM project in order to ensure that the work undertaken makes a useful contribution to the project's objectives and does not duplicate work being done elsewhere. Given the original research goals of the IUCN within the OFM project, and its wider commitment to promoting research into biodiversity of the deep-sea, this is the least satisfactory scenario for both the IUCN and the OFM project. However, given the present situation with regard to funding and timescales it might prove be the most pragmatic course of action and has the potential to deliver worthwhile outputs.

Main conclusions

- 1) Given the postponement of the IUCN-DOQ collaboration, IUCN will not be in a position to conduct research activities as originally planned under the OFM project unless either: the *Alucia* becomes available, or significant extra funding is obtained to charter an alternative vessel.
- 2) In light of the continuing uncertainties surrounding the *Alucia*, the IUCN is faced with the choice of either: pursuing substantially increased funding for the charter of an alternative vessel, or diverting its existing resources into contributions to the OFM project which do not involve ship-based sampling. Any work within this second option should be undertaken only after detailed discussions with SPC and other partners in the OFM project.
- 3) Of the research vessels potentially available, the *N/O Alis* or the *R/V Kaharoa* represent the best chances of completing a worthwhile seamounts sampling programme within the timescale of the OFM project.
- 4) The lead-in period for mobilising personnel and equipment for sampling cruises is now too short for cruises to take place in 2007. Therefore, if ship-based sampling is to take place, revised cruise plans and science strategies should be prepared for submission to vessel operators no later than January 2007 for operations in 2008. This is the latest date for sampling to take place if data are to be made available within the timescale of the OFM project.
- 5) If ship-based sampling does take place, limitations of time and resources will probably require that the research plan originally proposed by IUCN should be cut to include only those elements which contribute directly to the central goals of the OFM project. In practice, this would mean concentrating on the pelagic elements of the research, particularly acoustic surveys of interactions between seamount topography and the vertically-migrating zooplankton of the DSL, and the 'ground-truthing' of these surveys by use of controlled-opening mid-water trawls.

Recommendation

It is clear that there are two primary options for moving forward:

1. Continue striving to secure an appropriate vessel to conduct the scientific research as planned. The variations of this option include the following (with financial implications in parentheses):
 - a. Using *MSV Alucia* (DOQ) as originally planned (no additional funds required)
 - b. Finding ways to complement efforts and join up with SPC in their planned cruises with the *N/O Alis* (additional funds most likely not required)
 - c. Securing either the *N/O Alis* or *R/V Kaharoa* to conduct scaled-down versions of the original cruise developed with the *Alucia* in mind (requires significant additional funding, estimated at roughly 15,000 USD per day of ship-time at a minimum)
2. Re-programme IUCN resources into alternative, non ship-based, research activities to facilitate the wider goals of the OFM project.

IUCN proposes to pursue both options in parallel initially in order to allow sufficient time to exhaust all the variations outlined under Option 1, but not lose any time in being able to move forward under Option 2 in the event that Option 1 is deemed unfeasible. A date of 28 February 2007 is proposed at which time a final decision will be taken as to which option is to be implemented. This five-month period will ensure adequate time to see how the *Alucia* refit progresses, for consultation with OFM partners, as well as other potential collaborators, while not jeopardizing the eventual delivery of project outcomes within the life-span of the project.

REFERENCES

1. Rogers, A. D. The Biology of Seamounts. *Advances in Marine Biology* **30**, 305-350 (1994).
2. Genin, A. Bio-physical coupling in the formation of zooplankton and fish aggregations over abrupt topographies. *Journal of Marine Systems* **50**, 3-20 (2004).
3. Longhurst, A., Sathyendranath, S., Platt, T. & Caverhill, C. An estimate of global primary production in the ocean from satellite radiometer data. *Journal of Plankton Research* **17**, 1245-1271 (1995).