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II. REPORTS

**Fostering International Collaboration
in Marine Biodiversity Sciences in the Asia-Pacific Region**

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AT THE 22ND Pacific Science Congress in Kuala Lumpur, Malaysia a workshop was held on 17th June 2011 where an international group of delegates discussed the potential for fostering international collaborations in the Asia-Pacific region. The discussion showed that there were strengths across the spectrum of disciplines in marine science in the region, especially regarding biodiversity and associated resources. They included taxonomy, genetics, fisheries, aquaculture, alien and invasive species, benthic ecology, pelagic ecology, pollution ecology, conservation and Marine Protected Areas. The potential of, and need for, increasing scientific collaboration in the Asia-Pacific region was discussed in an open forum attended by at least 23 scientists from 12 countries held at the end of a symposium held during the congress on discovering marine biodiversity.

A poll of attendees found that the reasons most wished to collaborate were to learn and benefit from others expertise, including bringing expertise from other countries to work on projects in their local, geographic area (Table 1). Other benefits included incorporating local and regional research into an international framework, more resources (access to expert's time, specialised equipment, funding), access to samples and/or data, improved international profile and reputation, and increased publications, in terms of quantity and quality. There were also benefits beyond the scientific research in improved cultural understanding that could contribute to society-level cooperation. The only deterrent mentioned to conduct more international collaboration was the carbon-footprint of travel to workshops, meetings, and field sites. However, this may be minimized by combining research visits with conferences; and video and tele-conferencing could reduce the need to travel. Once relationships and projects are established, less travel may be required to conduct the research, although the importance of face-to-face collaborations was acknowledged.

The perceived challenges in collaboration included awareness of funding sources and opportunities for meetings, finding suitable collaborators, and finding time to prepare funding applications. Conferences provide an excellent opportunity to meet potential collaborators but can be expensive to attend and the people one wishes to meet may not necessarily be there.

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TABLE 1

Responses to the Questionnaire About Why Scientists Want International Collaboration

Perceived benefit	Number of response
Learn from others (exchange knowledge, methods, training), especially information and skills not easily picked up from the literature, or that may not yet be published	4
Add expertise to my research that I lack (more multi-disciplinary, taxonomic expertise) thus improving quality of publications	4
Increase research effort in my geographic area	4
Funding opportunities	2
More fun and food!	2
Think more globally, do more 'big science' research	2
Co-authorship on additional scientific publications	1
Opportunity to travel (an expectation for scientists doing research of international standard)	1
Access to samples, data and information	1
Species cross borders	1
Positive feedback for cultural understanding	1
Improve international profile and reputation of my institution and research group	1
Assistance in arranging permits to collect specimens and samples	1

Having a regional network or organisation that would help in networking was considered highly desirable if regional cooperation was to improve. A number of global initiatives in marine biodiversity have arisen in the past decade, notably the Census of Marine Life (CoML) and the Ocean Biogeographic Information System (Costello et al. 2007). The Asia-Pacific rim is the richest area in the world in terms of marine biodiversity. Yet only Australia, India, Japan and New Zealand, were able to produce syntheses of their marine biodiversity knowledge in the CoMLs' regional review papers (Costello et al. 2010). This left the 'coral triangle', the most species-rich area, without any representation. With the growth in the economies and scientific communities in the region we encourage scientists, institutions and countries in the re-

gion to participate more actively and to take more leadership roles in global marine biodiversity initiatives. An example of such an initiative was the NaGISA project, initiated in Japan, which led global scale collaboration using a standard sampling protocol in coastal seas (Iken and Konar 2003, Cruz-Motta et al. 2010). Another example is the recently created Indo-Pacific Research Network, coordinated by the University of California at Santa Cruz (USA) and The University of Queensland (Australia), which brings together scientists that utilize genetic methods and models of ocean currents, with the goals of providing a practical and theoretical framework to understand evolutionary history and inform comprehensive management of marine species in the Indo-Pacific (Dr Eric Crandall, personal communication).

Multinational organizations that may provide a forum to foster international collaboration in marine science within the region were limited. One of which is the Pacific Institutes of Marine Sciences (PIMS). This was initiated in 2002 with 10 founding members but has since increased to 17 different institutions (see <http://www.pims.ust.hk/>). PIMS was incorporated to promote research programmes and the exchange of staff and students between member institutions. Since its inception, PIMS has funded a number of such exchanges for staff and post-doctoral researchers but has been largely inactive since 2006. It was agreed that this needed to be invigorated and broadened to include more western Asia-Pacific Rim members and collaborate with interested scientists from third-world countries. Other international bodies may help in networking, such as the Pacific Science Association, the proposed World Association of Marine Stations, Intergovernmental Oceanographic Commission (UNESCO), Scientific Committee on Ocean Research and International Association of Biological Oceanography, but they would not provide sufficient focus within the region. Other, larger scale initiatives do have a more regional focus with their regional branches such as the AP-BON and EASABII initiatives. There are, however, successful examples of smaller more specialist groups, e.g. on marine algae and sponge barcoding (www.spongebarcoding.org), as well as small-scale collaborations between laboratories or groups of scientists, and these should be facilitated further. This could be developed through more regional level meetings, bringing together local scientists to focus on issues relevant to the region.

The importance of international collaboration extends beyond scientists to also include fishermen, NGOs and other stakeholders in local communities. This is particularly important in the Asia-Pacific region where many members rely on marine resources such as fisheries and aquaculture, tourism etc. Managing the relationship between these needs and conserving biodiversity is often challenging, but needs to be acknowledged and factored into future initiatives. On several occasions marine research has been initiated or redirected based on the knowledge local fishermen can provide, and they often have better access to information and samples about marine resources. The National Oceanic and Atmospheric Administration in Hawaii, for example, is working with scientists to build a database of different projects that are ongoing and determine their needs. Fishermen are then connected to these projects and assist. As ecosystems in the ocean are tightly interconnected, and many countries rely heavily on these resources, an open question and issue that the community should consider to explore is how the Asian-Pacific region can benefit from the engagement of fisheries with marine research and how to coordinate such collaboration internationally. Examples of collaboration with fishermen and between scientists from different countries, have been the exploration of deep waters leading to the discovery of many new species in the Philippines (Ng et al. 2009, Richer de Forges et al. 2009). The fisheries organisations, notably the North Pacific Marine Science Organization (PICES), South Pacific Regional Fisheries Management Organization (SP RFMO) and Western Central Pacific Fisheries Commission (WCPFC), may also provide support for collaborative activities.

Mechanisms to promote collaboration include exchanges of staff, graduates doing international or large-scale research projects, and students attending courses. Having funding to cover the additional costs of joint research is critical but may be easier to achieve if all collaborators can share this cost, including the researchers' time. One suggestion to promote collaboration was to provide examples for text books based on observations and phenomena occurring within the Asia-Pacific, because at present text books were generally biased with examples from North America and/or Europe. Another suggestion was to work together to bring major conferences to the region. For example, the 2nd World Congress in Marine Biodiversity was held in Europe this September and had a call for proposals for the 3rd WCMB in 2014. Following this meeting, this group generated a proposal to host the Congress in the Asia-Pacific region. We can now report that this proposal was successful, and the 3rd WCMB will be hosted by the Institute of Oceanology in Qingdao, China in September 2014.

In addition to variable levels of funding that may be available within research institutions, a number of sources open to international partners have been identified. These include: Adaptation to Climate Change in Coastal Areas (ACCCoast) Project; Asia-Pacific Network (APN); Toyota Environmental Conservation Initiatives; JRS Biodiversity Foundation; Conservation International (CI)-Critical Ecosystem Partnership Fund (CEPF); Global Biodiversity Information Facility (GBIF) Ebbe Nielsen Prize; Natural Environment Research Council (NERC) International Opportunities Fund; Japan Society for the Promotion of Science (JSPS Bilateral Funding); The Pacific Development and Conservation Trust (New Zealand Dept Internal Affairs); Royal Society of New Zealand's International Mobility Fund; Canon Foundation (Japan, Europe); Human Frontier Science Program; and USA National Science Foundation Science, Engineering and Education for Sustainability Fellows (SEES) programme. Undoubtedly additional sources may be available, such as those raised by NGOs and from Foundations and there is a clear need to identify and disseminate this information and coordinate applications.

Trends in scientific publications show that the number of researchers in the Asia-Pacific region is growing at a greater rate than in the northern hemisphere (Ware and Mabe 2009), including increasing numbers of new species descriptions being published by scientists in the region (Zhang 2010). The commitments of many countries under the UN Convention on Biological Diversity (CBD) treaty to protect their biodiversity resources, including by 2015 to have 10% of their coastline habitats protected, may be expected to increase fundamental marine biodiversity research (Wood et al. 2008). The marine biodiversity forum at the 22nd Pacific Science Congress reported here demonstrates a great enthusiasm and motivation to increase networking and collaboration amongst scientists in the region for a variety of reasons (Table 1), and that there are some resources available to support this. Funding has been secured to re-launch the Pacific Institutes of Marine Science over the next six months, initially to review specific regional needs, including collaborative research, conferences and data sharing. We thus call on all relevant organizations within the region to join with PIMS to influence its development and thus improve the quality of marine science in the Asia-Pacific, and consider supporting the 3rd World Congress on Marine Biodiversity in Qingdao in 2014.

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