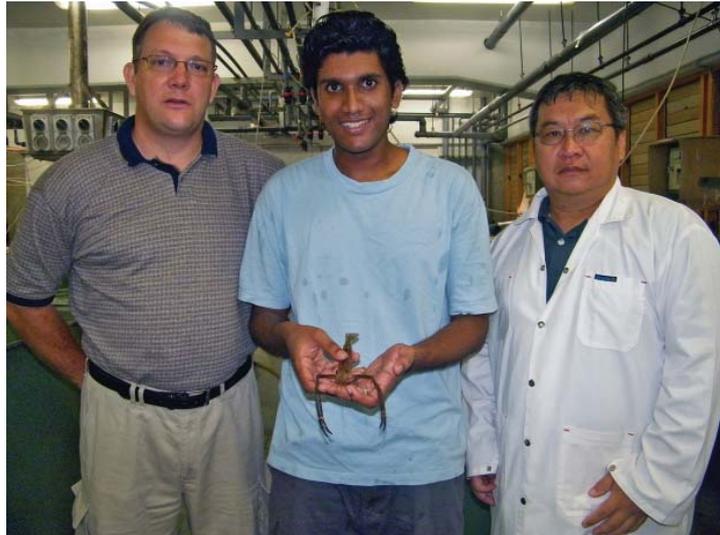


change into post-larvae (compared with 11 stages for *M. rosenbergii*). After they become post-larvae, the animals migrate landward and eventually settle in high-elevation freshwater streams far inland.

So far, five post-larvae have been produced in the USP laboratory. They metamorphosed into post-larvae after 77, 78, 85, 101 and 110 days of culture, respectively. It is a major achievement, because what previously appeared to be impossible has now been proven possible. For the future, however, this species still compares very poorly with *M. rosenbergii*, which can routinely reach post-larval stage in only 20–30 days and with 20–50% survival of big batches. There is scope for much more research into *M. lar*, and the work done here is an important step towards further developing and refining techniques for its culture.

This study at USP was initiated as part of an SPC-coordinated regional strategy for domesticating *M. lar* — through linked studies in Fiji, Vanuatu and New Caledonia — and funded by the Australian Centre for Inter-



Post-graduate student Monal Lal holds one of the freshwater prawn broodstock used for his research, flanked by his supervisors Tim Pickering of SPC (left) and Johnson Seeto of Marine Studies at USP (right).

national Agricultural Research in collaboration with SPC. The study was undertaken by Master of Science student Monal Lal and supervised by Johnson Seeto and Dr Timothy Pickering of SPC.

Apart from larval culture research, investigations are also continuing on capture-based culture of *M. lar* for grow-out in small ponds by rural householders as a cash crop. A new tech-

nique for rearing prawn larvae — developed by Japan International Cooperation Agency Senior Volunteer Tomohiro Imamura while at USP — was instrumental in achieving this outcome.

For further information, please contact:

**Tim Pickering**  
SPC Aquaculture Officer  
(TimP@spc.int)

## ■ Mountains of pelagic biodiversity<sup>1</sup>

By Alistair Dove

**Source:** Deep Type Flow – Conversations about marine science and society.

<http://deeptypeflow.blogspot.com/2010/05/mountains-of-pelagic-diversity.html>

If you ever saw the dramatic seamount scene in Blue Planet (and if you haven't, where ya been?), then you are probably familiar with the idea that submarine mountains can attract lots of animals; as Attenborough puts it, they “create oases where life can flourish in the comparatively empty expanses of the open ocean”. In that spectacular BBC sequence, jacks and tuna swarm

an Eastern Pacific seamount peppered with colourful schools of barberfish, *Anthias* and goatfish. Then the sharks cruise in, including silkys and hammerheads, there for a clean from the faithful barberfish.

There's a paper in the latest issue of PNAS that quantifies the richness of seamounts, so beautifully depicted by those

geniuses at the BBC Documentary department. The authors, led by Telmo Morato from the Secretariat of the Pacific Community in New Caledonia, analysed data gathered by longline fisheries in the western and central Pacific, close to and remote from seamounts. In a sense, a longline is a standardized sort of sampling unit like a quadrat, so they can be analysed across

locations to measure differences in diversity. They accounted for differences between total catch per longline using the statistical process called rarefaction, which is a practical application of one of my favourite fundamental biological patterns — the species accumulation curve —, which I've discussed before.<sup>2</sup> It looks like a great dataset with great spatial resolution and pretty good coverage in the tropics, though the equatorial zones are less well represented.

I don't think anyone would be surprised by their result that, yes, seamounts are diverse places. When they broke it down by species, about 2/5 (15 species) showed positive association with seamounts; this group included both sharks and fish. Interestingly, three species (pelagic stingrays, albacore and shortbilled spearfish) showed negative associations with seamounts, while 19 showed no measurable association. So, the net effect is positive, but there's clearly some structure in the data, depending on what species you look at. Nor, I think, would most people be surprised by the distance effect they found, wherein sample diversity decreased with distance moved away from the peak of a seamount, and most sharply

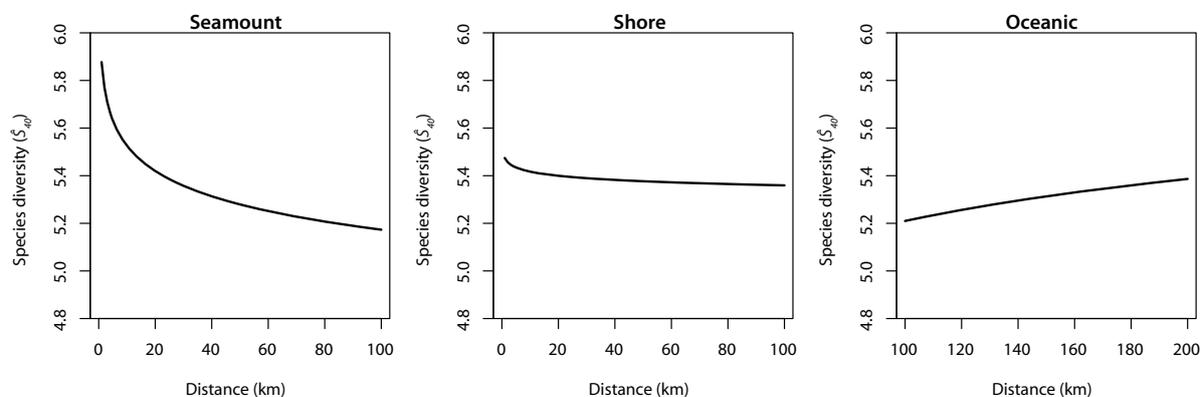
in the first 10 or so kilometers. What was surprising, to me at least, was that both the absolute diversity and the distance effect they found were greater on seamounts (Fig. 1, left) than they were for coastal zones (Fig. 1, center).

I would have thought that coastal zones, with their larger area, more complex topography and currents, coastal upwelling and inputs from the land, should have had higher diversity. Indeed, it kind of goes against the island biogeography ideas, that as we go away from the largest habitat towards smaller more distant patches, diversity drops; if you think of seamounts as underwater islands and continental shelves as underwater mainlands, perhaps you'll see what I mean.

There are a couple of reasons I can think of to explain the observed difference. Perhaps there is something intrinsic to seamounts, some feature of topography or productivity that makes them real magnets for diversity. Under this scenario, they are true biodiversity hotspots. Alternatively, perhaps coastal zones once were more diverse than seamounts but have been denuded by our actions, so that only the remote and submarine mountains remain as examples

of what once was. Perhaps it's a bit of both, or some other concept (that you should propose in the comments). Either way, Morato et al. show us that we may be successful at protecting widely roaming pelagic species by strategically preserving relatively tiny specks of submarine oases. Since reading their paper, I have enjoyed thinking of schools of pelagics, hopping from mountaintop to mountaintop, skipping across vast plains of abyssal ocean, and as usual dreaming about diversity and all the fantastic forms of life in the 3D wonderland of the open ocean. It just makes you want to down tools and grab the next slow boat bound for Cocos, doesn't it?

Morato T., Hoyle S., Allain V. and Nicol S. 2010. Seamounts are hotspots of pelagic biodiversity in the open ocean. *Proceedings of the National Academy of Sciences*. DOI: 10.1073/pnas.0910290107



**Figure 1.** Mean species diversity rarefied from 40 ( $S_{40}$ ) individuals as a function of distance to seamount summit or shore.

<sup>1</sup> Note from Editor: We published another article on seamount-related work by Morato et al. in this newsletter (see issue #129). Alistair Dove provides here a lively report about their work.

<sup>2</sup> See: <http://deeptypeflow.blogspot.com/2010/03/when-can-we-stop-sampling-and-have-beer.html> and <http://deeptypeflow.blogspot.com/2010/04/sacs-revisited.html>