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The union of Barcoding and Taxonomy: A case study in the commercially valuable blue swimming crab, *Portunus pelagicus* species complex

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In our preliminary results, five CCA species exhibited high genetic variation compared to one other species, *Pneophyllum conicum*. 18S rDNA sequence divergences of *P. conicum* from Japan (n=1) and Hawaii (n=5) ranged 0.1-0.6%. In contrast to *P. conicum*, sequence divergences of *Lithophyllum kotschyianum* from Japan (n=1), Hawaii (n=2) and Fiji (n=1) were 0.6-2.0%; *Hydrolithon onkodes* from Japan (n=1) and Australia (n=1), 3.7%; *H. reinboldii* from Japan (n=1) and Hawaii (n=4), 0.1-3.2%; *Neogoniolithon brassica-florida* from Japan (n=1), Australia (n=1) and Hawaii (n=2), 0.1-3.7%; and *Mesophyllum erubescens* from Japan (n=1) and Hawaii (n=2), 1.1%.

What causes such different levels of genetic variation? First, the true species diversity is likely to be underestimated because of the limited number of the morphological characters. In recent taxonomic studies of CCA, species circumscriptions focus on reproductive structures rather than gross morphology and vegetative structures. For example, *N. brassica-florida* was synonymized with several previously described species that are now considered to be growth forms of *N. brassica-florida*. However, this species may include some genetically and morphologically different species. Secondly, the lower levels of genetic variation in *P. conicum* may be caused by a reduced mutation rate, although it seems unlikely that such a large difference in mutation rate exists between algae occupying similar ecological niches within the same order. Thirdly, *P. conicum* from Japan and Hawaii is apparently genetically conspecific. To confirm whether species examined consist of either several cryptic species or even different species, further morphological and molecular studies of several specimens of each species need to be conducted.

Poster -2

Species diversity and potential growth rates of common scorpaenids found in coastal Singapore shores

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The ecology of scorpaenids is poorly studied. Present information stems primarily from venom studies and a few taxonomic descriptions which have dealt with the toxicity and biochemistry of stonefish. In general, little much has been done with regards to studying the general biology and ecology of stonefish and other scorpaenids. In determining the growth rates of common scorpaenids found in Singapore, a two month sampling census at 24 sites around coastal Singapore indicated that there are eight species of scorpionfish found locally thus far. The most common species included long spine scorpionfish, *Paracentropogon longispinnus*, the stargazer waspfish, *Trachycephalus uranoscopus* and estuarine stonefish, *Synanceja horrida* respectively. The largest scorpaenid found in Singapore was *S. horrida* while the smallest was *P. longispinnus*. Otoliths extracted from these three common species indicate that the relative growth rates could potentially be determined using otolith weight in relation to body size for *P. longispinnus*, *T. uranoscopus* and *S. horrida*. However, validation of age using electron microscopy of otoliths for these species will be required to confirm this finding.

Poster -3

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Whilst DNA barcoding has been shown to uncover hidden pockets of biodiversity in different animal groups, species discovery via barcoding should nevertheless be carried out in tandem with careful

morphological analysis, knowledge of biogeographic information and judicious checking of historical literature to maximise its full value to the scientific community as well as in practical situations. In our case, analyses of COI sequences and morphology of the marine swimming crab *Portunus pelagicus* showed that it is in fact a complex of at least four species. However, while unique Molecular Operational Taxonomic Units (MOTUs) may be morphologically indistinguishable, we also have what would be considered as a single MOTU comprise of two species with pronounced morphological differences between them. Using a complement of various methods, we have clarified the systematics of this commercially important group of species group. In the process, we have maintained nomenclatural stability as far as possible yet assign pre-existing names to each rediscovered species.

Poster -4

A new cavernicolous freshwater crabs from Samar, Island, Philippines

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A new cavernicolous freshwater crab of the genus *Sundathelphusa* is described from Langun-Gobingob cave in Samar, Island, Philippines. The new species has greatly reduced eyes, absence of body pigmentation and noticeably elongated ambulatory legs typical to cave obligate crabs. The new species is clearly distinct from all known cavernicolous *Sundathelphusa* by its spiny pereopods. The cave is located in one of the archipelago's largest karst formation (about 2970 hectares) situated in the Western Samar province. Specimens of the new species were collected from two separate locations of the cave system. One is in the very big chamber of the cave, about the size a football field stadium, approximately 100 meters from the opening. Here, the new species was collected from the water trapped in mud holes caused by footsteps along the bank of small subterranean stream. Others were collected from the shallow pools of subterranean river located in another chamber approximately 150 meters from the outside which could only be accessed through a small hole. The two chambers were separated by a huge limestone wall and are both in complete darkness.

Poster -5

Updating records of zooxanthellate scleractinian corals in Singapore

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Singapore's hard coral species records have not been updated in the last 12 years. We present an inventory of zooxanthellate scleractinian species through field surveys at eight reef sites, and consolidation of past work, RMBR reference collection and recent publications. Species assessment surveys and recent literature revealed a total of 165 species, 30 of which are new records, increasing the number of species ever found in Singapore from 189 to 258. Raffles Lighthouse registered the largest number of species and represents the most undisturbed reefs of the sites studied. Taking into account reef area, the number of species in Singapore is comparable to reefs in neighbouring countries. Only 64.0% of total species recorded have been found in recent years, but this study is not exhaustive in terms of sampling effort and site coverage. As 11.6% of all species have been newly recorded in the last three years, and only 52.0% of species with distribution ranges encompassing Singapore have been found, a larger inventory can be expected with more rigorous assessments.