

## **Australia's Mega Marine Biodiversity Gap**

### ***A Range of Records***

Australia's long geographic isolation has led to high levels of endemism within its flora and fauna, with high proportions of each taxonomic group unique to our region. The Australian Marine Jurisdiction (AMJ) is also one of the largest in the world and encompasses the five major climate zones, from tropical to polar. These features, along with the variety of geomorphology around our 60,000+ km coastline, have resulted in a wide range of habitat types that support a vast diversity of species, ecological communities and ecosystems. Examples of our marine habitats include:

- estuaries (>1000, only 50% considered to be pristine)
- rocky reefs (estimated to support 50% of our temperate fisheries)
- coral reefs (360 coral species in GBR; 300 species in Ningaloo, WA)
- mangrove systems (43 species, the highest in the world)
- seagrass systems (30 species, the highest in the world)
- sponges – one third of the world's estimated 15,000 species
- beaches and dunes (50% of our coastline)
- Antarctic coastline and islands

### ***Undiscovered Treasure***

Australia is considered to be one of the 12 mega-diverse nations of the world, and as the only developed country in this group, bears considerable responsibility internationally for biodiversity conservation. With some 6% of the Southern Hemisphere in the AMJ we can also be expected to have a significant proportion of total global marine biodiversity under our care. About one sixth of the world's 1.5 million described species are marine, however it is estimated that marine life represents some two thirds of the world's biodiversity. For example, of the 32 or so invertebrate phyla, 31 occur in the oceans, 15 in freshwater habitats and 10 on land. It has also been suggested that the unexplored deep-sea (representing about 60% of Earth's surface) could hold tens of millions of undiscovered species and recent estimates suggest that deep-sea diversity is much higher than in any other marine habitat, perhaps rivalling tropical rainforests in total species numbers.

### ***Significance of Biodiversity***

Biodiversity refers to the variety of genomes (the genetic material specifying all characteristics and functions within an organism), species and ecosystems. It is the foundation for understanding and predicting how human and natural effects can change ocean ecosystems. An understanding of the diversity of genes responsible for individual species' adaptations and responses to their environment (intraspecific diversity) is a foundation for understanding almost all ecological and evolutionary processes. Marine biological diversity is changing, dramatically in some cases, and the most recent changes are due to broad-scale human activities. However, our ability to evaluate the scale and ultimate consequences to life in the sea of a plethora of anthropogenic effects is limited by our inadequate knowledge of marine biodiversity and the patterns and processes that control it.

Adequate understanding of what creates and maintains diversity is a core scientific underpinning for policy and management decisions regarding pollutant and waste disposal, habitat alteration, fisheries resources, and the preservation of threatened species. Not knowing how many species are in a community severely limits our ability to predict the fate of that community under different kinds of anthropogenic

stresses. Not knowing the identity of species in a community severely limits our ability to compare different systems and to understand the biology and ecology of such organisms by comparing them to their better-known relatives. Our current inability to provide such detailed taxonomic and ecological information to policy makers may have important implications for the conservation of marine life and the sustainable use of marine resources.

### ***Taxonomy in crisis***

Australian marine taxonomy is in crisis. Our relatively small pool of taxonomic experts are ageing rapidly – without a well established ‘next-generation’ in place. Taxonomic services and training remain under supported. While the task of classifying marine life is enormous and challenging, new technologies can open opportunities and accelerate discoveries. The rise of molecular/genetic techniques and tools has revolutionised species characterisation, particularly for microscopic organisms. In fact it is estimated that  $10^{30}$  microbe cells in the ocean constitute more than 90% of the mass of living things in the oceans. The cytochrome oxidase 1 gene in the mitochondria of cells has been nominated for the ‘barcode’ of marine animals. Such genetic barcodes can assist the few marine taxonomists to focus their precious powers of description on the new and the special. Both these complementary streams of systematics, the classical, descriptive taxonomy and the new molecular/genetic methods require trained personnel. This lack of current expertise combined with the huge number of undescribed and undiscovered species in the AJM make up Australia’s Mega Marine Biodiversity Gap.

Useful References:

<http://www.deh.gov.au/soe/2001/coasts/index.html>

<http://www.coml.org/baseline>

<http://www.agu.org/revgeophys/butman01/butman01.html>

<http://www.austmus.gov.au/invertebrates/pdf/marineoverview.pdf>

*Dr G.M. Newton*

*National President*

*Australian Marine Sciences Association*