Cohabitation of Indian and Pacific Ocean species at Christmas and Cocos (Keeling) Islands

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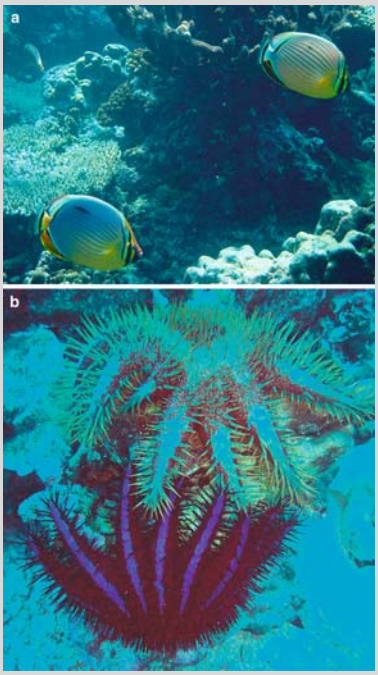

Fig. 1 Cohabitation at Christmas Island of **a** butterflyfishes from the Indian (*Chaetodon trifasciatus*—left) and Pacific Ocean (*Chaetodon lunulatus*—right), and **b** genetically distinct colour morphs of crown-of-thorns starfish (*Acanthaster planci*) from the Indian (bottom) and Pacific Ocean (top)

The major biogeographic border for Indo-Pacific coral reef organisms lies in the eastern Indian Ocean where the Indian and Pacific Oceans' regional biotas abut. Situated on this border are Christmas and Cocos (Keeling) Islands, oceanic islands located approximately 400 and 1,000 km (respectively) southwest of Indonesia.

The coral reef communities of these islands are unique because of the high proportion of species at the edge of their geographic range. For example, of the 533 fishes recorded at Cocos Islands, 22% are at their range edge, with 100% representation in some families and 37–57% representation in angelfishes, butterflyfishes and damselfishes (Allen and Smith-Vaniz 1994). During fieldtrips between 2001 and 2008, observations across a range of taxa revealed numerous Pacific and Indian Ocean species were cohabiting (Fig. 1). This cohabitation is significant for two reasons.

Firstly, if Indian and Pacific Ocean species cohabit at these islands then why do they not cohabit throughout their ranges? Traditionally it was assumed that species from one ocean basin were unable to colonise the other basin due to insufficient dispersal, or could not establish populations because they were maladapted to local conditions. However, Indian and Pacific Ocean species have dispersed long distances (over 1,000 km) to colonise Christmas and Cocos Islands and have established populations in the same environmental and ecological conditions. It remains unclear why these species are still constrained to their respective ocean basins. Broad-scale studies involving cohabitation at Christmas and Cocos Islands are required to determine what limits a species' geographic range.

Secondly, cohabitation sets the scene for hybridisation. Indian and Pacific Ocean surgeonfishes cohabit and hybridise extensively at Christmas and Cocos Islands (Marie et al. 2007). However, other cohabiting species do not hybridise. The fact that only some Indian and Pacific Ocean species hybridise provides the unique opportunity to determine what factors promote hybridisation and what favours reproductive isolation and speciation on coral reefs.

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References

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Reef sites

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