



Biological indicators of overfishing

Overfishing occurs when off-take of fish by humans occurs at levels above that at which fish stocks can replenish naturally. This can have substantial effects on community structure and, in extreme cases, can even leave some species vulnerable to extinction (see also Hot Topic 11.3). **Early warnings** are vital to enable Applied Ecologists to have meaningful input into fishing quotas and other methods to ensure that fishing stocks are not over-used.

Working in the Persian Gulf, Valavi et al. (2009) established that the abundance of two species, short-spine sea urchin *Echinometra mathaei* (Figure A), and Arabian butterfly fish *Chaetodon melapterus*, showed consistent correlation with fishing pressure.

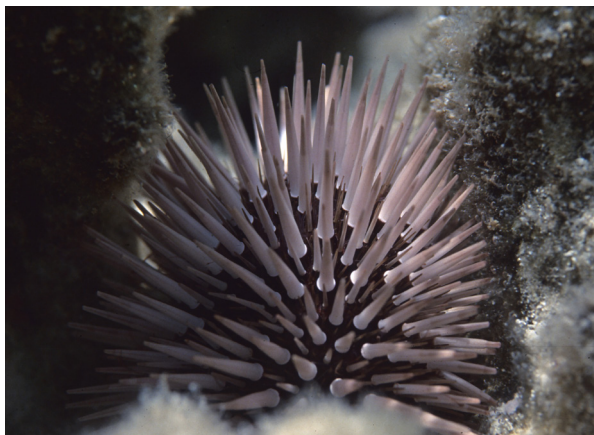
In the case of the short-spine sea urchin, this correlation was positive, so the number of urchins increased as fishing pressure increased. This was probably because a reduction in predator fish such as wrass (Labridae) and emperor fish (Lethrinidae) provided predator release for the urchins and a resultant increase in their population. In the case of the Arabian butterfly fish, the correlation was negative, so

the number of butterfly fish decreased as fishing pressure increased. This was not because the species was routinely caught, as it is not targeted and is very rarely caught as by-catch. Instead, the most likely explanation is that the increase in sea urchins is decreasing live coral cover, which in turn is negatively affecting the corallivore butterfly fish.

These two species have other traits that have made them especially useful as biological indicators: they are common, easy to count, and widespread in the region. Moreover, the pattern between their abundance and fishing levels is both strong and fairly consistent over time and space.

REFERENCE

Valavi, H., Savari, A., Yavari, V., Kochanian, P., Safahieh, A., & Savadkuhi, O.S. (2009) Coral reef anthropogenic impact bio-indicators in the northern part of the Persian Gulf. *Applied Ecology and Environmental Research*, Volume 7, 215–227.



Online Case Study 4 Figure A Short-spine sea urchin *Echinometra mathaei*.

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