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DISCUSSION

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Comment on the paper by J. B. C. Jackson: Reefs since Columbus (*Coral Reefs*, Supplement to Vol. 16: S23-S32)

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The recent paper by Jackson (1997) quoted, correctly, from my work on Caribbean coral reef fisheries which stated that it was "..shown that for most areas of the Jamaican Shelf, the fishing intensity is sufficient to ensure that extremely few fishes survive for more than a year after recruitment and the proportion of fishes which survive to spawn must be extremely small" (Munro, 1983). However, he then makes the extraordinary statement that, "the report goes on to recommend a mesh size for traps of 6.60 cm maximum aperture that would provide a maximum yield of barely reproductive juveniles with a maximum fishing intensity of 1.5 canoes/km^2, without any consideration of the possible consequences for the health of the entire ecosystem".

If Jackson had actually read and understood the relevant chapters in Munro (1983) he would have found that the work addressed the problems of the effects of exploitation on the composition of reef fish communities, by examining the composition and magnitude of trap and hook-and-line catches from coral reefs. These reefs ranged from those on the intensively exploited north coast of Jamaica, to those of the south-western parts of Pedro Bank, which had never been exploited. Our work also addressed the problems of recruitment limitation and protection of nursery areas.

One of the principal conclusions which was drawn from our work in Jamaica in 1969–73 was that doubling the mesh size to 6.60 cm and reducing the fishing intensity by 50–70% would result in an increased catch. At the same time, these measures would enable most of the important species in the catch to reach maturity before recruitment to the fishery and would enable fishes to live to a larger size before their, almost inevitable, capture.

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Additionally, recruitment of the species most adversely affected by the fishery might be improved as a result of increases in the biomasses of spawning stocks. Consequently, the composition of the exploited fish community might be restored to something resembling its original state. It was also suggested that traps should be abolished from the narrow northern shelf of Jamaica.

However, no mesh size, fishing effort or gear regulation occurred, so none of what was suggested came to pass. Subsequently, the combined effects of several severe hurricanes, the die–off of *Diadema antillarum*, and the low biomass of herbivorous fishes as a result of over-fishing, resulted in the degradation of the coral reef community on the northern shelf of Jamaica (Hughes 1994). The composition of the fish communities at the Port Royal Cays and at Pedro Bank, far to the south of Jamaica, has also changed progressively as result of unremitting exploitation with small-meshed fish traps, with most species of snappers, groupers and jacks and other desirable species becoming progressively rarer components of the catch (Koslow et al. 1988).

The fact that human activities have permanently changed the composition and functioning of ecosystems over past centuries is not a new revelation, although it might seem so to some. In the case of Caribbean coral reef fisheries, the advent of galvanised wire mesh and of outboard motors greatly increased the pressure on coral reef fish stocks in relatively recent years. Prior to that time there were areas which were too remote to be exploited with any degree of intensity and which harboured abundant stocks of large, mature fishes. Economic factors, principally the low price of fish (which had to compete with inexpensive imported salted fish), also constrained the ranges of fishing boats. However, the rise in human population, the increasing demand for fish and, consequently, increases in the relative price of fresh fish, have led to unremitting pressure on the fish stocks and expansion of the

fisheries to areas which were seldom or never exploited. When Jackson claims that Jamaica's fish catch has barely changed in past years he misses the point that early catches would have come from nearshore areas and would have been principally comprised of desirable predatory species, such as snappers and groupers, often of substantial size. In today's catches, such species are comparatively rare and the bulk of the catch is comprised of small, herbivorous or omnivorous fishes. Most of the catch of reef fishes comes from the remote Pedro and Morant Banks and nearshore areas are massively depleted. If Jamaica's fisheries were well managed, catches could be increased, the larger species could be restored to the ecosystem, fishers would be less poverty-stricken and coral reefs would flourish. That is not to say that that reefs could be restored to their pristine state, but good governance and management could do much to restore the reef ecosystems. Unfortunately, these factors are most difficult to achieve and, combined with overpopulation and poverty, seem to ensure that the situation is likely to worsen.

Finally, Jackson claims to show that *D. antillarum* was always abundant on Caribbean reefs. The statistical basis for this claim is, at best, dubious. However, as far as the state of Caribbean coral reefs is concerned, the important point does not concern the response of *D. antillarum* to decreases in predation rates. The important thing is that the stock densities of *D. antillarum* which could be observed on Jamaican coral reefs prior to the die-off appear to have been sufficient to maintain macroalgae in check, even when biomasses of herbivorous fishes were greatly reduced. In those parts of the Caribbean where herbivorous reef fish remain relatively abundant, the catastrophic die-off of *D. antillarum* did not result in massive overgrowth of algae and reefs have remained in relatively healthy condition.

References

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