

The scope of tropical reef fisheries and their management

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SUMMARY

Coral reef resource systems extend throughout the tropics and are exploited primarily by subsistence fishers, supplying food for millions of people. The magnitude of harvests per unit area taken from coralline shelves approximates those taken by trawlers from temperate shelves. In view of this, the current estimated potential global annual harvest from tropical reef fisheries of 6 million metric tonnes (t) is probably conservative. The relative composition of reef fishery catches changes in response to increasing effort, largely due to the different vulnerability of predatory and herbivorous species to fishing gears. In extreme cases, this change can result in dramatically reduced value of the total catch. Marine protected areas, either transitory or permanent, appear to offer the best prospects for management of reef fisheries, particularly if they are allied to community-based systems.

1.1 REEF RESOURCE SYSTEMS

Tropical reef fisheries provide employment and sustenance for millions of coastal dwellers (Salvat, 1992). Their distribution is discontinuous; only minor reef systems are found in the eastern sides of the Atlantic and

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Pacific Oceans, while they reach their greatest development in the clear coastal waters of the Indo–West Pacific (Figs 1.1–1.3).

For the purpose of this book a reef fishery is defined as one that is conducted in an area in which the presence of reef building (hermatypic) corals largely precludes the commercial-scale use of mobile fishing gears such as trawls and seine nets. The lower bound of such fisheries is set by the depth at which hermatypic corals can grow and, depending upon water clarity, can extend beyond 80 m in oceanic areas and around islands (Goreau and Wells, 1967). Non-hermatypic corals and sponges often extend this boundary. On continental shelves and in relatively turbid waters the lower limits often lie at 30–60 m (Clausade *et al.*, 1971; Done, 1982).

Along continental margins, the seabed normally slopes away to depths of around 200 m before descending more rapidly towards the ocean depths. However, there are often carbonate shelves which have developed for reasons relating to change in relative sea level in recent geological time and to growth of corals. An abrupt break in the shelf usually occurs at depths of 50 m or less, sometimes even close to the sea surface, beyond which the shelf descends precipitously to the bathyal zone. Windward or upcurrent portions of such shelves often support prolific coral growth, leeward or downcurrent areas usually have less coral, and large areas are covered by calcareous sediments. Characteristically, a sill reef is present at the windward margins of an insular shelf and vast areas of luxuriant coral growth can be found 20–50 m below the surface.

The growth of corals towards the surface to form an emergent reef and reef flat is a process that culminates in the formation of an offshore ribbon or bank reef, a barrier reef surrounding a lagoon, or in the development of a fringing reef close to shore. The characteristics of either a lagoon or a reef flat depend upon exposure, tidal regime and turbidity. Ecological conditions may develop in lagoons such that they no longer support coral growth and the lagoon floor is covered by soft sediments, although sometimes interspersed with emergent coral heads.

Thus it is that between the conspicuous reef crest and reef flats which emerge at the lowest spring tides and the lower limits to coral growth there are, in many tropical seas, large areas which can be described either as coralline shelves or as lagoons (Fig. 1.4).

Fig. 1.1 (pg. 3) Diagrammatic map of the central Atlantic Ocean and far-eastern Pacific Ocean, showing geographic areas with major reef systems.

Fig. 1.2 (pg. 4) Diagrammatic map of the Indian Ocean, including western South East Asia and the far-western Pacific Ocean, showing geographic areas with major reef systems.

Fig. 1.3 (pg. 5) Diagrammatic map of the central Pacific Ocean, showing geographic areas with major reef systems.