CHAPTER

8

Conservation Status of the World's Fish Fauna: An Overview

ROBERT A. LEIDY

and PETER B. MOYLE

In the five years since we first reviewed the status of the world's fishes (Moyle and Leidy 1992), there has been an explosion of new information on the conservation of aquatic organisms and their ecosystems. Notwithstanding this surge of interest, many aquatic ecosystems remain poorly understood because conservation biology remains primarily focused on the loss of biotic diversity in terrestrial environments. Loss of diversity in aquatic environments has received comparatively little attention, even though the physical, chemical, and biological degradation of aquatic environments is widely recognized as a major problem, usually in the context of the spread of human disease, loss of fisheries, or degraded water quality for drinking, irrigation, or recreation. Yet aquatic habitats support an extraordinary array of species, many of which are being lost as their habitats deteriorate.

Ironically, while interest in the conservation of aquatic organisms has increased over the last five years, so too has the rate and extent of degradation of aquatic environments upon which these organisms depend. The root cause of the greatest loss of aquatic biodiversity remains the rapid expansion of human populations. The earth's human population has increased by approximately 500 million to about 5.7 billion people between 1990–1995, and it continues to increase at a rate of more than 86 million people annually (United Nations Population Fund 1995). The implications of increasing human populations for the conservation of aquatic biodiversity are not trivial, as about 60% of the world's population lives within 100 km of the ocean and most inland cities center on lakes and rivers that eventually drain into the ocean (The World Resources Institute *et al.* 1996).

General forms of aquatic degradation due to increasing human populations include physical conversion and degradation of natural habitats, various forms of water pollution, development of freshwater resources, introduction of exotic organisms, and overfishing. For example, it is estimated that 950 million people rely on fish as their primary source of protein; however, more than two-thirds of the earth's marine fish stocks are either overfished or reaching their limit to sustain a fisheries (World Resources Institute *et al.* 1996; Food and Agriculture Organization 1993, 1995; see chapter 6). Human demands on the world's freshwater resources are also increasing. While fresh water covers about 1% of the continents, increased human demands for freshwater are rapidly outstripping

P. L. Fiedler et al. (eds.), *Conservation Biology*

supply in many regions of the world (Postel 1996). Engelman and LeRoy (1993) estimate that the scarcity of fresh water is already a problem in 20 countries, and that by the year 2025 the number of people in water-scarce countries could be as high as 2.42 billion (see World Resources Institute *et al.* 1996). Clearly, the threat from increasing water demands on the world's freshwater biotas, particularly in regions of projected chronic scarcity (e.g., Africa, western Asia), will be severe.

Our currently inadequate appreciation of the conservation status and ecological functioning of aquatic ecosystems and their constituent fishes is the result of a number of factors. From a logistical and technological perspective, most marine habitats are too remote or too deep for easy study; most freshwater habitats are too turbid, deep, or physically dynamic to monitor easily. In addition to these methodological difficulties, there are experimental design constraints, specifically, the inherent but confounding variability in spatial and temporal scale, especially in aquatic environments such as rivers and nearshore marine environments where disturbance is a major force structuring fish communities. Also, many aquatic organisms are microscopic (e.g., the planktonic component) or extremely small (e.g., many aquatic invertebrates), therefore being difficult to identify. Thus, the organisms we know best in aquatic habitats are fish because of their relatively larger size, abundance, economic importance, and comparative ease of capture and identification (Karr 1981). Fortunately, fishes are appropriate indicators of trends in aquatic biodiversity because their enormous variety reflects a wide range of environmental conditions. Trends observed in fish also have been noted similarly for other less documented groups, such as freshwater molluscs and crustaceans (Williams *et al.* 1993).

With the exception of only a very few regions (e.g., North America and Europe), the distribution, ecology, and status of most fish species remain poorly understood. Even in the better known regions, new fish taxa continue to be described, although individual species abundances may not be well known. Examination of trends in freshwater fish faunas from different parts of the world indicate that most fauna are in serious decline and in need of immediate protection. Species most likely to be threatened with immediate extinction are either: (1) specialized for life in large rivers, although the number of threatened species in small rivers is increasing; (2) of lacustrine or inland sea habitats; (3) found in arid, freshwater environments; (4) dependent on coastal estuaries and reefs and other shallow-water marine habitats; or (5) endemics restricted to very small areas, such as springs or caves.

The purposes of this chapter are to review the status of aquatic environments as reflected by fishes and to make recommendations for worldwide fish conservation. To do this, we examine the following questions:

(1) Why are aquatic environments so vulnerable to degradation?

(2) How much diversity as measured by fishes exists in aquatic environments?

(3) How appropriate are fish as indicators of aquatic biodiversity?

(4) What are the taxonomic and ecological characteristics of threatened fishes?

(5) What is the status of fish faunas from different regions of the world and what are some of the reasons for their decline?

(6) What actions can be taken to protect aquatic biodiversity?