Chapter 6
Acclimation to Seawater in the European Eel *Anguilla anguilla*: Effects of Silvering

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6.1 Introduction

6.1.1 Osmoregulation

Teleost fishes regulate the osmotic concentration of their body fluids at about 30–40% of the level of oceanic sea water, as do most vertebrates (including ourselves!). This process is known as osmoregulation, which will be briefly summarized following the outline given in Rankin and Davenport (1981), which uses the eel as an example. The most primitive chordates, the hagfish, Family *Myxinidae*, have blood isoosmotic with sea water and are confined to the marine environment, where the phylum Chordata (which includes the vertebrates) must have originated. Later vertebrates are thought to have evolved from ancestors who lived in freshwater, which they were only able to colonize by reducing their blood osmotic concentration to minimize two problems; osmotic entry of water and diffusional loss of salts, which are serious problems as fish gills must have a large surface area and thin epithelium to facilitate oxygen uptake from the water. In marine teleost fishes blood composition is similar to that of fishes in freshwater, resulting in the opposite problems; osmotic entry of water and diffusional loss of salts.

In the face of these dissipative forces homeostasis is maintained by active processes in the gills, kidneys and guts. Most teleost species only possess the mechanisms to osmoregulate (and therefore survive) in either sea water or freshwater; they are said to be stenohaline. A small minority are euryhaline, being able to move between fresh and salt water either at certain stages in their life cycle (e.g. salmon) or at any time (e.g. eels, flounder). The basic features of eel osmoregulation have long been known but in recent years there has been a resurgence of interest in its endocrine control mechanisms. The functions of the osmoregulatory organs will be briefly described, followed an overview of the hormones implicated and finally a more detailed discussion of their role in the eel life cycle.

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G. van den Thillart et al. (eds.), *Spawning Migration of the European Eel,*