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The Ear as Part of the Octavolateralis System

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32.1 Introduction

The inner ear and lateral line form the octavolateralis system in aquatic vertebrates. This system provides an array of electrosensory and mechanosensory inputs that are integrated with chemosensory and visual information to produce behavioral responses appropriate for the organism (see Blaxter 1988). As several chapters in this volume note (Enger et al. Chapter 29; Kalmijn Chapter 9), there are structural and functional parallels between the inner ear and the mechanosensory lateral line systems. Direct comparisons between these systems are useful with regard to the phylogeny, ontogeny, micromechanics, transduction processes, coding, central connections, and behavioral use of these organs. Just as research on the lateral line has advanced our understanding of inner ear function (see Flock 1974), insights gained from vestibular and auditory research might help to guide questions regarding lateral line function. This chapter addresses some parallels between the mechanosensory lateral line and the ear of fishes and considers how investigators of these two systems might learn from one another.

Recent reviews and books are available on the function of the inner ear in fishes, addressing vestibular (Platt 1983, 1988) and auditory mechanisms (Tavolga et al. 1981; Popper and Fay 1984; Popper et al. 1988). Fay (1988b) reviews the literature on behavioral studies of detection and discrimination mediated by the ears and the lateral line.

32.2 Similarities and Differences Between Ear and Mechanosensory Lateral Line

Differences in the major peripheral structures of the inner ear and lateral line of a fictitiously “representative” fish are schematically outlined in Fig. 32.1. The inner ear is fairly compact, containing six or seven end organs confined in a small space deep in the skull. The pouches and tubes of this membranous labyrinth contain a special fluid called endolymph and patches of sensory epithelia called cristae, maculae, or papillae, depending on their precise morphology.
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