Hearing

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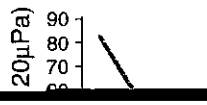
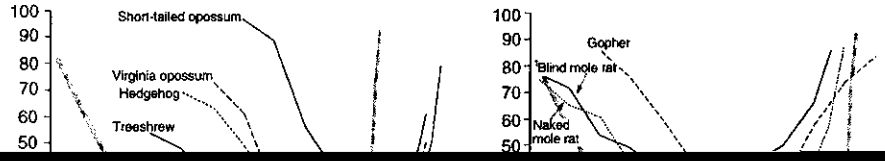


source of selective pressure in the evolution of mammalian hearing has been the need to local-

ize sound in order to direct the eyes to sound


100
90
80
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Short-tailed opossum
Virginia opossum
Hedgehog
Treeshrew
100
90
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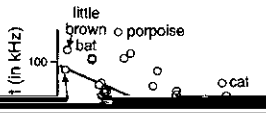
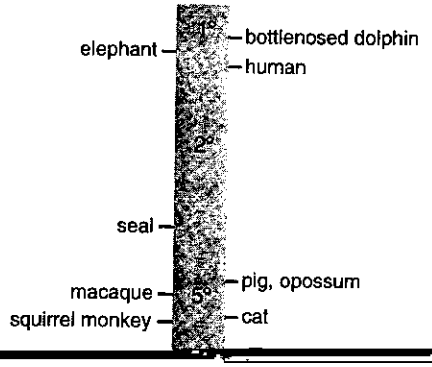
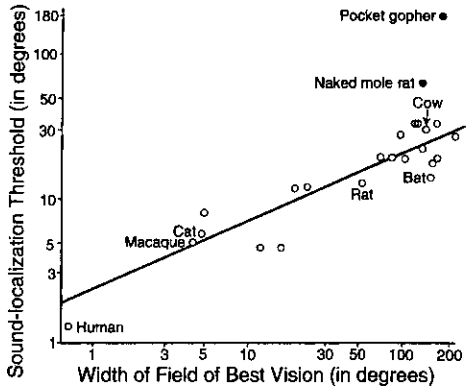
50
Gopher
Blind mole rat
Naked
mole rat



mole rat in Figure 3). Not only have these animals lost the ability to hear high frequencies, but they have also lost virtually all ability to

Sound-Localization Thresholds

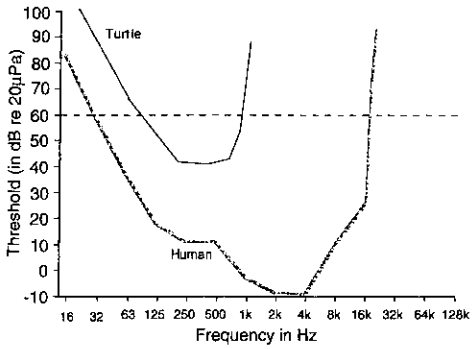




Birds

Birds differ from mammals in that they (1) lack

other species. For example, field studies have been used to determine the degree to which different species of swallows recognize and approach the sound of their own offspring and to examine the response of male song sparrows to the songs of other males (Beecher & Stoddard, 1990). Laboratory studies have investigated the categorization of vocalizations by various songbirds and have used reaction time as a measure of the degree to which a bird perceives two calls or songs to be different (Dooling, 1992).



sound reception, including the lateral body wall and lungs (Hetherington, 1992).

Detection of Sound

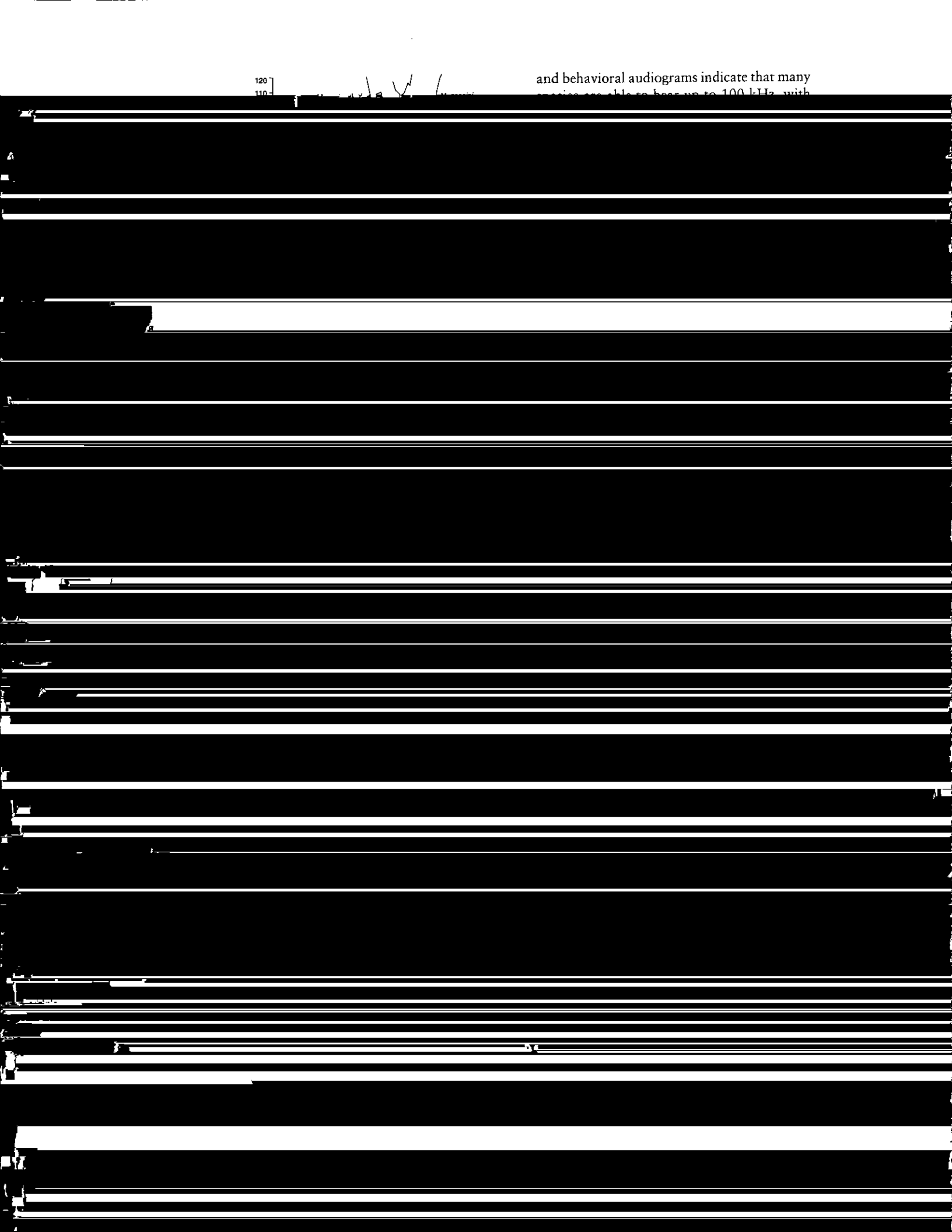
Although a number of behavioral audiograms have been obtained for frogs, most rely on unconditioned responses, which tend to underestimate sensitivity (see Fay, 1988). More-sensitive audiograms, obtained using the conditioned reflex-inhibition technique, are available for the bullfrog and green tree frog (Megela-Simmons et

tachian tubes and the mouth cavity. This makes it possible for a sound to reach the inner as well as the outer surface of the eardrum, turning the ear into a "pressure difference" receiver, and this is believed to make the ear more directionally sensitive (Eggermont, 1988).

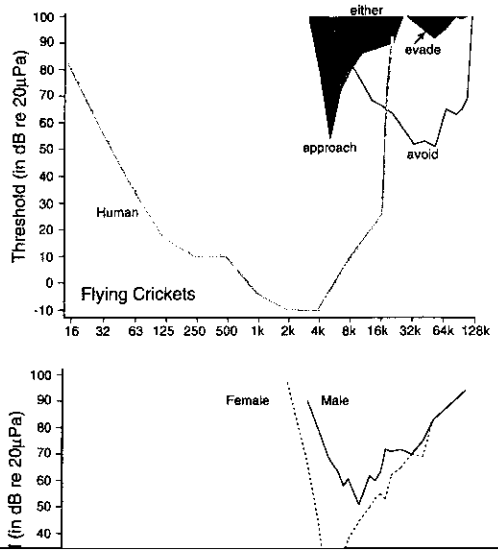
Identification of Sound

Playback studies are more commonly used with frogs than with other vertebrates, including birds

including sharks (Fay, 1988; Klump, Dooling, Fay & Stebbins, 1995). The general pattern that



and behavioral audiograms indicate that many



ultrasound in tethered flight (Yager & May, 1990). It should be noted that both of its tympana are located together in a deep ventral cleft and are separated by less than 150 µm, thus giving it a "cyclopean" ear (Yager & Hoy, 1989).

Identification of Sound

Playback techniques are widely used to study the perceptual responses of insects by assessing the effectiveness of different sounds in eliciting an approach or avoidance response. Studies using these techniques have shed light on the ability of crickets to discriminate the calls of their own species from those of others, the relative effectiveness of different parts of a call, the modification of the response to one sound by

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calization in azimuth. *Journal of Comparative Psychology, 105,* 125–133.

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