5

SENSORY SKILLS AND BRAIN

In 1973 Grahame Webb and I were travelling at speed up a stretch of the Liverpool River in Arnhem Land, Northern Territory, in an open 5 m aluminium boat when we spotted a pygmy goose settled on the water up ahead. Almost simultaneously, a movement caught our eyes as a 2.5 m C. porosus *ran down a high bank opposite the goose, dived into the water and disappeared. Was it after the goose? We pulled to a halt. The tidal current was driving eddies of floating leaves. Spits of rain bounced droplets from the surface of the turbid river. The goose paddled on. Suddenly the croc surfaced midstream, looking straight at the goose now about 10 m away and submerged again. Within a few more seconds, the goose was pulled down and disappeared under the muddy water. We saw no further sign of either goose or croc.*

Think about the sensory skills required for this and similar acts. The goose was originally about 40 m away, so the croc showed good visual acuity. It swam underwater, following a planned course across the current, probably with some knowledge of its depth. Its brief surfacing allowed a check on direction and distance. But it could not rely on vision to travel the last 10 m, the water was too muddy. Yet it located the goose and pulled it under without even breaking the surface. I was impressed! For some time, we've known that crocodylians have good visual acuity and binocular vision, and any creature with a lung might be able to sense hydrostatic pressure and so assess depth. But how did it find the goose? Could it sense the feet, presumably paddling away in the murky stream? The answer to that has become clearer only recently: they use their integumentary sensory organs (ISOs) and these and other crocodylian sensory organs and skills will now be explored.

Crocodylians need to sense two worlds: air and water. The different physical properties of these two media in transmitting light, sound (pressure waves and vibrations) and chemicals have 'design' implications for crocodylian sensory systems. Crocs often float at the surface almost completely submerged, with just the eyes, nostrils and (usually) ears visible, well placed for sensing the world above the waterline (Figs 5.1, 5.2). They have the same senses that we do: vision, touch, hearing, smell and taste (and balance and sensitivity to temperature). They also have some very interesting sense organs on their skin (integumentary sense organs, ISOs) that are a bit reminiscent of the lateral line organs in fishes but are in fact unique to crocodylians. Alligatoridae have ISOs only on the head, but other crocodylians have them all over, presumably enabling more input from underwater sources (Fig. 5.3). New research is generating exciting results about ISOs and it has become clear that they are multifunctional, sensing action below the waterline as well as around the teeth and jaws, all useful in feeding, and even sensing changes in pH. ISOs are particularly dense on the head, and crocs pay a lot of attention to each others heads during courtship, stroking and rubbing (Fig. 5.30, Chapter 12) so they almost certainly play an important role in this behaviour.

The eye of Crocodylus porosus, *with part of the ear opening and a number of integumentary sense organs also visible. (Photo DSK)*