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The Cassowary's Casque

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The Southern Cassowary *Casuarius casuarius* is variously described as having a hard bony (MacDonald 1973; Simpson & Day 1984; Beehler *et al.* 1986) or a horny (North 1914; Pizzey 1980; Coates 1985; Reader's Digest 1986) casque. We recently had an opportunity to dissect an adult male Cassowary found dead near Feluga, in northern Queensland, and found that the casque is neither horny nor bony. The skull does not have a protuberance as might be expected and the casque itself consists of a keratinous skin over a core of firm, cellular foam-like material that looks like some hi-tech plastic. This foam is very resilient and gives the casque elastic properties that appear to be lost in dried museum skins. The casque is very rigid longitudinally but can easily be squeezed and deformed laterally. When pressure is released the casque springs back to shape.

The casque is usually described as serving to provide protection as the bird moves through thick vegetation. Cassowaries normally move slowly with head and neck erect, but when moving at high speed they stretch the neck out horizontally and run full tilt through the vegetation, brushing saplings aside and occasionally careering into small trees. The casque would help protect the skull from such collisions. There is also the possibility that it has a secondary sexual function. However, both sexes have one, the female's being larger than the male's and I (F.C.) have not seen it being particularly prominent in mating displays or fighting. We believe the foam inside the casque supports the idea that it acts as a protective device — it appears to have excellent shock-absorbing qualities.

We have been able to find no reference to this peculiar internal structure and it would be worthy of the attention of avian anatomists. It is strange that the myth of a bony casque has been maintained, especially since Pycraft (1900) makes no mention of any bony protuberance of the skull in his monograph on ratite anatomy.

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Notes on Ground Temperatures at Nesting Sites of the Maleo *Macrocephalon maleo* (Megapodiidae)

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Literature on temperature and temperature fluctuations in mounds and pits of megapodes is scarce and often incomplete. Few papers give detailed descriptions (Crome & Brown 1979; Seymour & Ackerman 1980; Todd 1983; Booth & Seymour 1984; Seymour 1985; Seymour, Vleck & Vleck 1986). Apart from Todd (1983), all articles refer to megapodes that build mounds of leaf litter where heat is produced by microbial decomposition. These mound-building megapodes spend much time and energy in constructing the mound and in the regulation of its inner temperature (Baltin 1969; Seymour 1985; Seymour, Vleck & Vleck 1986). Non-mound-building megapodes like the Maleo *Macrocephalon maleo* and several *Megapodius* spp. bury their eggs in excavations (pits) in sand on beaches or inland where the sun or volcanism heats the ground, and do not spend any time in regulating the incubation temperature. Records of ground temperatures at nesting sites of the Polynesian Scrubfowl *Megapodius pritchardii* (Todd 1983) are the only detailed data for any non-mound-building megapode. The present study provides data on ground temperatures at nesting sites of the Maleo.

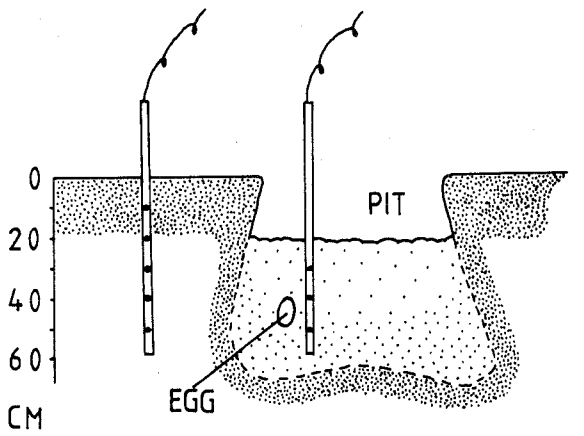

FIGURE 1 Maleo pit with egg. Temperature sensors shown inside and outside pit (1), Tambun inland nesting ground, Dumoga-Bone National Park, North Sulawesi, Indonesia.

Materials and methods

Temperature measurements were made at three different Maleo nesting grounds in North Sulawesi, Indonesia, during 1985 and 1986: (1) Tambun, Dumoga-Bone National Park: this nesting ground (1.6 ha) is heated by a hot water stream and several hot water wells. The lowland tropical rainforest at this site was recently felled and it is now overrun by *Lantana camara* and other secondary vegetation. The soil is dense and stony. (2) Tiwo, Tangkoko-Batuangus Nature Reserve: this nesting ground, situated in the lowland tropical rainforest, consists of several small bare spots. It is heated by subterranean hot water and the sun. The soil is a loose volcanic rubble. (3) Batu Putih, Tangkoko-Batuangus Nature Reserve: this black volcanic gravel beach, where the sun acts as a heat source, is now abandoned by the Maleos. It was historically an important nesting ground, but has been out of use since 1913 due to over exploitation of the eggs by man (MacKinnon 1978).

The ground temperature at Tambun and Tiwo was measured at the bottom of the pits in which the Maleos bury their eggs (Fig. 1). Depths at which temperatures were recorded inside pits, were measured from the floor of these pits. On two occasions the temperature was measured just next to an egg. At the Tambun nesting ground, temperature recordings were also made outside pits, with depth measured from the actual surface level. Thus, depths measured inside and outside pits are not directly comparable. Ground temperature at Batu Putih beach was recorded above the high-tide line at the location where the Maleos used to bury their eggs according to Wallace (1860) and Guillemard (1886).

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