DO DIVING LEATHERBACKS PURSUE GLOWING JELLY?

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Last year N. Mrosovsky (1987) publicised the remarkable ability of the leatherback turtle *Dermochelys coriacea* to dive to abyssal depths (at least to 1200m). The experimental studies had been carried out by Eckert's group (University of Georgia), and followed earlier investigations off the Virgin Islands (Eckert *et al* 1984, 1986) which had revealed an ability to reach the more modest (but still impressive) depths of 400-500m. Eckert *et al* exploited the nesting habits of female leatherbacks to attach a harness and pressure sensitive device to a female during her beach crawl to lay eggs; the device was collected on a subsequent nesting episode about 10 days later.

In his article Mrosovsky concentrated upon the thermal problems involved in deep dives, since there is evidence that adult leatherbacks are capable of endothermy (virtually essential for a reptile spending long periods of activity at depths below 1000m where temperatures below 5°C are universal, whatever the latitude). There are other interesting physiological problems, particularly concerning respiration, avoidance of nitrogen embolism ("bends") and buoyancy which must be encountered and solved by the leatherbacks, but the most pressing question concerns the reason for such dives.

It has long been known that leatherbacks subsist almost exclusively upon jellyfish and related animals (such as siphonophores), a rather unlikely diet for such large animals given the low organic content (perhaps as little as 2-5% of wet weight) of coelenterates. This diet imposes a requirement for large quantities of food; young leatherbacks eat 5-10 times as much bulk of food as young green or loggerhead turtles of similar size. In pursuit of jellyfish, adult leatherbacks forage far into temperate waters (they are regular summer visitors to Canadian, Norwegian, British and Peruvian waters for example), where their endothermy (presumably due to active biochemical and physiological processes, since they must spend weeks at temperatures of about 10-12°C) allows them to exploit swarms of jellyfish such as *Cyanea arctic.*

The author has some familiarity with the use of midwater nets trawled (from R.V. *Discovery*) in tropical and subtropical areas of the eastern Atlantic (where adult leatherbacks were occasionally observed at the surface). The catch at depths between 800 and 1500m is dominated in bulk by gelatinous animals; medusae, ctenophores, siphonophores and salps. Particularly noticeable and common are the large *Pyrosoma* (pelagic tunicates) which may be more than 0.5m long. A 1 hour trawl with an 8 m^2 net often caught several kg of jelly, and gelatinous animals were invariably present in reasonable quantities. Though the biomass of deep water is generally lower than at the surface, there is evidently a constant supply of jelly at depth (this supply is probably substantially independent of latitude as the abyssal environment is affected little by surface conditions). This constancy of distribution contrasts with the situation in surface waters where jellyfish distribution is patchy, both geographically and temporally.

Abyssal water is not only cold, but dark (little if any light penetrates below 1000m) and most midwater animals are bioluminescent. This is especially true of gelatinous animals and it has been suggested by Marshall (1979) that medusae and siphonophores luminesce to warn potential predators of their generally toxic, stinging properties. The leatherback is apparently immune to such toxins (Mrosovsky, 1987), so the flashes of blue/green light (often lasting for several seconds) will enable it to locate prey readily, probably giving a much better fishing efficiency than the nets of research vessels.

Deep diving may be used generally by leatherbacks when surface supplies of jelly are poor, but there may be a particular problem for nesting animals (the subject of Eckert's studies). Adult females lay eggs on about 6 occasions during a breeding season (Pritchard, 1971), at

intervals of about 10 days. These animals therefore have to remain in a restricted area for 8-9 weeks. During this period they will be unable to forage widely for surface-dwelling jellyfish (which are probably less expensive to collect in energy terms), but the remote nesting areas are usually close to deep water, enabling them to exploit the reliable source of glowing, abyssal jelly.

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