EARTHQUAKES

Burma's fault

The great Sumatra–Andaman earthquake of 26 December 2004, and the tsunami that it triggered, also shook the geological community. Much scientific effort has since focused on the possibility of further calamitous events in the Bay of Bengal, and especially on understanding the southern stretch of the fault that was responsible for the earthquake, and which lies to the west of the island of Sumatra.

But the fault's northernmost limit, which extends along the coast of Myanmar (Burma) to Chittagong in Bangladesh and faces the densely populated Ganges delta (pictured), has received relatively little attention. Phil Cummins' conclusion that an active zone still exists off Myanmar, as he reports on page 75 of this issue, thus makes for disquieting reading (P. R. Cummins *Nature* **449,** 75–78; 2007).

The Sumatra–Andaman earthquake was triggered when the Indian tectonic plate was thrust violently under the southeast Asian plate off the northwestern coast of Sumatra. Although this subduction zone was known to extend farther north through the Andaman Islands, its location and nature in the Myanmar region were less clear. It had been thought that subduction was no longer active in this area, and that the plate boundary extended, not under the sea, but on the land through Myanmar.

Cummins bases his alternative hypothesis on previous geological studies and recent geodetic measurements, as well as on historical accounts detailing the effects of past earthquakes. He couples these observations with the fact that the floor of the Bay of Bengal has a thick layer of sediments, up to 20 kilometres deep, fanning out from the mouths of the Ganges and Brahmaputra rivers. This 'Bengal fan' insulates the underlying rock, creating thermal conditions more suited to generating earthquakes. Taken together, the implication is that a long, submarine subduction zone stretches for some 900 kilometres from the northern Andamans to the west of Chittagong.

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The existence of such a fault requires a thorough re-evaluation of the potential for deadly tsunamis in the northern Bay of Bengal. Cummins' simulation of a large earthquake off the coast of Myanmar and the resultant tsunami shows the devastating effect it could have, and underscores the need for further study and monitoring of rock deformation in this region.

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ZOOLOGY

Twice bitten

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The toothy visage of a moray eel is a fearsome sight. The discovery that morays can thrust a second pair of jaws out from their throat to wolf down prey whole increases their predatory reputation still further.

Many animals swallow their prey whole. Snakes come to mind, of course; but amphibians, lizards, birds and thousands of fish species can also attack, and gulp down, prey nearly as large as their head — imagine swallowing a peanut-butter sandwich or a salmon whole and you get some idea of how remarkable a feat that is. The methods by which animals do this vary from the suction feeding of fishes[1] to the 'unhinged-jaw' mechanism of snakes[2] and the inertial feeding of lizards and birds[3]. (For inertial feeding, picture a pelican thrusting its head upward to use gravity to choke down a large fish.)

These gulping mechanisms, along with most other vertebrate feeding habits that involve killing, dismembering and/or swallowing other animals, have generally been thoroughly investigated. On page 79 of this issue, however, Mehta and Wainwright[4] document yet another tactic. They show how moray eels — elongated snake-like fishes that inhabit coral reefs and rocky intertidal habitats worldwide — drag a large item of prey into their gullet by using a second set of grasping jaws that they thrust forward from deep in their throat.

Accessory jaws positioned in the throat are known as pharyngeal jaws, and are quite common among fishes. In many species, some of the bones that support the gills, called the branchial arches, have been modified into feeding tools that can filter prey from the water, crush and grind hard food such as snails or clams, and even grasp and tear softer prey before it is swallowed[5].

Perhaps the most widely known pharyngeal jaws are found in freshwater cichlids and marine wrasses and parrotfishes. These fish families possess hard, toothy pharyngeal plates that are thought to have allowed a wide range of feeding habits to develop and promoted their evolutionary diversification[6]. But Mehta and Wainwright reveal[4] an additional class of pharyngeal-jaw mechanism. They aptly term this the 'raptorial pharyngeal jaw', for its ability to reach far forward from its resting position in the pharynx, and grab the prey to transport it back towards the stomach.

The discovery of this mechanism in the reticulated moray eel (*Muraena retifera*) is notable in several respects. First, it is a classic example of discovery-based science, stemming from an inspirational "oh wow!" moment. Such moments are crucial to the study of living organisms, for they complement the approach of testing *a priori* hypotheses with statistical analyses of large data sets. In this case, Mehta and Wainwright combined intellectual curiosity and visualization technology to reveal the moray eel's unusual behaviour. They had previously found[7] that several types of eel do not use suction at all during feeding. This led them to search for alternative ways in which these predators could transport their prey into the oesophagus. By recording high-speed videos of eel feeding events in the laboratory, the mechanism became clear: the videos show the pharyngeal jaws projecting far forward into the mouth cavity to latch onto the food. Stills from one of the videos are shown as Figure 1, overleaf.

A second notable aspect of this research is the way the authors backed up their primary video records with a detailed anatomical study of the pharyngeal bones and muscles. They also performed X-ray fluoroscopic analysis (the same technique used in a 'barium swallow' to obtain pictures of the human gut) to examine the range of movement of the pharyngeal jaws. These data sets allowed a detailed and intriguing look at a novel feeding mechanism in this diverse and important group of animals.

As with all fascinating discoveries in animal behaviour and function, unexplained facets of the story remain. First, Mehta and Wainwright generalize their results obtained in a single species more broadly among eels. Although this may be valid for certain groups of morays within the 200-odd species in the moray family Muraenidae alone (and another 400 species in other eel groups), a more extensive comparative