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NATURAL HISTORY NOTE

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The first record of sea anemone *Stichodactyla gigantea* consuming a sea snake *Emydocephalus ijimae*

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The main vertebrate predators of sea snakes (Elapidae; Hydrophiinae) are sharks, moray eels, groupers, sea eagles, saltwater crocodiles, leopard seals, and red-banded snakes (Heatwole, 1999; Sasai et al., 2020). There have been a few reports of sea snakes being eaten by invertebrates such as crabs (Voris & Jefferies, 1995), and there are two reports of sea snake interactions with sea anemones. In one report, a live turtle-headed sea snake *Emydocephalus annulatus* was held by a sea anemone (Ineich & Laboute, 2002), and in another report, an olive-headed sea snake *Hydrophis major* exhibited extreme distress immediately after coming into contact with the sea anemone *Entacmaea quadricolor* (Goiran & Shine, 2014). However, in these cases, the sea snakes were alive and were not eaten by the sea anemones. Here, we report the consumption of an Ijima's turtle-headed sea snake *Emydocephalus ijimae*, by the gigantic carpet anemone *Stichodactyla gigantea* and discuss the cause of death of the snake.

Emydocephalus ijimae is a viviparous sea snake species distributed in coral reefs in the region around the Ryukyu Islands in Japan to Taiwan (Ota & Masunaga, 2005). The genus *Emydocephalus* is unusual in being effectively non-venomous, a feature related to its diet which is exclusively the eggs of coral reef fish (Voris, 1966; Heatwole, 1987). *Stichodactyla gigantea* is a common anemone species in the tropical regions of the Indo-Pacific region, where it is found in shallow sandy areas of coral reefs (Hattori & Kobayashi, 2009). This sea anemone is a generalist predator that uses its tentacles to capture prey such as urchins, snails, crabs, shrimps, as well as small fish (Madhu & Madhu, 2017). Further, it is known that they often become host to the clown anemone fish *Amphiprion ocellaris* (Fautin & Allen, 1992).

At 01:09 h on 16 February 2022, we discovered an *S. gigantea* (maximum width of oral disc approximately 330 mm) that was swallowing an *E. ijimae* (snout-vent length, SVL = approximately 300 mm) in the lagoon of the coral reef area of Okinawa Island, Japan (26° 40'16.12'' N, 127° 53'15.95'' E) (Fig. 1). At this size the sea snake is likely to have been a neonate as *E. ijimae* give birth to their young from November to January which are 280–320 mm in SVL (Masunaga et al., 2003). Initially, the anemone and snake were positioned in the shallows of an area of sand with limestone rock, and the head and tail of the sea snake had been engulfed. By the time of observation, most of the body parts appeared at the surface of the water because the tide was low. At 01:15 h the observer pulled up the remains of the *E. ijimae*, as the rest of the body was swallowed by then. The upper body, which was approximately 75 mm in length was only skin, and the bone or some internal parts of the body had been digested (Fig. 2). Around the sea anemone there were two small clown anemone fish of approximately 15 mm and 30 mm in length and some squat shrimps *Thor amboinensis*. Their size was measured by photographing them beside a stick of known length that was used later to estimate their length with the Leafareacounter Plus softeware.

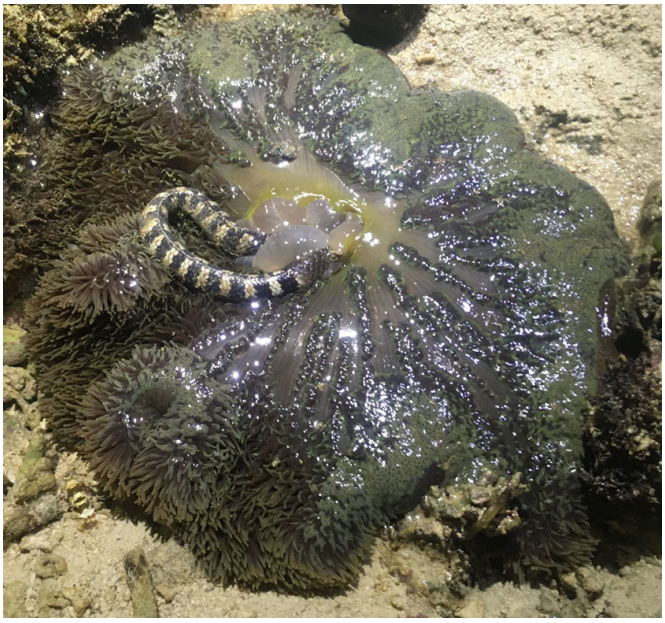

Figure 1. *Stichodactyla gigantea* swallowing an *Emydocephalus ijimae* in the lagoon of a coral reef area

Although *A. ocellaris* spawn close to sea anemones (Ida, 1984) it is unlikely that the sea snake was drawn to the anemone to search for *A. ocellaris* eggs to feed as the clown anemone fish were not of spawning size and, in any case, they usually spawn in summer (Ida, 1984). It would appear that the consumption of sea snakes by sea anemones is rare because ours is only the second recorded case. The current and previous cases (Ineich & Laboute, 2002) of sea snake captured by sea anemones have both involved neonate/

Figure 2. The upper body remains of *Emydocephalus ijimae* with only skin, indicating that some internal parts of the body were digested, a clown anemone fish is visible top centre

juvenile individuals. It has been noted that sea snakes avoid sea anemones (Goiran & Shine, 2014) due to their venom. However, *S. gigantea* is known not to cause a strong stinging sensation, but instead is extremely sticky (Fautin & Allen, 1992). In this case, sea snake species of the genus *Emydocephalus* may be more vulnerable because they are considered to be relatively slow swimmers (Shine et al., 2004; Avolio et al., 2006). Once stuck in the tentacles they run the risk of drowning as sea snakes need to breathe through their lungs even though they can depend on cutaneous respiration to a certain degree (Heatwole & Seymour, 1975). We concluded that the sea snake may have died by drowning, while being unable to escape from the sticky tentacles of the sea anemone, or may already have been dead before it made contact with the anemone.

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