

## A case of cannibalism in the false smooth snake *Macroprotodon cucullatus* on the island of Lampedusa

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The genus *Macroprotodon* (Colubridae, Colubrinae) includes four snakes species with a Mediterranean (Maghreb & S. Mediterranean) chorotype (Sindaco et al., 2013).

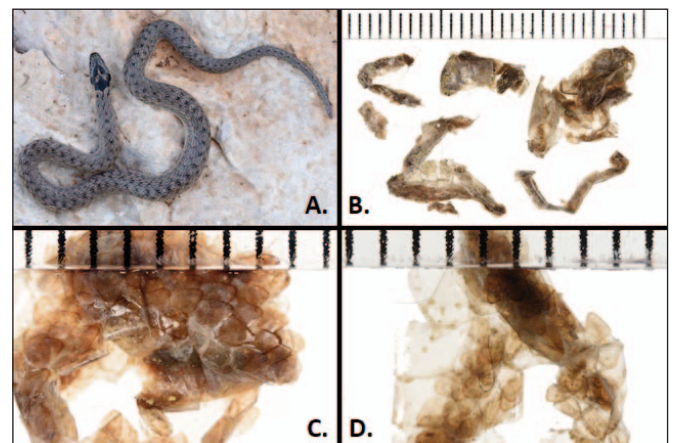
The only population of false smooth snake in Italian territory is located on Lampedusa Island (Province of Agrigento, Sicily), a limestone 'horst' belonging to the North African continental shelf and located in the Sicilian Channel, 113 km east from Tunisia and 205 km south from Sicily. Based on morphological characters (Wade, 2001), in recent times most studies attribute the Lampedusan false smooth snake to *Macroprotodon cucullatus textilis* (Duméril & Bibron, 1854) (Kreiner, 2007; Capula et al., 2011; Sindaco et al., 2013; Cattaneo, 2015; Di Nicola et al., 2019; Di Nicola, 2019). The genetic identity of this population has not yet been investigated, consequently its taxonomy requires confirmation and so here we will refer only to *Macroprotodon cucullatus* (Geoffroy St-Hilaire, 1827).

The false smooth snake is a secretive species with nocturnal or crepuscular habits (Capula et al., 2011; Speybroeck et al., 2016). *Macroprotodon* spp. feed mainly on reptiles; in Iberia *M. brevis* (Günther, 1862) feed primarily on amphisbaenians (*Blanus* spp., 50 %) and lacertids (mainly *Psammotromus* spp., 21 %); in Morocco they mainly eat skinks (*Chalcides* spp., 42 %), lacertids (*Psammotromus* spp., 21 %) and amphisbaenians (*Blanus* spp., 14 %) (Pleguezuelos et al., 1994); in Balearic Islands *M. mauritanicus* seem to predate mainly small rodents (Pleguezuelos et al., 1994). Ophiophagy and cannibalism seem to be quite rare behaviours and are currently known only in the Balearic populations of *M. mauritanicus*, where a young *Malpolon monspessulanus* was predated (Pleguezuelos et al., 1994). Two cases of cannibalism have been observed in captivity (Wade, 1988) and a case between two fighting adult males in the field, documented only in the early stages of head swallowing (Capellà et al., 2011).

Information on the feeding behaviour of the Lampedusan *M. cucullatus* is still based on the observation of a few cases, which would indicate a diet of mainly lizards and arthropods (Corti & Luiselli, 2000; Cattaneo, 2015). However, most of the remains of the arthropods may have actually been ingested by the predated lizards (Corti & Luiselli, 2000). The current study reports the first observation of cannibalism detected in Lampedusan *M. cucullatus* and moreover the first in this

species, if its identity is confirmed by biomolecular analysis.

On 18th April 2019, near Taccio Vecchio (Lampedusa), a false smooth snake was caught in order to record some morphological characters. The snake was an adult male (Fig. 1A) with a snout to vent length of 315 mm, a tail length of 50 mm (injured tip) and a body weight of 20 g. During the measurements the snake defecated and the faeces were collected and preserved in absolute alcohol. The faecal remains were subsequently hydrated and then examined by stereomicroscope. Six pieces of snake skin were found, including dorsal and ventral scales (Fig. 1B, C & D). The dorsal scales were smooth and shortened with a single apical pit, consistent with the skin being from *M. cucullatus*. On Lampedusa, the false smooth snake is sympatric with only the Eastern Montpellier snake *Malpolon insignitus*, but this species has elongated and grooved dorsal scales (Di Nicola, 2019) quite unlike those of *M. cucullatus*. The intact ventral scales were stretched and measured and a maximum width of 6.0 mm was detected. This value was compared with a specimen (R771) of the Zoology Museum Pietro Doderlein (University of Palermo) on which higher values at midbody (6.6 mm) and similar values near the cloaca (5.8 mm) were found. Taking into account that the museum specimen was a sub-adult (SVL: 224 mm) and the measured scales were not totally stretched, it can be assumed that the remains belong to a juvenile or sub-adult snake.



**Figure 1.** False smooth snake: **A.** Adult male with cannibalistic behaviour, **B.** Overview of all the faecal remains, **C.** Detail with dorsal scales, **D.** Detail with ventral scales

Mainland populations of *Macroprotodon* spp. consume mostly lacertids and amphisbaenians both in Europe and in Africa (Pleguezuelos et al., 1994); consequently cannibalism was unexpected. However, there are two potential explanations for cannibalism, which are not mutually exclusive. The first concerns possible scarcity of suitable prey. Amphisbaenians are not present in the whole Italian territory and lacertids are generally lacking on Lampedusa (Padoa-Schioppa & Massa, 2001), except for a small population of Italian wall lizard *Podarcis siculus* currently located in the only urbanised area of the island, where they were introduced (Lo Valvo & Nicolini, 2001). In the same area, the Maltese lizard *Podarcis filfolensis* has also been observed (Lo Cascio et al., 2005), but they are apparently now absent (authors' unpublished data). On some other Mediterranean islands, in response to the availability of different resources, some species are known to shift their feeding habits to other prey (Corti & Luiselli, 2000; Pleguezuelos et al., 1994). The second explanation concerns population density. On Lampedusa *M. cucullatus* is not usually considered abundant (Corti & Luiselli, 2000; Capula et al., 2010), but during the authors' surveys the species was observed throughout the island and in some locations the population density was apparently high (detection of about 4-5 snakes / hour), with cases of communal sheltering among individuals of similar age. It is possible that this high local density increases the likelihood of cannibalism, in a situation where other colubrid species with cannibalistic tendencies appear to have developed behaviours to minimise intraspecific interactions (Kolanek et al., 2019). Further investigation of the Lampedusa population of *M. cucullatus* may help establish the frequency of cannibalism and give greater insight into why this occurs.

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