

An extreme record of cannibalism in *Podarcis erhardii mykonensis* (Reptilia: Lacertidae) from Siros island, Cyclades, Greece

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The Aegean Wall Lizard, *Podarcis erhardii* (Werner, 1930), is a widely distributed lacertid species endemic to the Balkan region. It ranges from southern Serbia, the FYR of Macedonia, and Albania to mainland Greece and several clusters of Aegean islands (Valakos et al., 2008). The species has a snout-vent-length of 49.78 mm and feeds primarily on insects (Valakos et al., 1986; Arnold and Ovenden, 2002). Isolated lizard populations, such as those on islands, have been known to expand their diet to include plant material (Brock et al., 2013; Donihue et al., 2015) and cannibalistic practices (Polis, 1981; Pérez-Mellado and Corti, 1993; Castilla and Van Damme, 1996; Pafilis et al., 2008; Brock et al., 2013).

Our behavioural observation concerns cannibalism in *P. erhardii*. Island populations of *P. erhardii* have been recorded displaying cannibalistic properties, such as ovophagy (Brock et al., 2013) and tail biting (Deem and Hedman 2014) in the past. Additionally, other species within the genus *Podarcis*, such as *P. gaigeae*, *P. muralis*, *P. hispanica*, *P. lilfordi*, and *P. pityusensi*, are known to attack and consume adult tails and whole juveniles of the same species (Arnold, 1988; Castilla and Van Damme, 1996; Dappen, 2011; Pafilis et al., 2011; Zagar and Carretero, 2012). However, this is the first direct observational record of an adult *P. erhardii* consuming the flesh of another intraspecific adult (but see Donihue et al., 2015).

During a herpetological expedition on 9 June 2017 on the Greek Cycladic island of Siros (37.42257°N, 24.87869°E), I. Madden witnessed a large adult male *P. erhardii mykonensis* (subsp. Werner 1933) feasting on a deceased conspecific adult male. Upon closer inspection,

the cannibal was observed to have a severed upper half of another adult *P. e. mykonensis* in its mouth (Fig. 1). The dead lizard was missing its posterior half from just behind the forearms to the tail, the cause of which is unknown. I. Madden photographed the event, as well as recorded a 1-minute video of the lizard as it began to run away, with the dead lizard torso and head still in its mouth. The cannibal continuously ran along the top of a wall and paused intermittently to thrash the corpse against the cement. After 2 minutes, the cannibal lizard escaped our view by jumping into thick herbaceous vegetation off the back side of the wall, with the severed anterior of its prey still clutched in its mouth.

Cannibalism can be an advantageous strategy for individuals from populations where there is crowding of conspecifics and/or resources are rare. Obvious advantages of cannibalism include nutritional and energetic benefits when traditional food sources are scarce (Polis, 1981). However, the location of this particular predation event had a high availability of invertebrates from surrounding human settlements, though local *P. e. mykonensis* lizard densities were relatively high compared to populations from other islands of similar size and ecology as Siros (K.M. Brock, unpublished data). Cannibalism may also provide direct mating benefits to adult individuals within a population, as the consumption of another same-sex adult would immediately eliminate a potential reproductive competitor. Similarly, cannibalism can provide indirect benefits for competition between conspecific individuals as consuming the offspring of a competitor via ovophagy or infanticide would eliminate future competition for food and females (Polis, 1981; Cooper et al., 2015). The high density of lizards and abundance of invertebrates may imply stronger sexual selection or greater competition for quality territory in this population and, therefore, more reproductive competition (Cooper et al., 2015). Given the accumulation of observations

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Figure 1. A large adult male *P. e. mykonensis* consuming the dismembered head and shoulders of a conspecific adult male. The cannibal was observed thrashing the upper torso and head of its prey against the wall on which it stood. After approximately two minutes of observation, the cannibal ran away from observers into vegetation on the backside of the wall, its prey still clutched in its jaws.

of cannibalistic events in *Podarcis* species from both mainland and island populations with varying degrees of intra-specific lizard densities (Brock et al., 2014, and Brock unpublished data), food sources and availability (Donihue et al., 2015), more empirical research is needed to understand why this peculiar behaviour has evolved in certain populations within a species and not in others.

References

- Arnold EN (1988) Caudal autotomy as a defense. In: Gans, C., Huey R.B. (eds) *Biology of the Reptilia 16, Ecology B: Defense and Life History*. Alan R Liss, New York, 235–273.
- Arnold, E.N., Ovenden, D. (2002): *A Field Guide to the Reptiles and Amphibians of Britain and Europe*. Harper Collins, London.
- Brock, K.M., Bednekoff, P. A., Pafilis, P., Fougopoulos, J. (2014). Evolution of antipredator behavior in an island lizard species, *Podarcis erhardii* (Reptilia: Lacertidae): The sum of all fears? *Evolution*, **(69)**1: 216–231.
- Brock, K. M., Donihue, C. M., Pafilis, P. (2013). New records of frugivory and ovophagy in *Podarcis* (Lacertidae) lizards from East Mediterranean Islands. *North-Western Journal of Zoology* **10** (1), 223–225.
- Castilla, A.M., Van Damme, R. (1996): Cannibalistic propensities in the lizard *Podarcis hispanica atrata*. *Copeia* **1996**(4): 991–994.
- Cooper, W. E., Dimopoulos, I., Pafilis, P. (2015), Sex, Age, and Population Density Affect Aggressive Behaviors in Island Lizards Promoting Cannibalism. *Ethology*: doi:10.1111/eth.12335
- Dappen, N. (2011): Cold-blooded Cannibals. Observations on cannibalistic egg eating and predation on juveniles within *Podarcis pityusensis*. *Lacertidae* (Eidechsen Online) 2011: art.113.
- Deem, V., Hedman, H. (2014). Potential cannibalism and intraspecific tail autotomy in the Aegean Wall Lizard, *Podarcis erhardii*. *Hyla* **2014**(1): 33–34
- Donihue, C.M., Brock, K.M., Fougopoulos, J., Herrel, A. (2015). Testing the impact of food availability and intraspecific aggression on the functional ecology of an island lizard. *Functional Ecology*: doi: 10.1111/1365-2435.12550.
- Pafilis, P., Pérez-Mellado, V., Valakos, E.D. (2008). Postautotomy tail activity in the Balearic wall lizard, *Podarcis lilfordi*. *Naturwissenschaften*: **95**: 217–221.
- Pafilis, P., Meiri, S., Fougopoulos, J., Valakos, E. (2009): Intraspecific competition and high food availability are associated with insular gigantism in a lizard. *Naturwissenschaften* **96**: 1107–1113.
- Pafilis, P., Fougopoulos, J., Sagonas, K., Runemark, A., Svensson, E., Valakos, E.D. (2011): Reproductive biology of insular reptiles: marine subsidies modulate expression of the “island syndrome”. *Copeia* **2011**(4): 545–552.
- Pérez-Mellado, V., Cort, C. (1993). Dietary adaptations and herbivory in lacertid lizards of the genus *Podarcis* from western Mediterranean islands (Reptilia: Sauria). *Bonner Zoologische Beiträge*: **44**: 193–220.
- Polis, G. A. (1981). The Evolution and Dynamics of Intraspecific Predation. *Annual Review of Ecology and Systematics*, **12**:1, 225–251.
- Valakos, E. (1986): The feeding ecology of *Podarcis erhardii* (Reptilia: Lacertidae) in a main insular ecosystem. *Herpetological Journal* **1**: 118–121.
- Valakos, E.D., Pafilis, P., Sotiropoulos, K., Lymberakis, P., Maragou, P., Fougopoulos, J. (2008): The Amphibians and Reptiles of Greece. *Chimaira*, Frankfurt am Main, 281–286.
- Zagar, A., Carretero, M. A. (2012). A record of cannibalism in *Podarcis muralis* (Laurenti, 1768) (Reptilia, Lacertidae) from Slovenia. *Herpetology Notes*, **5**: 211–213.