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GASTROINTESTINAL PARASITES IN SAURIANS FROM SOME CENTRAL MEDITERRANEAN ISLANDS

VICENTE ROCA,¹ PIETRO LO CASCIO² & JUAN MARTIN¹

¹ Departament de Zoologia. Facultat de Ciències Biològiques. Universitat de València. Dr. Moliner, 50. 46100 Burjassot. València. Spain.

² Associazione Nesos. Via Vittorio Emanuele, 24. 98055 Lipari (ME). Italy. e-mail: vicente.roca@uv.es

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Resumen: Se ha llevado a cabo un estudio helmintológico de muestras fecales de tres especies de saurios (*Podarcis filfolensis*, *Podarcis raffonei* y *Chalcides ocellatus*) en islas del Norte y Sur de Sicilia (Mediterráneo Central). Se detectaron cuatro especies de nematodos, *Parapharyngodon micipsae*, *Parapharyngodon* sp., *Pharyngodon* sp. y *Skrjabinelazia* sp. Los resultados obtenidos sugieren, para los tres hospedadores, pobreza de sus comunidades helmintianas y hábitos alimenticios esencialmente carnívoros.

The islands of Central Mediterranean harbour several lizard species, including several ones which are endemic of macro- and micro-insular systems. Parasitological studies on these populations could result of special interest due to the peculiar zoogeographical and ecological characteristics related to the hosts, such as isolation, high population densities, and feeding habits (Pérez-Mellado & Corti, 1993; Brown & Pérez-Mellado, 1994; Van Damme, 1999; Carretero, 2004).

However, the parasites of these populations have not been so far investigated and, in general, data on Mediterranean lizards are still scarce and referred mainly to the lacertids of the genus *Podarcis* (Hornero, 1991; Roca, 1993, 1995, 2004).

In this paper the results of some investigations concerning two species of Lacertidae, *Podarcis filfolensis* (Bedriaga, 1876) and *Podarcis raffonei* (Mertens, 1952), and one of Scincidae, *Chalcides ocellatus* (Forsk., 1775), are discussed.

MATERIALS AND METHODS

Study area

The present research concerns the parasites of lizard populations occurring on three circum-Sicilian islets: Lampione, the smallest of the Pelagie Islands group (Channel of Sicily); Scoglio Faraglione and Strombolicchio, two tiny islets belonging to the Aeolian Archipelago (S Tyrrhenian) (Figure 1).

Lampione (35°33'00"N / 12°19'11"E Greenwich, 17 Km off the W coast of Lampedusa Island) has a surface of 21 000 m² and a maximum elevation of 36 m. The vegetation is dominated by halo-nitrophilous perennial shrubs (*Arthrocnemum macrostachyum*) and high temporal herbs (*Lavatera arborea*), due to the occurrence of a large colony of Mediterranean Yellow-legged Gull, *Larus cachinnans*, which induces a strong level of eutrophication and nutrient imbalances on the soil.



Figure 1. Localization of the searched lizard populations.

Scoglio Faraglione (38°34'77"N / 14°48'08"E, 300 m off the W coast of Salina Island) has a surface of 4900 m² and a maximum elevation of 35 m. The top of the islet is covered by a dense epi-littoral vegetation, referred to the *Senecioni-Helichrysetum litorei*.

Strombolicchio (38°49'07"N / 15°15'13"E, 1.5 Km off the NE coast of Stromboli Island) has a surface of 3000 m² and a maximum elevation of 49 m. Its perimeter is formed by very steep cliffs, sparsely covered by chasmophyllous formations referred to *Hyoseridetum taurinae-dianthetosum aeolici*, while on the top spots of maquis of *Euphorbia dendroides* also occur.

The studied islets are nowadays uninhabited, even if Lampione and Strombolicchio have been partially anthropised during the building of lighthouses.

Studied species

The saurian hosts parasitologically investigated are *Chalcides ocellatus*, *Podarcis filfolensis* and *Podarcis raffonei*.

C. ocellatus, is widespread throughout N Africa, some areas of Asia (from Middle East to western Pakistan) and S Europe, where it

occurs on several islands (such as Crete, Rhodes, Maltese Archipelago, Sicily, Sardinia and their satellites: Schneider, 1997). It is one of the most common lizards in the Pelagic Islands, and the Lampione population is characterised by high density and an unusual rather high proportion of vegetal matter included in the diet (P. Lo Cascio, unpublished data).

P. filfolensis is endemic of the Maltese Archipelago and also occurs on some Pelagic Islands (Linosa, Lampione, and recently discovered on Lampedusa, Lo Cascio *et al.*, 2005), where it was probably introduced (Bischof, 1997). Lampione Islet represents the westernmost site of the distributional range of the species, where it shows a very high population density. Partial herbivorism is well known for this species (Lo Cascio *et al.*, 2004; Bombi *et al.*, 2005).

P. raffonei is endemic of the Aeolian Archipelago and is considered one of the most threatened species of the Mediterranean fauna, due to its restricted distribution, limited to three tiny islets (Strombolicchio, Scoglio Faraglione and La Canna) and to few small areas of Vulcano Island (Capula & Lo Cascio, 2006). The

islets' populations are characterised by low density. This species is known as a strictly insectivorous lizard (Luiselli *et al.*, 2004), even if further investigations suggested the occurrence of a partial herbivorism in some micro-insular environments (P. Lo Cascio, unpublished data).

Methods

The lizards were noosed or captured by hand, then measured and sexed. Faecal remains were obtained during their examination. No specimens were sacrificed during the present study. The faecal pellets and the parasites were preserved in alcohol and successively examined in laboratory under a stereoscope. Parasites were examined under optical microscope.

RESULTS AND DISCUSSION

Four nematode species were found in all of three host species examined. Three of them, *Parapharyngodon micipsae* (Seurat, 1917), *Pharyngodon* sp. and *Parapharyngodon* sp., belong to the family Pharyngodonidae, and the other, *Skrjabinelazia* sp. belongs to Seuratidae (Chabaud, 1974; Petter & Quentin, 1976).

Number of individuals, sex of the hosts and localities in which nematodes were found, are indicated in Table 1.

Nematodes belonging to these genus and species are usually found in skinks from North Africa (Ashour *et al.*, 1992; Al Deen *et al.*, 1995; Ibrahim *et al.*, 2005) and in several species of *Podarcis*, lizards from Europe (Roca, 1985; Hornero, 1991; Roca, 1995; Martin, 2005). Nevertheless, as *P. raffonei* has been helminthologically searched for the first time, it is a new host for *P. micipsae*, *Parapharyngodon* sp. and *Skrjabinelazia* sp.

Roca (1995) found homogeneous helminth fauna in Mediterranean insular lizards, in accordance with the hypothesis of Alcover (1988) regarding the common origin of these lizards. Roca (*loc. cit.*) suggested low diversity for the helminth communities of these insular hosts, in agreement with the typical pattern of helminth infection of many reptiles (Roca & Hornero, 1994), although slight differences may be found among several islands and hosts (Roca & Hornero, 1994; Roca, 1995).

This preliminary study does not include data of prevalence or intensity of helminths because the methodology used for helminthological analysis is an indirect method. But, taking into account the number

Table 1. Intestinal parasites found in sampled hosts.

Reference code	Host	Sex	Locality	Date	Parasite found
1	<i>P. raffonei</i>	M	Scoglio, Faraglione	02/05/05	<i>P. micipsae</i> (1 ♂; 2 ♀)
2	"	H	Strombolicchio	29/03/05	<i>Parapharyngodon</i> sp (3 ♀)
3	"	H	"	04/10/05	<i>Parapharyngodon</i> sp (1 ♀)
4	"	M	"	04/10/04	<i>Parapharyngodon</i> sp (4 ♀)
5	"	H	"	04/10/04	<i>Skrjabinelazia</i> sp (1 ♀)
6	"	M	"	04/10/04	<i>Skrjabinelazia</i> sp (2 ♀)
7	"	M	"	08/09/04	<i>Parapharyngodon</i> sp (4 ♀)
-	"	M	"	21/06/05	<i>Parapharyngodon</i> sp (1 ♀)
2	<i>P. filfolensis</i>	M	Lampione	16/09/05	<i>Pharyngodon</i> sp (1 ♀)
1	<i>C. ocellatus</i>	-	"	02/06/04	<i>Pharyngodon</i> sp (1 ♂; 1 ♀)
3	"	-	"	16/09/05	<i>Parapharyngodon</i> sp (1 ♀)
4	"	-	"	16/09/05	<i>Parapharyngodon</i> sp (1 ♀)
5	"	-	"	21/05/05	<i>Skrjabinelazia</i> sp (7 ♀)

of species and individuals found, we can also predict poor helminth communities in the tree examined hosts in agreement with the results of Roca (1995) for other Mediterranean species and islands. This typical pattern of poor helminth communities is related with several features of these reptile hosts, as ectothermy, simplicity of the alimentary canal, low vagility and simple diet (Kennedy *et al.*, 1986; Roca & Hornero, 1994).

Pharyngodonid nematodes found in searched hosts are typical of the carnivorous reptiles (Petter & Quentin, 1976; Martin *et al.*, 2005). Thus, although tendency to herbivory is reported for *P. filfolensis*, and has been reported in other insular lacertids, e.g. *Podarcis lilfordi* and *Podarcis pityusensis* from the Balearic Islands (Pérez-Mellado & Corti, 1993; Roca & Hornero, 1994), our results suggest that *P. filfolensis*, *P. raffonei* and *C. ocellatus* are primarily carnivorous being the tendency to herbivorism a secondary adaptation (Roca, 1996) related to the trophic availability and to the evolutionary age of the lizard populations on each island.

REFERENCES

- Alcover, J.A. 1988. Las faunas paleolíticas de las islas mediterráneas. *Mundo Científico*, 80: 504-517.
- Al Deen, A., Al Shareef, M.F. & Saber, S.A. 1995. Ecological studies of *Chalcides ocellatus* (Forsk., 1775) and *Hemidactylus turcicus* (Linnaeus, 1758) from Egypt with special reference to helminth parasites. *Journal of Egyptian Society of Parasitology*, 25: 145-156.
- Ashour, A.A., Koura, E.A., El-Alfy, N.M. & Abdel Aal, Z. 1992. On the morphology of the Oxyurid nematode *Pharyngodon mamillatus* (Linstow, 1897) from *Chalcides ocellatus* from Egypt. *Journal of the Egyptian Society of Parasitology*, 22: 801-807.
- Bischoff, W. 1997. *Podarcis filfolensis* (Bedriaga, 1876). 276-277. In: Gasc, J.P. (ed.), *Atlas of Amphibians and Reptiles in Europe*. SEH - Muséum National d'Histoire Naturelle. Paris.
- Bombi, P., Vignoli, L., Scalera, R. & Bologna, M.A. 2005. Food habits of *Podarcis filfolensis* (Reptilia, Lacertidae) on a small Mediterranean island during the dry season. *Amphibia-Reptilia*, 26: 412-417.
- Brown, R.P. & Pérez-Mellado, V. 1994. Ecological energetics and food acquisition in dense Menorcan islet populations of the lizard *Podarcis lilfordi*. *Functional Ecology*, 8: 427-434.
- Capula, M. & Lo Cascio, P. 2006. *Podarcis raffonei* (Mertens, 1952). 480-485. In: Sindaco, R., Doria, G., Razzetti, E. & Bernini, F. (eds.), *Atlante degli Anfibi e dei Rettili d'Italia*. Polistampa. Firenze.
- Carretero, M.A. 2004. From set menu to a la carte. Linking issues in trophic ecology of Mediterranean lacertids. *Italian Journal of Zoology. Supplement*, 2: 121-133.
- Chabaud, A.G. 1974. Class Nematoda. Key to subclasses, orders and superfamilies. 1-17. In: Anderson, R.C., Chabaud, A.G. & Willmot, S. (eds.), *C.I.H. Keys to the Nematode Parasites of Vertebrates*. Commonwealth Agricultural Bureaux, Farnham Royal. Bucks. England.
- Hornero, M.J. 1991. *Helminthofauna de los Lacértidos endémicos de las Islas Baleares (Mediterráneo Occidental)*. Ph. D. Thesis University of Valencia.
- Ibrahim, H.M.S., Fadiel, M.M. & Nair, G.A. 2005. Gastrointestinal helminths of the lizard *Chalcides ocellatus* from Benghazi, Lybia. *Journal of Helminthology*, 79: 35-39.
- Kennedy, C.R., Bush, A.O. & Aho, J.M. 1986. Patterns in helminth communities: why are birds and fish different? *Parasitology*, 93: 205-215.
- Lo Cascio, P., Luiselli, L. & Corti, C. 2004. Preliminary data on the ecology of *Podarcis filfolensis* at Lampione Islet (Pelagie Islands, Channel of Sicily). 25. In: Corti, C. & Lo Cascio P. (eds.), *Abstracts of the 5th International Symposium on the Lacertids of the Mediterranean Basin*. Lipari, Italy, 7-11 May 2004. Florence University Press. Firenze.
- Lo Cascio, P., Corti, C., Billeci, V. & Nicolini, G. 2005. "First came, first served", or the recent introduced lizard populations of Lampedusa Island (S Italy). *Abstracts of the 13th Ordinary General Meeting of the Societas Europaea Herpetologica*. Bonn, Germany, 27 September-2 October 2005.
- Luiselli, L., Capula, M., Corti, C., Lo Cascio, P. & Pérez-Mellado, V. 2004. Preliminary data on the feeding ecology of *Podarcis raffonei* (Reptilia, Lacertidae), a threatened endemic lizard of the Aeolian Islands (Mediterranean Sea). 223-229. In: Pérez-Mellado, V., Riera, N. & Perera, A. (eds.), *The Biology of Lacertid Lizards. Evolutionary and Ecological Perspectives*. Institut Menorquí d'Estudis. Recerca, 8. Mahón.

- Martin, J.E. 2005. *Helmintofauna de los lacértidos endémicos de las Islas Canarias: relaciones parásito-hospedador*. Ph. D. Thesis University of Valencia.
- Martin, J.E., Llorente, G.A., Roca, V., Carretero, M.A., Montori, A., Santos, X. & Romeu, R. 2005. Relationships between diet and helminths in *Gallotia caesaris* (Sauria: Lacertidae). *Zoology*, 108: 121-130.
- Pérez-Mellado, V. & Corti, 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.
- Petter, A.J. & Quentin, J.C. 1976. Keys to genera Oxyuroidea. 1-30. In: Anderson, R.C., Chabaud, A.G. & Willmot, S. (eds.), *C.I.H. Keys to the nematode parasites of vertebrates*. Commonwealth Agricultural Bureaux, Farnham Royal. Bucks. England.
- Roca, V. 1985. *Contribución al conocimiento de los parásitos de los lacértidos y gekónidos del piso termomediterráneo del Levante ibérico*. Ph. D. Thesis. University of Valencia.
- Roca, V. 1993. Helmintofauna dels rèptils. 273-292. In: Alcover, J.A., Ballesteros, E. & Fornós, J.J. (eds.), *Història Natural de l'arxipèlag de Cabrera*. Monografies de la Societat d'Història Natural de les Balears, 2. CSIC-Editorial Moll. Palma de Mallorca.
- Roca, V. 1995. An approach to the knowledge of the helminth infracommunities of Mediterranean insular lizards (*Podarcis* spp.). 285-292. In: Llorente, G.A., Montori, A., Santos, X. & Carretero, M.A. (eds.), *Scientia Herpetologica*. AHE. Barcelona.
- Roca, V. 1996. The effect of some factors on the helminth parasite infracommunities of *Podarcis* lizards in the Balearic Islands (Western Mediterranean). *Bolletí de la Societat d'Història Natural de les Balears*, 39: 65-76.
- Roca, V. 2004. Helminth component communities of *Podarcis pityusensis* (Sauria: Lacertidae) from isolated and non-isolated host populations. 293-298. In: Pérez-Mellado, V., Riera, N. & Perera, A. (eds.), *The Biology of Lacertid Lizards. Evolutionary and Ecological Perspectives*. Institut Menorquí d'Estudis. Recerca, 8. Menorca.
- Roca, V. & Hornero, M.J. 1994. Helminth infracommunities of *Podarcis pityusensis* and *Podarcis lilfordi* (Sauria: Lacertidae) from the Balearic Islands (Western Mediterranean Basin). *Canadian Journal of Zoology*, 72: 658-664.
- Schneider, B. 1997. *Chalcides ocellatus* (Forsk., 1775). 312-313. In: Gasc, J.P. (ed.), *Atlas of Amphibians and Reptiles in Europe*. SEH - Muséum National d'Histoire Naturelle. Paris.
- Van Damme, R. 1999. Evolution of herbivory in lacertid lizards: effects of insularity and body size. *Journal of Herpetology*, 33: 663-674.



