

The yellow-legged gull, *Larus michahellis*, an occasional predator of *Timon lepidus* in the Atlantic Islands National Park (Galicia, NW Spain)

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RESUMEN: El lagarto ocelado (*Timon lepidus*) mantiene poblaciones de gran interés en varias islas, tanto por su estatus de conservación como por las particulares interacciones ecológicas que en ellas se desarrollan. En el caso del Parque Nacional de las Islas Atlánticas de Galicia, esta especie convive con una importante colonia de cría de gaviota patiamarilla (*Larus michahellis*). Desde el año 2009 hasta 2015 hemos detectado en este Parque Nacional siete casos de consumo de *T. lepidus* por *L. michahellis*. Se trata de una conducta nunca antes documentada y de reciente aparición, que podría estar relacionada con los efectos que el cierre de vertederos y la reducción de los descartes pesqueros están teniendo en esta especie de gaviota. El carácter ocasional de esta depredación no hace esperar efectos apreciables en estas poblaciones insulares de lagarto ocelado.

The ocellated lizard, *Timon lepidus* (Daudin, 1802), is a Mediterranean reptile widespread throughout most of the Iberian Peninsula, and patchily distributed in southern France and northwestern Italy (Sillero *et al.*, 2014). It occurs in a wide variety of open habitats and along a broad altitudinal range. Due to its basking behaviour and relatively large size, it is part of the diet of a high number of medium and large sized Iberian vertebrates. These predators are well documented, and include mostly birds. A literature review of avian predation on this species (Martín & López, 1996) shows the Falconiformes as common predators of *T. lepidus*, while the orders Strigiformes, Ciconiiformes and Charadriiformes are occasional predators. Only one species, *Gelochelidon nilotica*, has been reported as a predator of *T. lepidus* within Charadriiformes (Martín & López, 1990).

Throughout its range, *T. lepidus* occurs on some Atlantic and Mediterranean islands, some of which had experienced marked population declines (Mateo, 2015). Island native populations are usually of high conservation interest due to the combination of singular characteristics of islands ecosystems (e.g., isolation, age, size), with particular species interactions that are absent or less common in mainland populations (e.g., due to differences in trophic resources and presence of predators) (Wardle, 2002). For example, some island populations of *T. lepidus* show differences in antipredator behaviour (Vicente, 1989), social behaviour (Galán, 2000) and levels of frugivory (Piazzon *et al.*, 2012), when compared to their mainland counterparts.

The Atlantic Islands National Park (Galicia, NW Spain) represents a relevant example of these island populations of *T. lepidus*. This

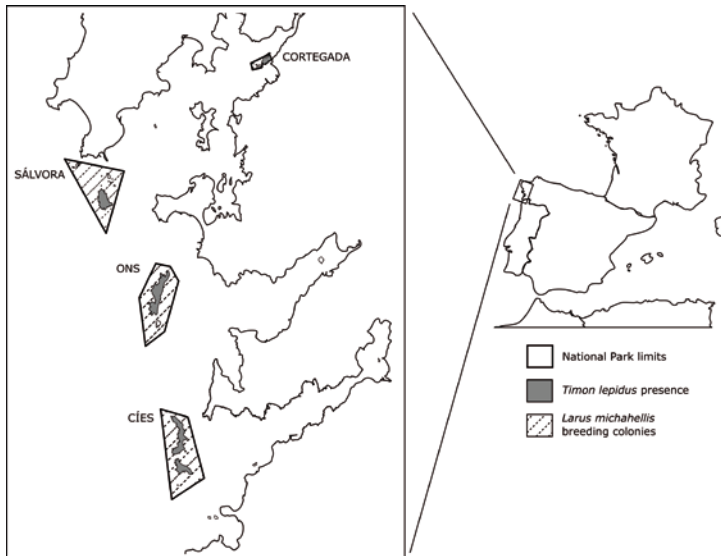


Figure 1: Distribution of *T. lepidus* (Galán, 2007) and *L. michabellis* (Pérez *et al.*, 2012) in the Atlantic Islands National Park.

Figura 1: Distribución de *T. lepidus* (Galán, 2007) y *L. michabellis* (Pérez *et al.*, 2012) en el Parque Nacional de las Islas Atlánticas.

species is present on the main islands of the four archipelagos of the Park (Galán, 2003; Figure 1), and a subspecies endemic to one of them (Sálvora), *T. lepidus oteroi*, has been described (Castroviejo & Mateo, 1998). Two other archipelagos, Cíes and Ons, harbour populations with very similar morphological characteristics, probably belonging to the same subspecies (Galán, 2003), although further genetic and morphological studies are needed to support the validity of this subspecies across all islands. These populations have been listed as Vulnerable (Xunta de Galicia, 2007) due to their unique taxonomic status and the decline experienced in the past on some of the islands.

The Atlantic Islands National Park also harbours important breeding colonies of Yellow-legged gull (*Larus michabellis*), which are among the largest in the world (Molina & Bermejo, 2009). The coexistence of *T. lepidus* and *L. michabellis* in such a relatively small territory and under the particular conditions of an island ecosystem provides the opportunity for interactions that are less likely on the mainland.

After receiving some occasional reports of gulls feeding on lizards from several islands of the Park, we decided to interview all the field personnel of the National Park. There are a total of 26 workers working in shifts, ensuring a permanent presence in all of the archipelagos since the protection of these islands (1980 in the case of Cíes, 1982 in the case of Ons, and 2002 in the case of Sálvora and Cortegada). We asked all of the workers if they had observed this behaviour, and, when the answer was affirmative, if they had observed the lizard previously alive. We also asked for available photographs of these interactions, and the exact place and date of each event. We checked all the reported events with the observers to discard possible duplicated observations.

We registered seven events of *L. michabellis* feeding on *T. lepidus*. In four of these cases, the observer could confirm that the lizard was alive before the event. We, however, cannot completely rule out some possible cases of scavenging in the other three, considering that the gulls were already feeding

on a dead lizard when this behaviour was observed. The first of these events was registered in 2009 and the last one in 2015. We obtained photographs and dates for three of these cases (Fig. 2), all of them happening in the second half of May. For the other four cases, we only obtained the year. There is no appreciable annual trend in the number of observed events (Fig. 3). All the cases were observed in Cíes and Sálvora, the two archipelagos of the National Park with the highest abundances of the two species (Table 1). The number of events was highest in Cíes, where there are more potential observers (National Park staff). There are neither recorded cases in Ons, where gulls and lizards are less abundant, nor in Cortegada, where there are no breeding gulls.

There are reports of predation of *L. michabellis* on other small lizards (Martín & López, 1990; Castilla & Labra, 1998; Vervust *et al.*, 2007; Pérez-Mellado *et al.*, 2014). It has also been suggested, without specific evidence, that gulls can predate on *T. lepidus* (Bischoff *et al.*, 1984; Cheylan & Grillet, 2004; Doré *et al.*, 2015). However, to our knowledge, this is the first confirmed case of *L. michabellis* preying on a lizard as large as *T. lepidus*.

We believe that this behaviour is not very common on these islands, taking into account that, since the first cases, the National Park workers have been very attentive to these events. In addition, we have been carrying out analysis of gull pellets over several years, without having found lizard remains in them (Atlantic Islands National Park, unpublished data). Considering the high number of gulls on the islands and the low number of events observed, they could represent a case of specialized predation of a few individuals, a common behaviour in this species (Ceia *et al.*, 2014).



Figure 2: *Larus michabellis* feeding on *Timon lepidus*. (a) Sálvora Island, 31/5/2009; (b) Faro Island, Cíes, 13/5/2013; (c) Monteagudo Island, Cíes, 30/5/2015.

Figura 2: *Larus michabellis* alimentándose de *Timon lepidus*. (a) Sálvora Island, 31/5/2009; (b) Faro Island, Cíes, 13/5/2013; (c) Monteagudo Island, Cíes, 30/5/2015.

All the events with a known date occurred in May, when these lizards show a seasonal peak in their activity (Mateo, 2015). Therefore, this behaviour has probably been facilitated in the National Park by the coexistence

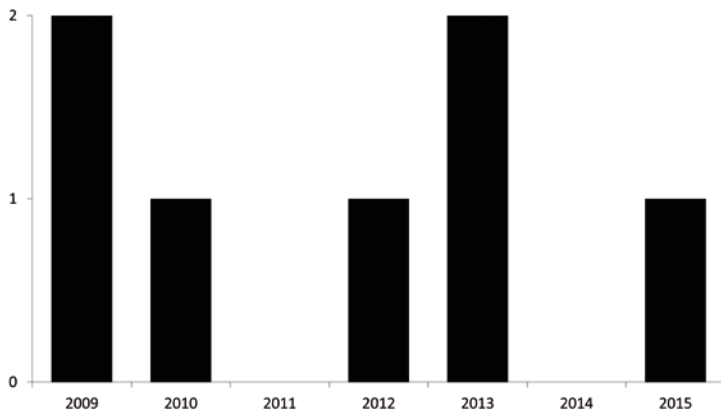


Figure 3: Annual distribution of the observed cases of *Larus michahellis* feeding on *T. lepidus*.

Figura 3: Distribución anual de los casos observados de *Larus michahellis* alimentándose de *T. lepidus*.

in time and space of these two species, when both gulls and lizards breed during spring, and the former actively search for food to feed their chicks. Population density seems also to have an effect, considering that observed interactions occurred in the islands where both species are most abundant.

It is also worth noting the recent emergence of this species interaction. There has been a continued presence of conservationists and researchers visiting these islands since their protection, with regular visits by ornithologists and herpetologists that have not previously reported cases of such interaction. One possible explanation is the recent decrease in food resources available to *L. michahellis*. This is an opportunistic species that frequently uses two

anthropogenic food sources, garbage dumps and fishing discards, which, due to its easy access, led to a marked increase in its populations at the end of the XX century (Blokpoel & Spaans, 1991, and references therein). Recently, two European Union environmental action plans aiming at reducing fishing discards and closing garbage dumps have decreased the availability of these resources, with a considerable impact on gulls' diet (Ramos *et al.*, 2009). The population of *L. michahellis* in the Park seems to be suffering the consequences of this reduction in food availability. The number of breeding pairs has experienced a decrease of 65.8% over the last 10 years (Atlantic Islands National Park, unpublished data). This situation has led to changes in the feeding ecology of *L. michahellis*.

Table 1: Observed events, number of observers and abundance of *T. lepidus* (Galán, 2007) and *L. michahellis* (Pérez *et al.*, 2012) on the islands of the Atlantic Islands National Park.

Tabla 1: Eventos observados, número de observadores y abundancia de *T. lepidus* (Galán, 2007) y *L. michahellis* (Pérez *et al.*, 2012) en las islas del Parque Nacional de las Islas Atlánticas.

	Observed events	Permanent staff	<i>T. lepidus</i> abundance		<i>L. michahellis</i> abundance	
			Individuals/ha	SE	Breeding pairs	Density (pairs/ha)
Cíes - Monteagudo	1	4	58,7	22,1	3.771	19,95
Cíes - Faro	5	4	96,4	27,0	1.271	12,67
Cíes - San Martiño	0	0	35,0	10,0	2.423	15,36
Ons	0	4	15,5	3,9	2.246	5,27
Sálvora	1	1	57,0	26,7	4.786	19,99
Cortegada	0	1	NA	NA	0	0,00

llis, increasing the diversity of its diet (Duhem *et al.*, 2003) and the levels of predation on smaller species (Oro & Martínez-Abraín 2007). This idea is reinforced by at least two other recent documented cases of *L. michabellis* preying on unusual preys (Báez, 2015; Ros, 2015).

Overall, these observations point to *L. michabellis* as an occasional predator of *T. lepidus*, with an unlikely role in the population decrease of *T. lepidus* registered in some of these islands. *Larus michabellis* has been unfairly blamed in the past for negatively affecting other species (Oro & Martínez-Abraín, 2007; Pérez-Mellado *et al.*, 2014). However, the real threats to *T. lepidus* in the Park have already been identified. Introduced domestic cats, *Felis silvestris catus*, considered the most successful and damaging invader on islands (Bonnaud *et al.*, 2011), are the main cause of concern (Galán, 2003, 2007). Moreover, introduced American mink, *Neovison vison*,

and black rat, *Rattus rattus*, might be potential threats for amphibians and reptile populations of these islands (Velo-Antón & Cordero-Rivera, 2011; Romero, 2015). Eradication campaigns of cats and minks have been successfully conducted since 2009 by the staff of the National Park and they are not currently considered a major threat. Both *L. michabellis* and *T. lepidus* have been inhabiting these islands for a long time, and there is no evidence to think that this coexistence would threaten *T. lepidus* populations in the near future.

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