

First observations of the Atlantic beach cricket, *Pseudomogoplistes vicentae* (Grylloidea: Mogoplistidae), in the Basque autonomous community, Spain

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Abstract

The Atlantic beach cricket *Pseudomogoplistes vicentae* Gorochov, 1996 (Orthoptera: Grylloidea: Mogoplistidae) is among the rare Orthoptera species that live exclusively in coastal habitats. It inhabits cobble beaches from North Africa to Great Britain, with populations known in Morocco, Portugal, Spain, France, Channel Islands, Wales and England. *P. vicentae* was found on the Spanish continental coast for the first time in 2018, in Asturias. The discovery of three populations in the Basque autonomous community (Northern Spain) is reported here, and useful information for increasing its detection and monitoring its populations is provided.

Keywords

Europe, Palearctic region, scaly crickets, understudied insects, vulnerable species

Introduction

Beach crickets (*Pseudomogoplistes* spp.) live exclusively in coastal stony habitats, in a narrow band of the shoreline upon the influence of sea movements caused by tides and storms. They are ground dwelling crickets which hide below the shingles or debris of the wrack line. Closely dependents on this rare habitat and thus having small areas of occupancy, *Pseudomogoplistes* species are threatened by habitat alteration and destruction. Heavy storm surges, marine pollution (oil spill) and beach excavation are already known to affect local populations in Great Britain (Sutton 2015) and the coming rise of oceans due to climate change is repeatedly cited as a major threat (Sutton 2015, Vahed 2019). Except in Great Britain and France, little is known on the precise distribution of *Pseudomogoplistes* spp.

Out of the five *Pseudomogoplistes* species previously described (Table 1), two are present on continental Western European coasts: *Pseudomogoplistes squamiger* (Fischer, 1853) on the Mediterranean beaches, and *Pseudomogoplistes vicentae* Gorochov, 1996 on the Atlantic beaches (Fig. 1). *P. vicentae* was described by Gorochov (1996) from specimens collected in Morocco and Portugal and is currently considered a vulnerable species in Europe and Great

Britain (Hochkirch et al. 2016, Sutton 2017) and close to extinction in France (Sardet and Defaut 2004). Its presence is reported in four localities in England and Wales—Branscombe (Devon), Marloes sands and Dale beaches (Pembrokeshire) and Chesil beach (Dorset) (Sutton 2017, Vahed 2019)—as well as in the Channel Islands—Sark and Guernsey (Bourgaize 2019); Northern France, including Brittany and Normandy (Bretagne vivante 2017, Stallegger 2019); and Spain, including the Canary Islands and Asturias (Gorochov and Llorente 2001, Kleukers et al. 2018). However, on the continental coasts of Spain, only one population has been discovered very recently, i.e., in Asturias (Kleukers et al. 2018). Observations of the Atlantic beach cricket in three locations of the Basque autonomous community, north of the Iberian Peninsula and roughly 200–250 km away from the population observed in Asturias are reported here. Useful information to improve *Pseudomogoplistes vicentae* detection is also provided.

Methods

After an adult male *Pseudomogoplistes* spp. specimen was found by chance on the 13th of July 2019, trapped in an empty plastic water bottle on the beach of Agiti kala (San-Sebastian/Donostia, 43°18'27.3"N, 2°04'21.3"W, Gipuzkoa, Basque autonomous community, northern Iberian Peninsula), I conducted a survey at this site on the 3rd and 4th of August. I first looked for beach crickets in an accumulation of red drift algae, but the abundance of jumping sand fleas (Crustacea: Amphipoda: Talitridae) and the absence of any cricket led me to abandon the search in this micro-habitat. I then searched for crickets by looking beneath large stones that could be easily moved and digging between cobbles during the afternoon in a non-standardized way. Later, survey was performed at night between 23:00 and 01:00 using a headlamp (Ultra Rush model, Petzl). The beach crickets were searched for using two methods: (1) opportunistic searching on the surface of cobbles and rocks for ten to forty-five minutes scouting sequences, from the high water line to approximately 15 m upward and (2) using heads of cooked shrimps deposited on the top of rocks as alimentary bait. Twenty-two baits, separated by approximately

Table 1. *Pseudomogoplistes* species, their known distribution, and conservation status according to Hochkirch et al. (2016) for Europe, Sutton (2015) for Great Britain, and Sardet and Defaut (2004) for France.

Species	Known distribution	Conservation status
<i>P. squamiger</i> Fischer, 1853	Mediterranean coast of Albania: Karaburun peninsula (Ponel et al. 2013); Algeria: Tamenfoust (Sahnoun et al. 2010); Croatia: Dubrovnik, Lokrum and Šipan islands (Sombke and Schlegel 2007, Puskás et al. 2018, Skejo et al. 2018); France: Frioul, Riou, Planier, and Porquerolle islands, Banyuls, Bormes-les-Mimosas, Giens, Hyères, La Croix-Valmer, Le Pradet, Port-Vendres Ramatuelle, (Maurin 1999, Berville et al. 2012, Dusoulier 2017), Corsica island (Braud et al. 2002); Greece: Kos and Tilos islands (Sotiris 2017); Italy (Fontana et al. 2002, Baroni et al. 2013); Spain: Alicante and Castellón (Gorochoch and Llorente 2001, Luccià Pomares 2002); Malta (Gauci et al. 2005); A (dubious?) mention in the Atlantic coast of Spain in Canarias islands (Bland et al. 1996).	LC ¹ in Europe. Close to extinction in France
<i>P. byzantium</i> Gorochoch, 1995	Black sea coast of Crimea: Cape Martyan reserve, Karadag nature reserve (Gorochoch 1984, Gorochoch 1995); Mediterranean coast of Greece: Thassos island (Gorochoch 1995, Willemsse et al. 2018).	EN ¹ in Europe
<i>P. turcicus</i> Gorochoch, 1995	Turkey: Okurcalar beach (Gorochoch 1995).	Unevaluated. Okurcalar beaches are very unnatural today.
<i>P. vicentae</i> Gorochoch, 1996	Atlantic coast of Channel islands: Guernsey and Sark (Bourgaize 2019); Morocco: Tanger (Gorochoch 1996); Portugal: Algarve (Praia do Castelejo), Lisboa (Cabo Raso) (Gorochoch 1996); Spain: Gran Canaria (Maspalomas) (Gorochoch and Llorente 2001), Asturias (Kleukers 2018); Great Britain: Devon (Branscombe), Pembrokeshire (Marloes sands and Dale beaches), and Dorset (Chesil Beach) (Sutton 2017, Vahed 2019); Ssp. <i>P. vicentae septentrionalis</i> in France: Manche, Côte d'Or (Stallegger 2019); A (dubious ?) mention in the Mediterranean coast of Algeria (Habibas islands) (Gorochoch and Llorente 2001).	VU ¹ in Europe VU in Great Britain Close to extinction in France
<i>P. madeirae</i> Gorochoch & Marshall, 2001	Madeira island (Funchal) (Gorochoch and Marshall 2000)	DD ¹ in Europe

¹ DD: Data deficient; LC: Least concern; Vu: Vulnerable; EN: Endangered species.

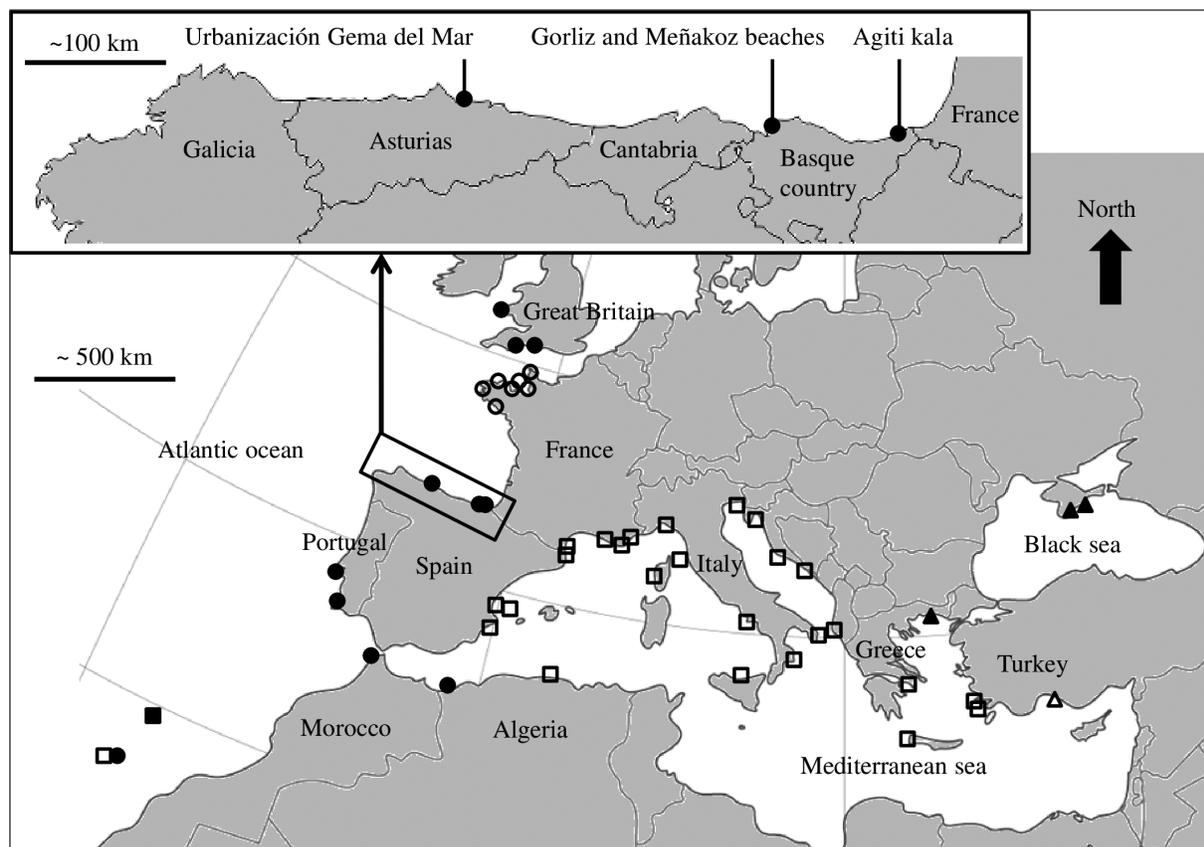


Fig. 1. Distribution of the beach cricket species (*Pseudomogoplistes* spp.). A. Distribution of *P. byzantium* (black triangle), *P. madeirae* (black square), *P. squamiger* (white square), *P. turcicus* (white triangle), *P. vicentae* (black circle), *P. vicentae septentrionalis* (white circle); B. Focus on the distribution of *P. vicentae* in northern Spain.

2 m, were deposited and checked thirty minutes later. Crickets were photographed with a compact digital camera (Canon PowerShot G9 X Mark II). In respect with local environmental laws, no cricket was captured.

A survey was also performed in two other sites of the Basque autonomous community, at Gorrondatxe Beach (Getxo, 43°22'54.7"N, 3°00'50.3"W) on August 6, 2019, and Meñakoz Beach in Bizkaia Province (Gorliz, 43°23'43.4"N, 2°59'06.6"W) on August 12, 2019. These beaches were identified as putative favorable habitats (i.e., coves or beaches with large (>30 m) cobble deposits) from Google Maps. These searches were done during the day in a non-standardized way, as in Agiti kala.

Results

Because of its brown body covered by numerous scales with an enlarged abdomen tip, the first specimen found in Agiti kala was identified as a male *Pseudomogoplistes* sp. according to the descriptions of *P. vicentae* and *P. squamiger* provided in Sardet et al. (2015). Then, based on the distribution of the different *Pseudomogoplistes* species, *Pseudomogoplistes vicentae* Gorochov (1996) was considered the best candidate species as it is the only beach cricket species largely found on the Atlantic seashores (Fig. 1). This identification was then confirmed through the comparison of pictures of one male anal plate (Fig. 2) to the descriptions provided by Gorochov (1996) and Sardet et al. (2015): Pictures showed a "medial shallow concavity bearing group of hairs"

(Gorochov 1996) as expected for *P. vicentae* and did not show any lateral tufts of dense tawny bristles that would have been expected for *P. squamiger*. In the current state of our knowledge of *Pseudomogoplistes* taxonomy, specimens found can thus be regarded as *P. vicentae*.

In total, more than 20 adults and 30 nymphs could be observed, among which six females and five males could be photographed. During diurnal surveys, no crickets could be found beneath large stones, while three nymphs could be found digging into cobbles. At night, opportunistic searches led to observation of both nymphs and adults (Fig. 2) walking on cobble surface at an average rate of 10.2 individuals per hour (Table 2). Both males and females could be observed in similar proportions. Bait observation also proved to be efficient for cricket detection: eight out of 22 baits (36%) attracted between one to three crickets after 30 minutes. During those nights, three individuals were found dead: two were trapped in an empty can of beer and one in a piece of plastic holding a small amount of water.

On Gorrondatxe Beach, three nymphs were discovered. In Meñakoz Beach (Fig. 3), one nymph and one adult male were found.

Table 2. Observations of the Atlantic beach cricket *Pseudomogoplistes vicentae* during nocturnal opportunistic search in Agiti kala, San-Sebastian, Gipuzkoa, Basque autonomous community. Scouting sequence duration: duration of a continuous sequence dedicated to opportunistic scouting for crickets walking over the cobbles. Rate of encounter: total number of crickets observed during a scouting sequence divided by the duration of this scouting sequence and expressed on an hourly base.

Night	Scouting sequence duration (min)	Female	Male	Unknown sex adult	Nymphs	Total	Rate of encounter (indiv./h)
August 3, 2019	45	1	0	0	3	4	5.3
	25	1	2	0	1	4	9.6
	10	0	1	0	0	1	6.0
August 4, 2019	30	0	1	0	5	6	12.0
	30	2	1	1	3	7	14.0
August 15, 2019	30	2	1	1	3	7	14.0

Discussion

Observations of *P. vicentae* in three sites of the Basque autonomous community have increased knowledge of its distribution in Europe and continental Spain. The Gorrondatxe Beach population is roughly 200–250 km away from the population observed in Asturias by Kleukers et al. (2018), while Agiti kala population is 550–600 km from the nearest northern population in France (Herbrecht 2007). The fact that *P. vicentae* could be found quite easily in Agiti kala, Gorrondatxe Beach, and Meñakoz Beach confirms that this species has suffered a lack of study, as suggested by Kleukers et al. (2018). Our results suggest that further observations can be expected in northern Portugal and Spain (Galicia, Cantabria, and Basque autonomous community), and even in southern France, in the region of Pyrénées Atlantiques.

The first specimens of *P. vicentae* found in England and France were initially regarded as accidentally introduced Mediterranean beach cricket, *P. squamiger* (Chopard 1951, Sutton 1999); these were only later identified as *P. vicentae*. Morère and Livory (1999) described the specimens from France (Carolles, Manche region, Normandy) as slightly different from *P. vicentae*, described by



Fig. 2. Night sights of the Atlantic beach cricket *Pseudomogoplistes vicentae* in Agiti kala (San-Sebastian, Gipuzkoa, Basque autonomous community). A. Young nymph; B. Intermediary nymph; C. Adult female feeding on a piece of potato chip; D. Adult male observed on the upward face of cobbles; E. Posterior view of a male abdomen showing the anal plate with a median shallow concavity.



Fig. 3. Habitat of the Atlantic beach cricket *Pseudomogoplistes vicentae* at A. Agiti kala, San-Sebastian and B. Meñakoz Beach, Gorliz, Basque autonomous community.

Gorochov (1996). Based on slight differences of the male's anal plate and genitalia, Morère and Livory (1999) assigned French specimens to a new taxon, *Pseudomogoplistes vicentae septentrionalis*. Today, the French populations are considered to belong to *P. vicentae septentrionalis*, while the subspecific status of populations from other locations (England, Guernsey Islands, Canary Islands, and Asturias) is not addressed. Whether populations from the Basque autonomous community belong to the nominal subspecies *P. vicentae vicentae* or to the subspecies *P. vicentae septentrionalis* cannot be addressed here, as no specimen was captured and the subspecific status of the closest population in Asturias is unknown. This situation highlights a need for a clarification of the subspecific status of these populations and other populations from Spain and England through a morphological and/or a genetic comparison with French populations.

These observations also provided some behavioral information on *P. vicentae*. While nocturnal observations did not efficiently detect *P. squamiger* (Dusoulrier 2017), they were efficient for detecting *P. vicentae*. This may allow the monitoring of *P. vicentae* populations through non-intrusive standardized observations along transects. The crickets were also observed to be attracted to food baits, such as cooked shrimps and other types of

food abandoned on the beach (grilled sardine waste and potato chips). This may be lethal when the crickets become trapped in food packaging, such as bottles, cans, or boxes. Such trapping is, however, already used in England to monitor *P. vicentae* populations with pit-fall traps baited with cat biscuits (Gardiner 2009, Vahed 2019). Baited pit-fall traps should be used for a detection campaign of other *P. vicentae* populations in putative favorable shores of the northern Iberian Peninsula and southern France.

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