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SHORT NOTES / BREVI NOTE

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ON THE RECENT OCCURRENCE OF *BRACHYTRUPES MEGACEPHALUS*
(LEFÈBVRE, 1827) (*Orthoptera Gryllidae*) ON LAMPEDUSA

BACKGROUND

Brachytrupes megacephalus has recently been recorded on the island of Lampedusa (PRAZZI *et al.*, 2014). This relatively large stenotopic species of cricket, with a central Mediterranean and North African distribution, belongs to the psammophilous biocoenoses, both coastal and Saharan.

Within the central Mediterranean, that is, land-masses that lie in relatively close proximity to Lampedusa, the species is known from Sicily (LEFÈBVRE, 1827; SERVILLE, 1838; ALICATA *et al.*, 1982; MASSA *et al.*, 2012; CONTI *et al.*, 2014), Tunisia (BONNET & FINOT, 1885; CHOPARD, 1943; GENTRY, 1965), the Maltese Islands (LANFRANCO, 1957; CASSAR, 1979, 1990, 1996; CASSAR & BONNET, 1985; CASSAR & STEVENS, 2002; CASSAR & CONRAD, 2008; MASSA *et al.*, 2012; CONTI *et al.*, 2014), Línosa (ESCHERICH, 1893; BACCETTI *et al.*, 1995; MASSA *et al.*, 2012; PRAZZI *et al.*, 2014), and Libya (WERNER, 1908; ZANON, 1924; SALFI, 1935; SCORTECCI, 1937; JANNONE, 1938; LA GRECA, 1957; GENTRY, 1965; MASSA, 1998, 2009). As a result of its rarity within European Union territory, the species has been listed in the Habitats Directive (Annexes II and IV), and, moreover, it benefits from designation of at least 22 Natura 2000 sites (EUROPEAN COMMISSION, 1992; B. Massa, *pers. comm.*).

Considering the species' distribution, it is of particular interest that until four male specimens were recorded during the first half of April 2014, this species was unknown from Lampedusa, as attested by both scientific workers familiar with the Orthoptero-fauna of the islet and local farmers (PRAZZI *et al.*, 2014). The authors note that in the days prior to these discoveries, strong winds were blowing that could have aided dispersal of the individuals from the Tunisian coast some 140 km away or from Línosa, some 45 km away; no indication of wind speeds is given in the said short note. The authors however acknowledge that this species is not known to take to the wing and cover such considerable distances. Another manner by which the species may have found itself on Lampedusa, according to the authors, is via passive dispersal, primarily on ferries or even immigrant boats that sailed to Lampedusa from coastal locations where the cricket maintains a population. The authors draw an analogy with the Gregarious Locust (*Schistocera gregaria*) migration of November 2012, when numerous locusts were observed on Lampedusa, in both rural and urban areas (PRAZZI *et al.*, 2014).

DISCUSSION

On the basis of current understanding of Mediterranean eustatic sea level fluctuations, it is highly probable that the species owes its presence on southern European shores to the period of marine



Fig. 1 — *Brachytrupes megacephalus* stridulating at its burrow entrance (photo credit: G. Bonetti)



Fig. 2 — Indicative location of Natura 2000 sites on central Mediterranean islands that harbour *B. megacephalus* populations (source: CASSAR *et al.*, 2017). Beyond these Natura 2000 sites, the species is also known from the islands of Lipari and Vulcano (Aeolian Islands) (MASSA, 2011).

regression associated with the Messinian Salinity Event (Hsü *et al.*, 1973, 1978), when land-bridge connections with North Africa were possible. Therefore, following the last major inundation of the Mediterranean Basin at the beginning of the Pleiocene, the Italo-Maltese *Brachytrupes megacephalus* populations remained isolated from their, presumably, North African centre of origin. Notwithstanding the sea level fluctuations that occurred as a result of various subsequent high-stands, wherein extensive tracts of land are known to have become inundated, the gradual nature of sea-level rise over geological time would have allowed the species to adjust its range to the position of the coast.

Although the species is relatively vagile, it is not known to undertake distant journeys by way of multi-generational migration, as in the case of long-distance migrant insects such as *Vanessa cardui* and *Schistocera gregaria*. This is essentially due to its morphology, the structure of which does not provide the functional mechanism to assume any flight of lengthy duration, beyond a number of metres (Cassar, *pers. field obs.*). Hence, it would not be plausible to assume that any individuals of the species may have taken to the wing and achieved a sea crossing of such a scale, that is, from Linosa or North Africa, even if aided by strong favourable winds, not unless dispersal morphs of the species exist, of which there is no recorded evidence to-date. Nor are there weather systems in the Mediterranean, such as those associated with low-latitude converging trade winds of the Inter-Tropical Convergence Zone, which permit other species of the same sub-family Gryllinae (such as *Gryllus bimaculatus*) to ‘migrate’ along the West African littoral (RAGGE, 1972; BOWDEN & JOHNSON, 1976). Based on our analysis of weather records, the winds around the time of the crickets’ occurrence on Lampedusa (April 3rd 2014 at 1200 UTC) were significantly strong, with South-East to North-West trending gales of 30 knots (Figs 3a-b). Such wind force would be equivalent to Beaufort F7-F8 and could have potentially generated 4-5.5 m waves according to this same scale. These gale force winds lasted till 0600 UTC of the following day (April 4th). Given that the prevailing winds on the days in question were blowing towards Lampedusa from the Gulf of Sirte (and not from the direction of Tunisia or Linosa), coupled by the fact that *Brachytrupes megacephalus* is not known to swarm nor to achieve long distances (beyond a few metres) when taking to the wing, it would seem inconceivable for the species to have surmounted such gale-force winds with accompanying wave heights of the potential magnitude described, over such considerable distance.

Consequently, it follows that the only plausible manner by which the four male crickets made it to Lampedusa would be via passive dispersal (unless introduced deliberately). Ferries and other coaster-type vessels, as well as fishing boats, including those utilized to convey immigrants from North Africa to Lampedusa, can provide the means for passive dispersal. The species certainly has the ability to crawl into fishing craft left lying on sandy beaches or may, alternatively, be attracted to intense artificial lights (LAKHDARI *et al.*, 2015) aboard quayside vessels. Such was probably the case of a specimen taken aboard a cargo ship berthed in Marsa (Malta), which had sailed into Grand Harbour from Augusta in Sicily via Libya (CASSAR, 1990).

CONCLUSION

There is no doubt that the occurrence of *Brachytrupes megacephalus* on Lampedusa, recorded by PRAZZI *et al.* (2014), is of significant importance. Species have been known to colonize new lands through passive dispersal via the human agency. In this particular case, given the ‘vulnerable’ conservation status of *Brachytrupes megacephalus* within EU territory, one can appreciate the benefit of this most likely unintended anthropic ‘intervention’. Undoubtedly, more work will need to be carried out, including field monitoring for any new occurrences (which could potentially lead to the establishment of a new population on Lampedusa).

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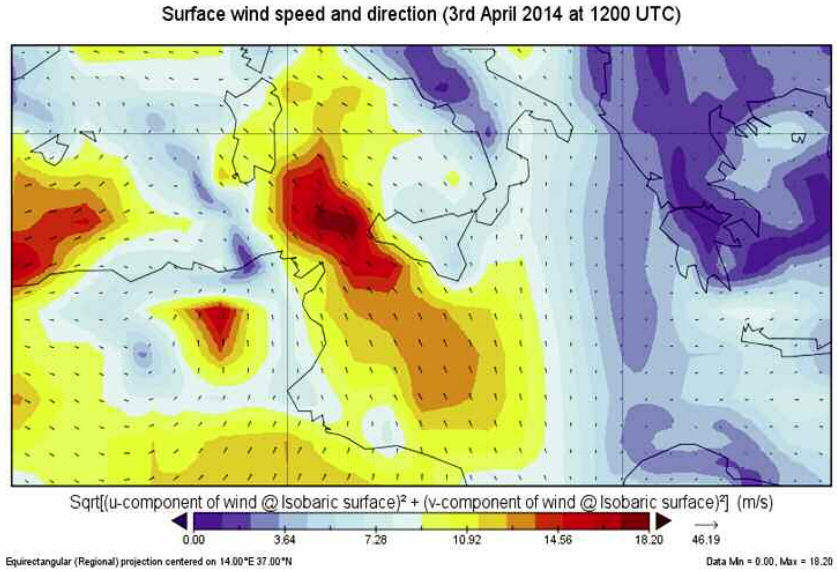


Fig. 3a

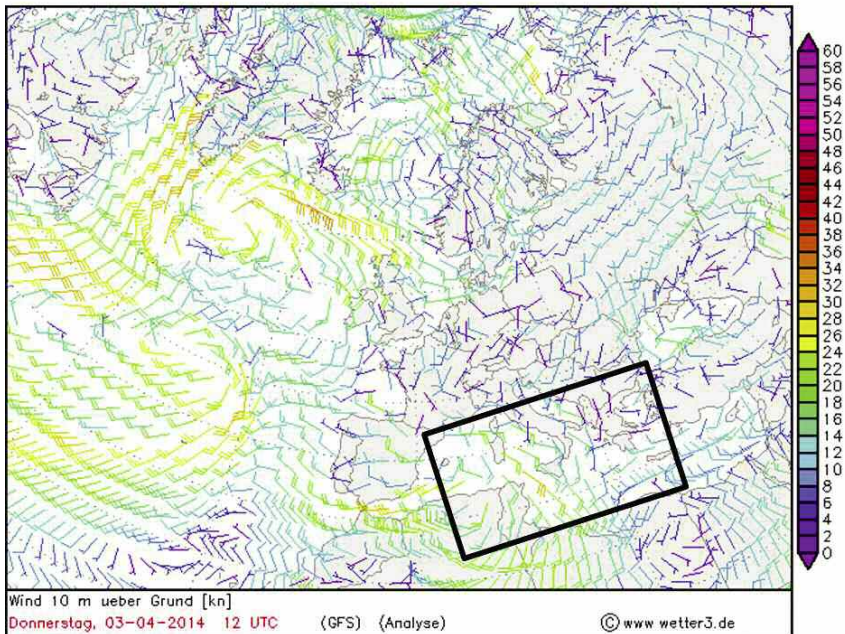


Fig. 3b

Fig. 3 — Weather data for 03 April 2014 at 12 UTC. (a, top) Synoptic 10-m wind chart analyses. (b, bottom) Regional surface wind speed (ms^{-1}) and direction over the central Mediterranean. Geographical extent refers to the inset shown in (a). (Data source: Global Forecast System archive)

useful suggestions to improve it. Grateful thanks are also due to Prof. Dr Axel Hochkirch of the Department of Biogeography, Trier University, for his helpful insights on potential dispersal mechanisms. Finally, the authors would like to extend their appreciation towards Mr Guido Bonett for having made the photograph, appearing as Figure 1 available, as also for looking after the visual technology relating to on-going research on *Brachytrupes megacephalus*.

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