

Presence of *Brachytrupes megacephalus* (Lefebvre, 1827) (Orthoptera Gryllidae) in the Oriented Nature Reserves “Capo Rama” and “Torre Salsa” (Sicily, Italy)

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ABSTRACT

The authors present preliminary findings regarding the distribution and habitat selection of *Brachytrupes megacephalus* (Lefebvre, 1927) (Orthoptera Gryllidae) within the “Capo Rama” and “Torre Salsa” Nature Reserves (Sicily, Italy). This elusive species is closely associated with undamaged coastal ecosystems and appears to be in decline in Italy. It has been listed in the European Union’s Habitat Directive 92/43/EEC and the European Red List. Consequently, a monitoring plan was initiated in March 2021 and continued into 2022. The monitoring involved identifying signs of presence (burrows, sand cones, and song) using zig-zag transects in sample areas, with the aim of collecting both presence/absence data and density information. The presence of the species has been confirmed at various sites within the two study areas and on the beach in Balestrate (Palermo). The data obtained are crucial for planning effective conservation initiatives for both the species itself and the ecosystems inhabited by it.

KEY WORDS

Sand dunes; Nature Reserves; Sicily; endangered species.

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INTRODUCTION

Brachytrupes megacephalus (Lefebvre, 1927), a striking Gryllidae species with a wide Mediterranean distribution, is well-known in Europe for its presence in southern Sardinia, Sicily, and some circum-Sicilian islands (such as Linosa, Lipari, Vulcano, Malta, and Gozo; recently, it has also been discovered in Lampedusa, where it was previously absent). This elusive species is primarily nocturnal, and its song is audible during the spring months, peaking in April and occasionally in au-

tumn. It is mainly linked to undamaged coastal environments, particularly the back-dune areas, although in Africa, it extends to more inland locations. In Sicily, historically, this species must have been abundant; in fact, Pincitore Marrott (1879) considered it a pest for grapevines in the Terrasini area. However, over the last half-century, its preferred habitat has suffered significant anthropogenic impact, resulting in a substantial contraction and fragmentation of its populations. As a consequence, *B. megacephalus* is now listed in Annexes II and IV of the *Habitat Directive* and is

considered Vulnerable on the European Red List. Monitoring efforts, as stipulated by established schedules, should ideally be coordinated by the regions where the species resides, following ministerial protocols (ISPRA 2016a, b). Regrettably, the relevant regional administrations have not yet implemented these monitoring programs. Investigations into the status of its populations have therefore been undertaken by the management authority of the two Sicilian Reserves, “Capo Rama” and “Torre Salsa”, where suitable habitats still exist (Figs. 1, 2).

MATERIAL AND METHODS

Study area

The “Capo Rama” coastal Nature Reserve (Terrasini, Palermo, Italy) covers approximately 57 hectares and is situated on a Triassic limestone platform dominated by cliffs reaching heights of approximately 35 meters (Fig. 3). These cliffs gradually slope down towards the sea. The area’s vegetation consists of species adapted to conditions of intense sunlight, aridity, constant winds, and marine aerosols. Along the cliffs, halophytic plant associations, represented by *Limnietum bocconeii*, thrive. Closer to the coastline, the Mediterranean scrubland (*Chamaeropo-Quercetum calliprini*) dominates, while typical therophytic grasslands of northwestern Sicilian rocky coasts are also present.

The “Torre Salsa” Reserve (Siculiana, Agrigento, Italy) extends along the southern coast of Sicily, between Siculiana Marina and Eraclea Minoa, covering a total area of approximately 760 hectares (Fig. 4). This protected area features rocky outcrops of various types, interspersed with maquis and garrigue vegetation. A brackish coastal marsh (now a geosite) and a sandy coastline interrupted by cliffs stretch for about 7 kilometers between Monte Stella and the mouth of the Fosso Gurra. The extensive sandy ridges, composed of fine quartz sands, contribute to the reserve’s unique environmental and landscape characteristics.

The vegetational aspects of coastal sandy habitats are represented by several plant communities. These communities thrive in the challenging con-

ditions of sandy coastal environments. Let’s delve into their characteristics: *Salsolo-Cakiletum marimae*. This association comprises species such as *Salsola* and *Cakile*; it plays a crucial role in stabilizing the sandy substrate. *Cypero capita-Agropyretum juncei*: this particular community, characterized by the presence of *Cyperus* and *Agropyron junceum*, adapts to the sandy coastal environment. *Elytrigia juncea*: dominating the landscape, *Elytrigia juncea* is a key component of the vegetational mosaic. Its ecological significance lies in its ability to thrive under extreme conditions. *Medicagini marinae-Ammophiletum australis*: we find this community on the higher dunes; it consists

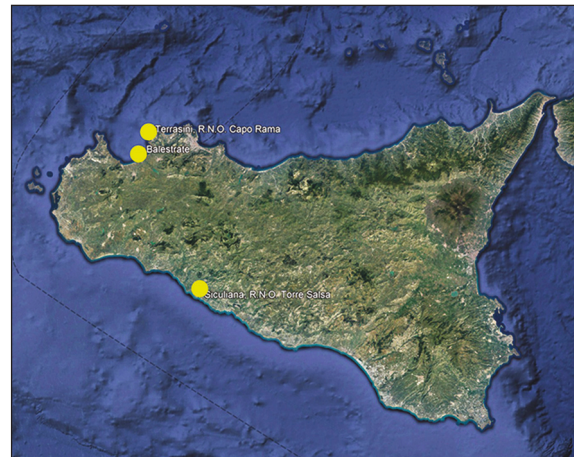


Figure 1. Study area in Sicily (Italy).



Figure 2. *Brachytrupes megacephalus*, at the entrance to its hole, Torre Salsa, 14.VII.2022 (Sicily, Italy).



Figure 3. The “Capo Rama” coastal Nature Reserve ((Terrasini, Palermo, Italy).



Figure 4. The “Torre Salsa” Reserve (Siculiana, Agrigento, Italy).

of species like *Medicago marina* and *Ammophila australis*, which are well-adapted to the sandy substrate. In the retrodunal stations we find *Seselio marimi-Crucianelletum marimae*, *Vulpio fasciculatae-Hormuzakietum aggregatae*: within this census, we encounter psammophilous therophytic vegetation. The species *Vulpio fasciculata* and *Hormuzakia* contribute to the unique ecological dynamics of this habitat. These vegetational communities play a vital role in shaping the coastal ecosystem, providing stability, and contributing to biodiversity. Their adaptation strategies allow them to thrive despite the harsh conditions of sandy coastal environments.

Data sampling

The monitoring methodology was adapted from the “Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: Specie animali” (ISPRA 2016a, b). This scientific reference tool is essential for monitoring animal species of community interest in Italy. To locate individuals and assess their distribution, we employed evening song listening. However, due to the intense cricket activity and the abundance of individuals, direct counting was not practicable. Consequently, we opted for the hole and cone counting method, following the monitoring techniques described by Petralia et al. (2003, 2015) and Conti et al. (2012) (Figs. 5–7). This involved using a zig-zag

transect within a sample area of approximately 1 hectare.

Weekly monitoring took place from mid-March until mid-May, coinciding with the period when songs were audible. At Capo Rama, a population abundance estimation and distribution assessment plan were initiated during spring 2021, while at Torre Salsa only monitoring has been performed.

Additionally, in spring 2022, investigations were conducted on the Balestrate beach using a Wildlife Acoustics Song Meter Micro environmental recorder.

RESULTS

In the months of April and May in 2018 and 2019, Cassar et al. (2019) investigated the north-western sandy coastal zones of Sicily, including Alcamo Marina, Balestrate, Isola delle Femmine, and Mondello. Despite observing clear signs of excavation, they did not find any presence of crickets. However, advanced decomposed remains were discovered on the beach in Alcamo on May 15, 2020, by one of the present authors (C. Muscarella).

The presence of *B. megacephalus* was confirmed within the “Capo Rama” Nature Reserve by the management personnel during the summer of 2017. These specimens were identified amidst formations of steppe-like grassland, characterized



Figure 5. Sandy cones of *Brachytrupes megacephalus*, Capo Rama, 8.VII.2022 (Sicily, Italy).

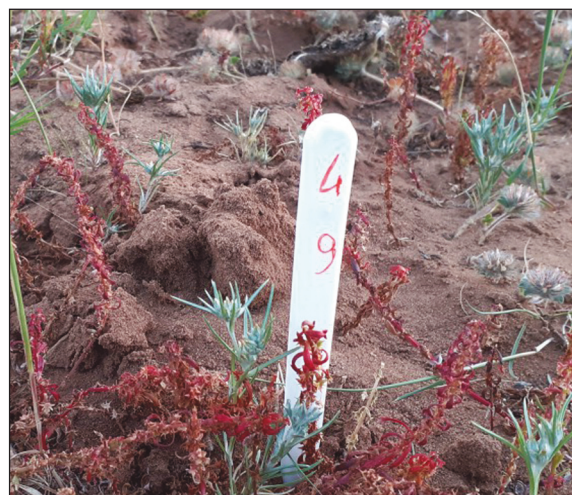


Figure 6. Hole and cone monitoring techniques, Capo Rama, 8.VII.2022 (Sicily, Italy).



Figure 7. Nymph of *Brachytrupes megacephalus*, Torre Salsa, 14.VII.2022 (Sicily, Italy).

by ephemeral subalpine therophytes, which thrive among the *Chamaerops humilis* shrubbery.

From this initial investigation, it emerged that *B. megacephalus* is present at four distinct stations within the reserve, each with varying abundances. The first two stations, located in the Reserve Zone A, revealed only a few individuals amidst the sparse aspects of the *Chamaerops humilis* shrub. In contrast, the other two areas - near Cala Porro - host a more substantial population due to the greater accumulation of wind-blown sand. In these areas, the vegetation exhibits distinct physiognomic and structural differences compared to the first two stations. Downstream from the road, a sparsely vegetated *Chamaerops humilis* scrub suggests past disturbances such as fires and grazing. Upstream from the road, however, the environment is characterized more by a garrigue physiognomy rather than a true shrubland.

The investigation also covered the beach of Balestrate (west of Capo Rama), where various traces of the species were found in the spring of 2022. These traces included burrow entrances and sand accumulations, and the presence

of the species was definitively confirmed through the twilight song of a male recorded by an environmental recorder.

In the “Torre Salsa” Nature Reserve, monitoring started in 2021 provided valuable data on the *B. megacephalus* population. Its presence was detected along the entire sandy coastal shoreline from Monte Stella to Fosso Gurra (near Bovo Marina). The preferred habitat of the species was found to be fixed dunes, characterized by the presence of *Crucianella maritima* L., *Pancretium maritimum* L., and other coastal dune systems that have stabilized and are no longer directly influenced by marine winds. These areas feature a substrate that is nearly desalinated, allowing for the formation of an initial soil layer. The plant communities in these habitats consist of perennial herbaceous species, including *Anchusa aggregata* Lehm.

In the same retrodunal context, the prevalence of *Centaurea sphaerocephala* L. is frequent. It is associated with several other psammophilous species, as well as ephemeral therophytic communities dominated by species belonging to the genera *Malcomia*, *Evax*, etc. Additionally, xerophilic

aspects of the *Thero-Brachypodietea* class have been observed. Furthermore, galleries of *B. megacephalus* have been identified in xeric environments characterized by low shrubs and perennial herbaceous plants near the retrodunal area.

CONCLUSIONS

Brachytrupes megacephalus, a species of cricket in the family Gryllidae, plays a pivotal role in intact dune environments. Unfortunately, due to anthropogenic impact, dune ecosystems have suffered severe consequences, including population decline and local extinction of certain species. The monitored territories have historically faced significant disturbances, such as fires, illegal dumping, unregulated grazing, and unauthorized coastal construction of houses. These activities have substantially altered coastal ecosystems, almost pushing them to the brink of extinction. However, since the establishment of protected areas in 2000, management authorities have taken crucial steps to mitigate these impacts. Actions include waste cleanup, continuous territorial surveillance, and environmental education for all visitors to the protected area. These efforts have significantly benefited the coastal fauna associated with these regions. Among the monitored populations, the one in Balestrate is particularly at risk of extinction. The extensive reforestation of *Acacia* sp. carried out approximately 40-50 years ago on the dune formations has drastically reduced the Balestrate population, bringing it to the brink of extinction. Obtaining qualitative and quantitative data on the species present remains a top priority. This basic information is essential for developing medium- and long-term conservation projects aimed at safeguarding biodiversity - the primary objective of any protected area.

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REFERENCES

- Cassar L.F., Conrad E., Borg J.J. & Galdies C., 2019. Field notes on two stenotopic orthopterans from the central mediterranean: *Brachytrupes megacephalus* (Grylloidea Gryllidae) and *Pamphagus ortolanii* (Acridoidea Pamphagidae). *Il Naturalista siciliano*, 43: 203–219.
- Cassar L.F., Conrad E. & Galdies C., 2021. *Brachytrupes megacephalus* Lefèbvre, 1827 (Orthoptera, Gryllidae) in the Maltese Islands: notes on biogeography, behaviour, and habitat of populations in the central Mediterranean area and the Maghreb. *Zootaxa*. 4975: 544560. <https://doi.org/10.11646/zootaxa.4975.3.5>. PMID: 34187031.
- Cassar L.F. & Galdies C., 2018. On the recent occurrence of *Brachytrupes megacephalus* (Lefèbvre, 1827) (Orthoptera Gryllidae) on Lampedusa. *Il Naturalista siciliano*, 42: 153–158.
- Conti E., Costa G., Petralia A. & Petralia E., 2012. Ecotoxicology of *Brachytrupes megacephalus* (Orthoptera, Gryllidae), protected species in EU. *Atti e Memorie dell'Ente Fauna Siciliana*, 11: 51–56.
- Hochkirch A., Nieto A., García Criado M., Cáliz M., Braud Y., Buzzetti F.M., Chobanov D., Odé B., Presa Asensio J.J., Willemse L., Zuna-Kratky T., Barranco Vega P., Bushell M., Clemente M.E., Correas J.R., Dusoulier F., Ferreira S., Fontana P., García M.D., Heller K-G., Iorgu I.Ş., Ivković S., Kati V., Kleukers R., Krištín A., Lemonnier-Darcemont M., Lemos P., Massa B., Monnerat C., Papapavlou K.P., Prunier F., Pushkar T., Roesti C., Rutschmann F., Şirin D., Skejo J., Szövényi G., Tzirkalli E., Vedenina V., Barat Domenech J., Barros F., Cordero Tapia P.J., Defaut B., Fartmann T., Gomboc S., Gutiérrez-Rodríguez J., Holuša J., Illich I., Karjalainen S., Kočárek P., Korsunovskaya O., Liana A., López H., Morin D., Olmo-Vidal J.M., Puskás G., Savitsky V., Stalling T. & Tumbrinck J., 2016. European Red List of Grasshoppers, Crickets and Bush-crickets. Publications Office of the European Union, Luxembourg.
- ISPRA-Ministero dell'Ambiente, 2016a. Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: Specie animali, 141/2016.
- ISPRA-Ministero dell'Ambiente, 2016b. Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: Habitat, 142/2016.
- La Piana F. & Sparacio I., 2010. Le dune e gli ambienti umidi costieri della Sicilia. Tra passato, presente e futuro. Edizioni "Il Brigantino", Palermo, 280 pp.
- Massa B., Fontana P., Buzzetti F.M., Kleukers R. & Odé B., 2012. Orthoptera. Fauna d'Italia XLVIII. Calderini, Bologna, 563 pp.

- Massa B., Rovelli V., Zapparoli M. & Bologna M.A., 2016. *Brachytrupes megacephalus* (Lefèbvre, 1827) (Grillo testone). In: Stoch F. & Genovesi P. (Ed.), Manuali per il monitoraggio di specie e habitat di interesse comunitario (Direttiva 92/43/CEE) in Italia: specie animali. ISPRA, Serie Manuali e linee guida, 141/2016.
- Petralia A., Russo C. & Cartarrasa S., 2003. Topology of *Brachytrupes megacephalus* (Lefebvre, 1827) (Orthoptera, Gryllidae) in some Sicilian Natural reserves. Atti “Fifth International Symposium on GIS and Computer Cartography for Coastal Zone Management”, Genova 2003.
- Petralia A., Petralia E., Sabella G., Brogna F. & Bianca C., 2015. Presence’s mapping of *Brachytrupes megacephalus* (Lefebvre, 1827) (Orthoptera Gryllidae) within the Natural Reserve of Vendicari (Noto, Siracusa, Italy). Biodiversity Journal, 6: 323–326
- Petralia A., Fiandaca P., Petralia E., Sabella G., Torrisi G., Bianca C., Lamanna F. & Dima C., 2021. On the presence and localization of *Brachytrupes megacephalus* (Lefebvre, 1827) (Orthoptera Gryllidae) in the “Oriented Natural Reserve Simeto Oasis” (Sicily, Italy). Biodiversity Journal, 12: 977–992
<https://doi.org/10.31396/Biodiv.Jour.2021.12.4.977.992>
- Pincitore Marott G., 1879. Di un insetto del genere Locusta che danneggia le viti nel territorio di Terrasini. Giornale ed atti del comizio agrario di Palermo, 34: 162–164.

