

Nota botànica

First evidences of the naturalization of *Eucalyptus globulus* subsp. *globulus* (Myrtaceae) at Mallorca (Balearic Islands)

Juan José Suárez-Fernández

Alien Species Workgroup. Associació per a l'Estudi de la Natura
Camí des Murterar, 44. 07100 Sóller. Illes Balears

Samuel Pinya

Alien Species Workgroup. Associació per a l'Estudi de la Natura
Camí des Murterar, 44. 07100 Sóller. Illes Balears

Biodiversity Monitoring and Research Center
Paratge Natural de la Serra de Tramuntana. Espais de Natura Balear
C/ Josep Coll Bardolet, s/n. 07170 Valldemossa. Illes Balears
sampinya22@gmail.com



Manuscript received in April 2012

Biological invasions are widely known as one of the major threats to biodiversity and natural ecosystems (Vitousek et al., 1996; Parker et al., 1999; Mack et al., 2000), to the extent of being considered by IUCN as the second cause of habitat destruction (GISP, 2001).

Exotic invasive species have been one of the main forces related to biotic and abiotic alteration processes in island systems (Loope & Mueller-Dombois, 1989). Biological diversity in these ecosystems is highly valued and, generally, a greater number of endemisms are found, together with many species that have evolved in conditions of low interspecific competence and with a minimal predatory pressure (Moragues & Rita, 2005). This results in poor biotic barriers to give resistance in front of naturalizations and invasions (Mack, 1996; Mack & Lonsdale, 2002).

The Balearic Islands are not an exception to this phenomenon. In 2004, 304 introduced species of flora were quantified, which represents 15.9% of the vascular flora of the Islands. Of this, 60% are naturalized species (Moragues, 2010), albeit this number is nowadays probably higher due to the non-stop entering movement of alien species in the Balearics.

Eucalyptus L'Hér. is one of the most important taxa widely planted outside their natural ranges in temperate zones (Richardson, 1998). However, the presence of *Eucalyptus* sp. populations can be associated to a number of problems, such as: the increase of fire hazard (Gassó et al., 2009) due to its litter accumulation, the modification of the water balance (Moragues & Rita, 2005), presence of

allelopathic compounds (Briones & Ineson, 1996), antimicrobial effects (Briones & Ineson, 1996) and soil alkalization (Baber et al., 2006)

Eucalyptus globulus Labill. is an allochthonous species in the Balearic Islands, and it is accepted to be considered as an alien species, although it is not considered invasive or potentially invasive (Moragues & Rita, 2005).

During the first half of the twentieth century, many state laws were promulgated to encourage and enhance afforestation and alleviate the demand for raw materials in Spain (De la Lama, 1951; Ruiz de la Torre, 2006), which led to the reforestation of *Eucalyptus* in around the Iberia peninsula and several areas of Mallorca. As an example, between the 60's-70's, two reforestations of *E. globulus* subsp. *globulus* were done at the public estates of Binifaldó and Menut (Escorca, N Mallorca). The first stocking was around the path of *Sa Coma de Binifaldó*, within a Myrtle shrubland (*Clematidi balearica* - *Myrtetum communis*) in a downward slope (31SDE9109); while the second was near the recreational area Menut II within an open maquis shrubland (*Cneoro tricocci* - *Ceratonietum siliquae* facies *Pinus halepensis*) in an almost flat profile (31SDE9110). In both localities a stream flows through them. From a regulatory point of view, both areas are located within the natural area of the Serra de Tramuntana Mountain range, as well as within the boundaries of the Special Protection Area and Site of Community Interest *Cimals de la Serra* (ES5310027). This area of the Natura 2000 network was declared, among other reasons, for the conservation of the Myrtle shrublands present in the area, included in the Habitat 5330 of the Council Directive 92/43/EEC.

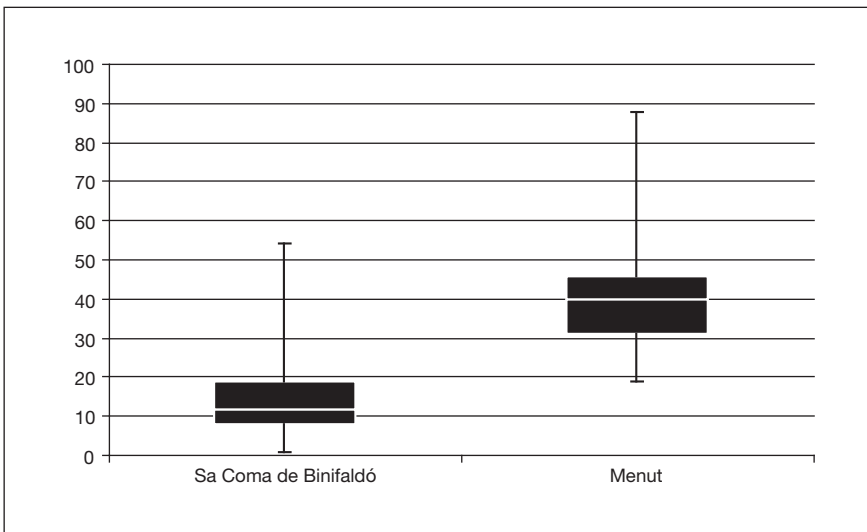


Figure 1. Distribution in % of the trunk diameter at breast height (DBH) in the population of sa Coma de Binifaldó (n = 74) and Menut II (n = 29).

A project on control and eradication of alien flora was started in the Serra de Tramuntana in 2009, in line with other conservation actions undertaken in other protected areas of the Balearic Islands, such as the natural park of s'Albufera de Mallorca, the nature reserve of s'Albufereta and the natural park of Sa Dragonera (Mayol et al., 2007).

In 2010, visits were made to the locations of the public estates of Binifaldó and Menut where *E. globulus* was present, and a study on the structure of both populations was done by measuring the trunk diameter at breast height (DBH = 1.30 m) of all individuals (Fig. 1).

Menut's population was formed by 29 specimens (DBH values: avg. 39.69 cm.; S.E. 13.87; min: 19 cm. and max: 88 cm.), while the one at *Sa Coma de Binifaldó* counted with 74 trees (DBH values: avg. 14.52 cm.; S.E. 10.29; min: 1 cm. and max: 54 cm.). Observed distribution of trunk diameter analyzed by z-test (Fowler et al., 2008) showed that both populations were significantly different (Fig. 2; $z = -8.8896$, $p < 0.00001$).

The population of Menut was composed mainly by adult individuals, according to the DBH, which may correspond to the ones that were planted in the 60's and 70's for reforestation policies. On the other hand, in *Sa Coma de Binifaldó*, the presence of a high percentage of individuals with a low DBH (< 22 cm.; 84 %), may suggest the hypothesis of a succession of breeding events, according with the wide small DBH classes. These specimens would have emerged as a

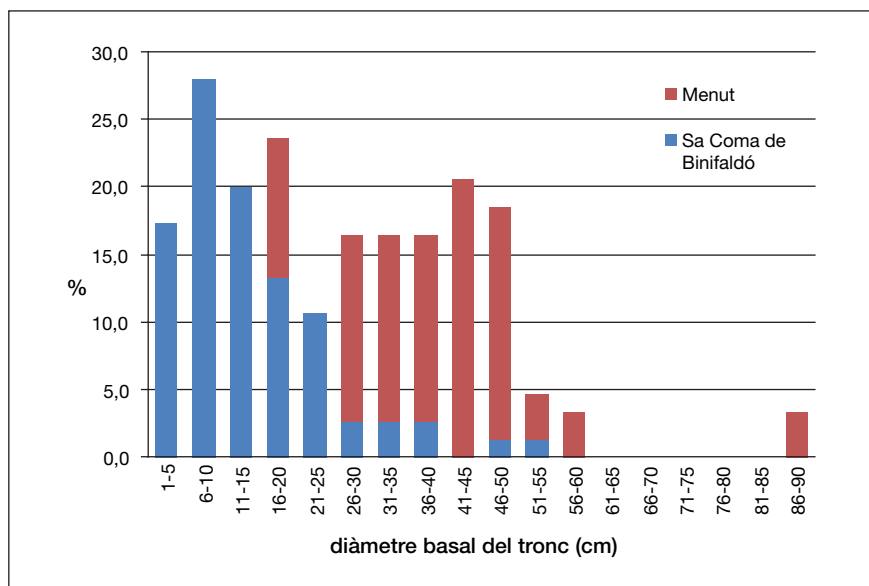


Figure 2. Comparison of the trunk diameter (DBH expressed in cm.) between the studied localities. Whiskers represent the minimum and maximum values, boxes the 50 % of the trunk diameter values, and white lines the mean value for each population.

result of the production of seeds of specimens from reforestation. Consequently, in *Sa Coma de Binifaldó* a reproduction process in a natural ecosystem without the intervention of man has occurred, and therefore, it should be considered as a naturalized population (Moragues, 2010).

The presence of a population of 74 specimens of *E. globulus*, joined to the reproduction process observed in a natural habitat is the first evidence of naturalization of this species in the island of Mallorca. The verified reproduction demonstrates that in favorable conditions, this species can naturalize, and therefore, may become a potential invasive species, as occurs with other *Eucalyptus* species in different geographic areas of the Mediterranean Basin (Arianoutsou et al., 2010), although any invasive behavior has been documented in Mallorca yet.

A monitoring of this alien species, should be carried out in future conservation policies, in order to detect those populations in which a breeding event could take place. In such circumstances, an eradication plan should be designed and executed to avoiding the massive production of seedlings and consequently, the forthcoming impacts on local biodiversity, when they will grow up.

Acknowledgements

We thank Joan Rita and Llorenç Sáez for their suggestions to improve the text, and to M^a Antònia Vanrell Cerdà for her support in the developing of conservation actions on the natural area of the Serra de Tramuntana Mountain Range. *Obra Social «La Caixa»* funded the project «Control of alien flora in the natural area of the Serra de Tramuntana Mountain Range» during 2010. The author J.J. was granted by *Espais de Natura Balear* with a TUO internship for new university graduates from the University of the Balearic Islands.

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