

226. *ELATINE BROCHONII* CLAUDAUD (ELATINACEAE), A NEW SPECIES TO THE PORTUGUESE FLORA

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Elatine brochonii Clavaud (*Elatinaceae*), uma nova espécie para a flora portuguesa

Key words. *Elatine brochonii*, *Elatinaceae*, Mediterranean temporary ponds, chorology, Portugal.

Palavras chave. *Elatine brochonii*, *Elatinaceae*, charcos temporários Mediterrânicos, corologia, Portugal

Elatine brochonii Clavaud in Actes Soc. Linn. Bordeaux 37: 63 (1883).

Exsiccatae:

PORTUGAL, ESTREMADURA (1): Palmela, Poceirão, Poceirão, 29S NC2275, 40 m.s.m., no limite sul do perímetro urbano, perto da escola José Saramago. Numa clareira de pinhal (*Pinus pinaster*) na margem de um caminho, numa depressão temporariamente encharcada, com vegetação rala composta por terófitos baixos de charcos temporários: *Lythrum borysthenicum* (Schränk) Litv., *Juncus tenageia* Ehrh. ex L. fil., *J. bufonius* L., *J. pygmaeus* Rich. ex Thuill. e *Illecebrum verticillatum* L., 6-V-2011, det. M. Porto, leg. R. Rego & M. Porto *SPB4* (LISU244560).

PORTUGAL, RIBATEJO (2): Benavente, Samora Correia, Companhia das Lezírias, 29S NC0894, 16 m.s.m., charco em matriz de eucaliptal a oeste do Campo de Tiro de Alcochete. Margem de charco temporário, em relvado de herbáceas baixas, 28-VI-2011, M. Porto *SPB5* (LISU244561).

PORTUGAL, RIBATEJO (3): Benavente, Samora Correia, Companhia das Lezírias, 29S NC0994, 17 m.s.m., charco em matriz

de eucaliptal a oeste do Campo de Tiro de Alcochete. Margem alta de charco temporário, debaixo de eucaliptal, 28-VI-2011, M. Porto *SPB6* (LISU244562).

PORTUGAL, RIBATEJO (4): Benavente, Samora Correia, Companhia das Lezírias, 29S NC1393, 33 m.s.m., charco na vizinhança de pinhal a este do Campo de Tiro de Alcochete. Margem de charco temporário, em solo arenoso revolvido, 28-VI-2011, M. Porto *SPB7* (LISU244563).

PORTUGAL, RIBATEJO (5): Abrantes, Bemposta, ca. 4 km NNW de Água Travessa, perto do Campo Militar de Santa Margarida, 29S ND6751, 200 m.s.m., pequeno charco temporário perto do caminho de terra principal. Dispersa por todo o leito de um charco pouco profundo, juntamente com *Lythrum borysthenicum* (Schränk) Litv. e *Juncus pygmaeus* Rich. ex Thuill. 16-VI-2011, M. Porto & A. J. Pereira *SPB8* (LISU244564).

PORTUGAL, BAIXO ALENTEJO (6): Alcácer do Sal, Torrão, ca. 1.3 km NE de Água Derramada, 29S NC5030, 103 m.s.m., charco temporário perto de um caminho de areia. Na margem de um charco temporário, nas zonas de vegetação mais rala juntamente com *Juncus pygmaeus* Rich. ex Thuill. e *Eryngium*

corniculatum Lam. 23-VII-2011, M. Porto, C. Tauleigne Gomes & A.J. Pereira *SPB9* (LISU244565).

Observations in other sites:

PORTUGAL, ESTREMADURA (7): Sesimbra, Sesimbra (Castelo), Herdade da Apostiça, 29S MC8968, 68 m.s.m., 15-VIII-2010, dry plants; 18-VI-2011, plants beginning to flower. Large and dense colony, occupying ca. 100 m² in a sand track with little vegetation cover.

PORTUGAL, ESTREMADURA (8): Sesimbra, Sesimbra (Castelo), Herdade da Apostiça, 29S MC8868, 69 m.s.m., 14-VII-2011, dry plants.

PORTUGAL, ESTREMADURA (9): Seixal, Fernão Ferro, between Fernão Ferro and Verdizela, 29S MC8968, 68 m.s.m., 18-VI-2011, flowering. In the center of a small temporary pond, in the vicinity of a habitational area.

PORTUGAL, RIBATEJO (10): Benavente, Samora Correia, Companhia das Lezírias, 29S ND1401, 22 m.s.m., in the center of a temporary pond within a sub-nitrophilous community, 28-VI-2011, fruiting.

PORTUGAL, RIBATEJO (11): Abrantes, Bemposta, ca. 5.3 km NNW from Água Travessa near Campo Militar de Santa Margarida, 29S ND6652, 200 m.s.m., 16-VI-2011, dry plants. In small temporarily flooded depressions along the border of a dust road.

PORTUGAL, ALGARVE (12): Vila do Bispo, Budens, Lagoa de Budens, 29S NB1306, 135 m.s.m., 23-V-2008, flowering. In the border of a small temporary pond crossed by a dust road.

Elatine brochonii Clavaud is a small annual herb with a very short life cycle (Rhazi, 2004), which inhabits Mediterranean temporary ponds in sandy or clayey places (Rhazi *et al.*, 2007b). Throughout its geographic range it is very rare, occurring only at scattered and very small populations in Spain, namely in the western

half, Soría and Gerona (Cirujano *et al.*, 1986; Cirujano *et al.*, 1992; Cirujano & Velayos, 1996; Benito, 2010), southwestern France, namely Gironde, Landes, Pyrénées-Atlantique (Lorenzoni & Paradis, 1997; Rhazi, 2004) and Saône-et-Loire (MNHN, 2003-2010), Corsica, Morocco and Algeria (Rhazi *et al.*, 2007b). The plant is globally declining due to habitat degradation, and many of the past locations no longer exist or face serious threats. It has been classified as Near Threatened “NT” in the IUCN Red List with a decreasing population trend (IUCN, 2011). In France, the species is included in the Annex I of the protected species of the metropolitan territory (JORF Arrêté du 20 janvier 1982) and is also listed in the French Red Book “Livre Rouge de la flore menacée de France” as Endangered “EN” (Olivier *et al.*, 1995). In Spain, it was formerly classified as Vulnerable “VU” (Bañares *et al.*, eds, 2004), having more recently been demoted to Near Threatened “NT” (Moreno Saiz, 2008).

The species, which was unknown to occur in the Portuguese territory, was now found at twelve sites in Setúbal, Santarém and Faro districts, in the provinces of Estremadura, Ribatejo, Baixo Alentejo and Algarve, covering a range of 120 km along a strip in the left margin of Tagus river plus two locations further south. The easternmost site is located at about 120 km from the nearest known population in Badajoz, Spain (Gómez-Hernández & Ortega-Olivencia, 1988).

Despite the fact that this is the first reference of this *taxon* for the Portuguese territory, our observations suggest that it is not necessarily rare in Portugal, occurring in several sites and attaining high local abundances.

Vegetation. Analyzing the phytosociological inventories where the closest species occur (*Elatine macropoda* Guss and *E. hexandra* (Lapierre) DC.), considerable differences can be observed, compared to *E. brochonii*. For the Guadalajara sites, Cirujano *et al.* (1986) state that the former two species

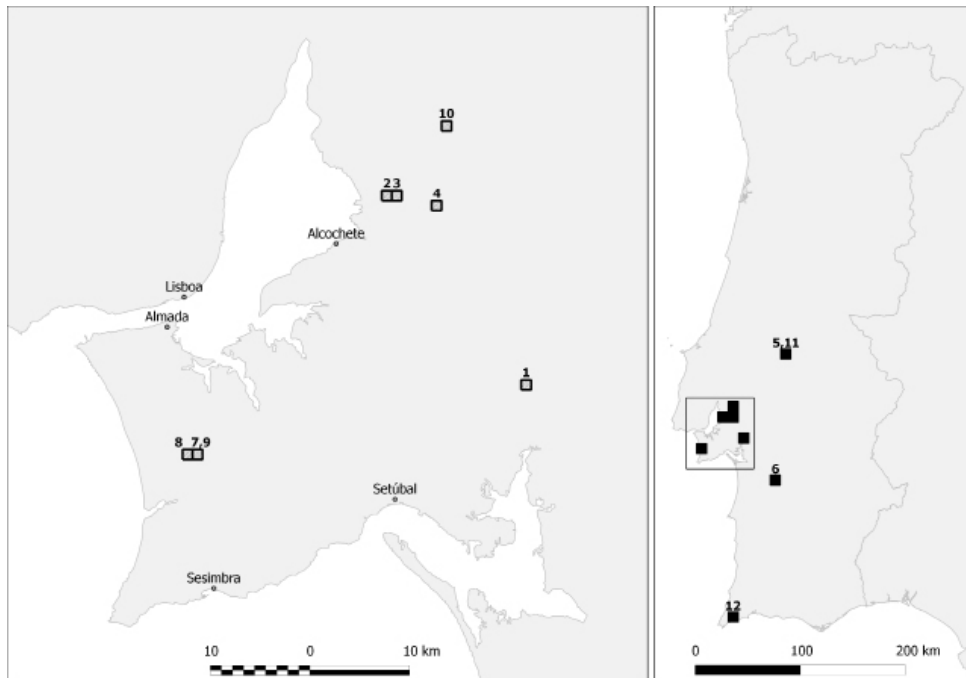


Figure 1: Map showing the UTM 1x1 km squares (left) and 10x10 km squares (right) of the twelve locations of *Elatine brochonii*. (E: Estremadura, R: Ribatejo, BAl: Baixo Alentejo, Ag: Algarve) (1) E, Palmela, Poceirão. (2) R, Benavente, Samora Correia. (3) R, Benavente, Samora Correia. (4) R, Benavente, Samora Correia. (5) R, Abrantes, Bemposta. (6) BAl, Alcácer do Sal, Torrão. (7) E, Sesimbra (Castelo), Herdade da Apostiça. (8) E, Sesimbra (Castelo), Herdade da Apostiça. (9) E, Seixal, between Fernão Ferro and Verdizela. (10) R, Benavente, Samora Correia. (11) R, Abrantes, Bemposta. (12) Ag, Lagoa de Budens, Vila do Bispo. *Quadriculas UTM 1x1 km (esquerda) e 10x10 km (direita) das onze localidades de Elatine brochonii. (E: Estremadura, R: Ribatejo, BAl: Baixo Alentejo, Ag: Algarve) (1) E, Palmela, Poceirão. (2) R, Benavente, Samora Correia. (3) R, Benavente, Samora Correia. (4) R, Benavente, Samora Correia. (5) R, Abrantes, Bemposta. (6) BAl, Alcácer do Sal, Torrão. (7) E, Sesimbra (Castelo), Herdade da Apostiça. (8) E, Sesimbra (Castelo), Herdade da Apostiça. (9) E, Seixal, between Fernão Ferro and Verdizela. (10) R, Benavente, Samora Correia. (11) R, Abrantes, Bemposta. (12) Ag, Lagoa de Budens, Vila do Bispo.*

are characteristic of the association *Elatino macropodae-Eleocharidetum acicularis* Cirujano *et al.* 1986. This association occurs in clay soils in the margins of ponds and bogs in the outer fringe where *Eleocharis palustris* (L.) Romer & Schultes can not survive in summer. Rosselló-Graell (2003), studying temporary ponds in Ribatejo, includes *E. hexandra* in the association *Elatino hexandrae-Littorelum uniflorae* Velayos *et al.* 1989. Both associations belong to the *Littoretalia uniflorae* W. Koch 1926 order and do not correspond to the

observed communities where *E. brochonii* was found in this study.

Benito (2010) describes an ephemeral community which develops only in the rainiest years, *Elatino brochonii-Marsileetum strigosae* Benito 2010. This community colonizes a thin line along the margins of ponds, and is characterized by the presence of *Elatine brochonii* and *Marsilea strigosa*; however this does not correspond to the observed Portuguese communities either.

Based on the studies of Lorenzoni & Paradis

(1997) in Corsica, Benito (2010) recognizes the association *Elatino brochonii-Juncetum pygmaei* Lorenzoni & Paradis ex Benito Alonso 2010. This association, which is very poor in species, is floristically similar to the observed communities in this study, namely due to the usual presence of small therophytes like *Juncus pygmaeus* Rich. ex Thuill., *J. tenageia* Ehrh. ex L. fil., *Lythrum borysthenticum* (Schränk) Litv. and *Illecebrum verticillatum* L.

Although we did not make phytosociological inventories, our non-exhaustive data suggests that the communities where *E. brochonii* was observed may correspond to *Elatino brochonii-Juncetum pygmaei* Lorenzoni & Paradis ex Benito Alonso 2010.

Habitat. The twelve colonies occupy temporary ponds in sandy to loamy soils of varied dimensions, hydroperiod and floristic compositions. In nearly all sites it occurs together with *Juncus pygmaeus*, similarly to what was observed by Lorenzoni & Paradis (1997), and *Lythrum borysthenticum*. In one single case, the plant was found growing together with sub-nitrophilous species like *Chenopodium* sp. and *Heliotropium supinum* L.

Within the temporary ponds, the plant occupies only open areas with very low cover of other herbaceous species, never occurring within tall herbaceous vegetation. In a few cases it seemed to benefit from artificially opened areas (temporarily flooded sand tracks with minimal traffic), where it attained very high abundances, possibly thousands of plants. In ponds densely covered with herbaceous vegetation, the plant strives to survive in the few open patches within.

We observed that the phenology of the plant is strongly linked with the hydroperiod, so that there was a 1.5-month lag between colonies with different hydroperiods. Indeed, Rhazi *et al.* (2007a) demonstrated that *E. brochonii* germination, vegetative development and reproduction are very dependent on hydrological conditions. The plant seems to

be more prone to occur in smaller temporary ponds, where it occupies the center, or in the margins of larger water bodies, where the flooding period is shorter. A longer flooding time limits flower production and increases plant mortality (Rhazi *et al.*, 2007a). It is worth noting that in one of the cases, it was found growing under a plantation of *Eucalyptus globulus* Labill. trees, together with non-hydrophilous annual vegetation, suggesting that it can withstand very short hydroperiods.

The preference of the plant by small ponds is corroborated by the fact that Rosselló-Graell (2003), who studied the large temporary ponds near Água Travessa site (Rosselló-Graell *et al.*, 2000) did not detect *E. brochonii*, but found its relative *E. hexandra*. *E. brochonii*, actually, inhabited the very small ponds which are interspersed within the large ones, which are usually inconspicuous from aerial images and even in the field, hence overlooked until now.

We also noticed that *E. brochonii* seems to benefit from some protection from direct sun light, which allows it to extend its vegetative growing period, and consequently produce more flowers. Indeed, in Poceirão, the most shaded site, plants were large due to vegetative growth, and attained high cover, with abundant flowers. In full sun light conditions, like in Herdade da Apostiça, plants were usually small, many of which producing only a single flower.

Our observations altogether suggest that *Elatine brochonii* may be a more plastic and tolerant species than it is generally accepted.

Major threats. From all sites, Herdade da Apostiça population is the largest and least threatened, namely because it is included in an important wetland conservation area, "PTCON0054 - Sítio Fernão Ferro / Lagoa de Albufeira" included in Natura 2000 Network (ICN, 2006). However, several temporary ponds extend beyond the conservation area and are frequently scattered in an urban matrix (e.g. the Fernão Ferro site). Similarly to what happens in the Poceirão site, these

areas which are in the close vicinity of urban areas may be destroyed in the near future by urban expansion, or other human impacts if not actively protected. At present, these sites show obvious signs of degradation, being used as dump sites.

The Água Travessa and Companhia das Lezírias sites appear to be in a favorable status in respect to conservation, given the current land use context. We emphasize the high conservation value of Companhia das Lezírias ponds, which, in addition to a large population of *E. brochonii* present other important species, such as *Juncus emmanuelis* A. Fern. & J.G. Garcia and *Eryngium galioides* Lam., both Iberian endemics with restricted distribution.

Our findings suggest that *E. brochonii* may actually have a broader distribution in Portugal than what can be derived from our observations. The fact that it has been overlooked until now is possibly related with its very small size and large inter-annual population fluctuations (Rhazi *et al.*, 2007a).

Considering that *E. brochonii* presents a narrow distribution worldwide, and is classified as “Near Threatened” by IUCN criteria, Portuguese populations represent an important geographic area for the conservation of this species, namely because of the large population size. It should, therefore, be targeted in future studies to adequately evaluate population sizes, trends and threats of this rare Western-Mediterranean species. A thorough study of the dynamic of Portuguese populations could further provide valuable insights to the conservation problems posed by this species in other countries, where, in many cases and opposed to the Portuguese situation, *E. brochonii* populations are generally small and declining.

Finally, we urge the need that this species be included in conservation policies at the national level. Despite the fact that some populations are large, some of the sites face severe threats

and are not guaranteed to be safeguarded. Plus, conservation of this species would also be favorable to other rare species which share a similar habitat.

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BIBLIOGRAPHY

- BAÑARES, Á., G. BLANCA, J. GÜEMES, J.C. MORENO y S. ORTIZ (Eds.) -2004- *Atlas y Libro Rojo de la Flora Vascular Amenazada de España. Apéndice*. Dirección General de Conservación de la Naturaleza. Madrid, 1.069 pp.
- BENITO, J. L. -2010- Aproximación a la flora, la vegetación y la conservación de las lagunas temporales mediterráneas de la provincia de Soria. *Flora Montiberica* 45: 54-86.
- CIRUJANO S., M. VELAYOS, F. CASTILLA y M. GIL -1992- *Criterios botánicos para la valoración de las lagunas y humedales españoles (Península Ibérica y Islas Baleares)*. ICONA. CSIC. Madrid.
- CIRUJANO, S., M. VELAYOS & P. PASCUAL -1986- Aportación al conocimiento de *Ranunculus peltatus* Schrank subsp. *saniculifolius* (Viv.) C.D.K.Cook, y su comportamiento fitosociológico. *Trab. Dept. Bot. Univ. Complutense* 13: 99-110.
- CIRUJANO S. & M. VELAYOS -1996- Elatine L. In: Castroviejo S., Aedo C., Cirujano S., Lainz M., Montserrat P., Morales R., Muñoz Garmendia F., Navarro C., Paiva J. & Soriano C. (Eds.) *Flora Iberica*. Vol.3. CSIC. Madrid.
- INSTITUTO DA CONSERVAÇÃO DA NATUREZA -2006- Plano Sectorial da Rede Natura 2000.

- <www.icn.pt/psrn2000/> Download 18 September 2011.
- IUCN Red List of Threatened Species. Version 2011.1. <www.iucnredlist.org>. Downloaded on 17 September 2011.
- JOURNAL OFFICIEL DE LA RÉPUBLIQUE FRANÇAISE. Arrêté du 31 août 1995 portant modifications de l'arrêté du 20 janvier 1982 relatif à la liste des espèces végétales protégées sur l'ensemble du territoire.
- GÓMEZ-HERNÁNDEZ, P. & A. ORTEGA-OLIVENCIA -1988- Fragmenta chorologica occidentalia, 2023-2060, *Anales Jard. Bot. Madrid* 45(2): 536-540.
- LORENZONI, C. & G. PARADIS -1997- Description phytosociologique d'une mare temporaire à *Elatine brochonii* dans le Sud de la Corse, *Bull. Soc. Bot. Centre-Ouest*, N.S. 28: 21-46.
- MORENO SAIZ, J.C. (Ed.) -2008- *Lista Roja 2008 de la flora vascular española*. Ministerio de Medio Ambiente, y Medio Rural y Marino y Sociedad Española de Biología de la Conservación de Plantas. Madrid. 86 pp.
- MUSÉUM NATIONAL D'HISTOIRE NATURELLE (Ed) -2003-2010- *Inventaire national du Patrimoine naturel*. <<http://inpn.mnhn.fr>>. Download on 18 September 2011.
- OLIVIER, L., J. P. GALLAND & H. MAURIN (Eds.) -1995- *Livre Rouge de la flore menacée de France*. Tome I: *Espèces prioritaires*. Collection Patrimoines Naturels (Série Patrimoine Génétique). n°20. SPN-IEGB /MNHN, DNP/ Ministère Environnement, CBN Porquerolles, Paris. 486 pp.
- RHAZI, L. -2004- *Elatine brochonii* Clavaud. In: Grillas P., Gauthier P., Yavercovski N. & Perennou C. (Eds.) *Les mares temporaires méditerranéennes: Fiches espèces*. Vol. 2. Station biologique de la Tour du Valat, Arles.
- RHAZI, L., P. GRILLAS, A. CHARPENTIER, M. RHAZI, N. LECLAINCHE, D. TITOLET, L. DESNOUBES, E. DUBORPER, N. YAVERCOVSKI & D. ELKHYARI -2007a- Effet de l'hydrologie sur les populations d'une espèce rare des mares temporaires méditerranéennes: *Elatine brochonii* (Elatinaceae). In: Paracuellos M. (Ed.) *Ambientes Mediterraneos. Funcionamiento, biodiversidad y conservación de los ambientes mediterráneos*. Colección Medio Ambiente 2: 185-193. Almería.
- RHAZI, L., P. GRILLAS & M. RHAZI -2007b- *Elatine brochonii*. In: IUCN -2011- IUCN Red List of Threatened Species. Version 2011.1. <www.iucnredlist.org>. Downloaded on 18 June 2011.
- ROSSELLÓ-GRAELL, A., D. DRAPER & C. TAULEIGNE GOMES -2000- Conservation status of mediterranean temporary ponds in Campo Militar de Santa Margarida (Ribatejo, Portugal), *Portugaliae Acta Biol.* 19: 191-199.
- ROSSELLÓ-GRAELL, A. -2003- Caracterização fito-ecológica das lagoas temporárias do Campo Militar de Santa Margarida (Ribatejo, Portugal), *Portugaliae Acta Biol.* 21: 245-278.
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