

# On *Pancratium maritimum* (sea daffodil, sea lily, sand lily)

## Abstract

The perennial geophyte sea daffodil, sea lily or sand lily (*Pancratium maritimum* L.) is a flowering species during the dry summer, widely distributed along Mediterranean seashores and grown in a wild stage. Populations of sea daffodil are exposed to sea breeze, salt spray, water shortage, strong solar radiation, elevated temperatures, substrate instability and moving sand. Also, it is expected that excessive tourism and human-induced activities will constrain the development of populations of *P. maritimum*, which have resulted from a long-term evolutionary process. *P. maritimum* exhibits large white flowers of a great aesthetic value during dry and hot summer weather conditions, when simultaneously flowering plant taxa are scarce. The buds remain protected below the soil surface on the underground perennial organ and the growth period alternates with a period of dormancy. The above-ground organs and tissues are exposed to harsh, ambient conditions and the large inflorescences of remarkable beauty and fragrance carry particular ornamental worth and thus economic value.

**Keywords:** growth, life history, phenology, sea daffodils, seasonality

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## Introduction

*Pancratium maritimum* L. (Amaryllidaceae) is a lily-like plant with daffodil-like leaves. *P. maritimum* is a bulbous perennial geophyte that is widely distributed, along the coastline of the Mediterranean region, from the Black Sea to part of the Atlantic coast.<sup>1-4</sup> Coastal habitats are particularly vulnerable, because they change in response to both biotic and abiotic factors and their biodiversity is affected by the effects of sea-level rise and human-induced impacts.<sup>5</sup> Therefore, populations of *P. maritimum* decrease due to urbanization, tourism development, tourist trampling, alteration, destruction of dune systems and over-collection;<sup>6</sup> in fact, excess of flowers sampling is seriously threatening the diversity of this species, resulting in a significant decrease of populations of *P. maritimum*. Actually, the flowering season of *P. maritimum*, and therefore the pleasure in seeing its beautiful flowers, begins in June and ends in September, coinciding with the period of excessive tourism in the Mediterranean, and at a time when simultaneously flowering plant taxa are scarce. Also, *P. maritimum* is receiving much attention from the international scientific community due to its value as a commercial ornamental plant.<sup>7-9</sup>

## History

*P. maritimum* has been known for at least 2,500 years in Greece and cultural aspects indicate that the plant ornamentation has played an important role in the early civilization.<sup>10</sup> The beautiful flowers of the sea daffodil are represented on frescos in Crete and Santorini; they are depicted on archaeological murals, known from excavations in Greece, which display detailed naturalistic portraying animals and plants. For example, the beautiful lily frescos in the palace of Knossos (Crete) and the frescos displaying lily-like flowers at Akrotiri on Santorini island can be identified as sea daffodils.<sup>10-13</sup> Notably, the etymology of the generic name *Pancratium* is derived from two Greek words, i.e. pan (παν) that means all and cratos (κράτος) that means potent.<sup>14</sup> Also, the sea daffodil is mentioned in Theophrastus' books written in the 3<sup>rd</sup> century BC<sup>15</sup> and Dioscorides' Codex written in

the 1<sup>st</sup> century AD.<sup>16</sup> It is worth mentioning that a watercolour of *P. maritimum* by the famous artist Ferdinand Bauer (folio 74, produced between 1787 and 1794) was based on specimens collected in Greece in the 18<sup>th</sup> century, i.e. during the first botanical expedition of Professor John Sibthorp to Greece,<sup>17</sup> and preserved in the Department of Plant Sciences at Oxford University (UK). A hand-coloured engraving of the above mentioned watercolour of *P. maritimum* (Figure 1 left) is included in 4<sup>th</sup> volume (published in 1823) of the magnificent *Flora Graeca* Sibthorpiana (Tabula 309, Hexandria: 6♂, Monogynia: 1♀), which is currently digitized and electronically accessed; therein, the quoted plant name is *P. maritimum* and the family (*Amaryllidaceae*), in accordance to the currently accepted international nomenclature (i.e. in the International Plant Name Index and the Plant List). Although, *Pancratium* appears as a well-structured group with interesting patterns of speciation, it is worth mentioning that there has been considerable taxonomic confusion in the literature among *Pancratium maritimum* L., *P. linosae* Soldano & F.Conti, *P. arabicum* Sickenb., *P. angustifolium* Lojac. and *P. angustifolium* M.Roem.<sup>18,19</sup> Nowadays, it is known that *P. linosae* and *P. angustifolium* are synonyms of *P. Maritimum*.<sup>20</sup> Notably, *P. arabicum* falls within the *P. maritimum* complex and provides new insights to formulate new working hypotheses for evolutionary biology of the genus.<sup>21</sup> Also, *Pancratium* is included in a clade with other Eurasian genera of Amaryllidaceae and their phylogenetic relationships reflect the complex geological history of the Mediterranean and neighbouring regions in Asia and Africa.<sup>18,22,23</sup> Life history characteristics of *P. maritimum* are related to adaptations of this perennial geophyte in response to Mediterranean climatic conditions, because the synanthous *P. maritimum* blossoms during the drought period (i.e. its flowers occur concomitantly with developed foliage). The leaves of *P. maritimum* are amphistomatic, a trait that is known to improve photosynthetic rates and contrast sandblasting. Leaf gas exchange and storage in *P. maritimum* are also regulated by aerenchyma tissue within leaf inter-vein spaces that acts by maintaining air circulation and relative humidity in leaf tissues and preventing leaf overheating.<sup>24</sup> Also, leaf adaptation to dry

coastal environments resulted in vascular elements ensuring efficient water supply to the photosynthetic tissues.<sup>24</sup> As the flowers open at dusk,<sup>25,26</sup> release a strong scent during the night.<sup>27–30</sup> Although, several aspects concerning pollination, pollen morphology, seed dispersal and germination, phytochemistry and genetics of *P. maritimum* have been investigated,<sup>31,32</sup> there is a scarcity of data on the ecophysiological traits of *P. maritimum* inhabiting maritime sands; therefore, much is still to be discovered. In other words, despite increasing interest in conservation and restoration of *P. maritimum* stands (Figure 1 right), a

comparative study on functional traits of the above- and below-ground tissues is still lacking. The associated plant-environment relationships are important to ensure plant survival, especially in stressful habitats, despite the evidence of a direct correlation with climate factors, such as elevated temperatures and low precipitation during the blossoming of *P. maritimum*. Further research is required to illustrate traits contributing to the functional adaptation and response mechanisms of *P. maritimum* to the fluctuations of the Mediterranean climate.



**Figure 1** *Pancratium maritimum*: (left) drawing by Ferdinand Bauer illustrated in *Flora Graeca Sibthorpiana* (with permission of the National Library of Greece) and grown in a wild state on the shores of Euboea Island in Greece (right).

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## Conflict of Interest

Authors declare that there is no conflict of interest.

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