Claw Wing: Unnoticed Character in Floral Morphology of The Genus *Dianthus (Caryophyllaceae)* with Taxonomic Implication and a New Section

Pençe Kanadı; *Dianthus (Caryophyllaceae)* Cinsi için Fark Edilmemiş Bir Karakter, Taksonomik Önemi ve Yeni Bir Seksiyon

Research Article

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ABSTRACT

The specimens of *Dianthus pinifolius* Sm. were collected during a field trip to the Bulgarian border of NW Turkey. It was recognized that the petals have a pair of wing on claw and it has a billamellate shape. Hairs, colour zonation of the limb, and ridges on the claws have been long known as typical petal characters of *Dianthus*. In this study claw wing is recognized in this species of the genus for the first time and reported to the scientific community. Generic circumscription of *Dianthus* L. is enlarged by recognition of the claw wing by comparing with the other genera of the *Caryophyllaceae*. Furthermore, in consideration of the diagnostic characters for delimiting the infrageneric taxa, the presence of claw wing is justified as a diagnostic character for describing a new section of *Dianthus*, hence Sect. *Pinifoli* Dönmez **sect. nov.** proposed as a new section for the genus. Diagnostic characters of the section, description, detailed illustration and a composed picture of the type species are also supplied.

Key Words
Character, *Dianthus*, morphology, petal, section, taxonomy

ÖZET

Dianthus pinifolius Sm. KB Türkiye'de Bulgaristan sınırında yapılan arazi çalışmasında toplanmıştır. Örnek incelenirken petal pençesinde iki tabaka görünümlü bir çift pençenin varlığı görüldü. Tüy, petal dudağında renk halkası ve pence üzerindeki çıkıntılar *Dianthus* L. cinsi için karakteristik özellikler olarak bilinmektedir. *Dianthus* cinsi için pençede kanat olduğu ilk defa bu çalışma ile bilim dünyasına duyurulmaktadır. *Caryophyllaceae* familyası içinde yer alan diğer cinsler de bu özelliği bakımından incelenip karşılaştırma yapılarak, *Dianthus*'un cins tanımı petal pençesi de katılarak genişletildi. Ayrıca, bu cinsin seksiyonlarını tanımlayan ayırıcı karakterler dikkate alındığında, pençesi kanatlı türlerin *Dianthus* cinsi içinde ayrı bir seksiyon altında toplanmasının uygun olacağı düşüncesiyle Sect. *Pinifoli* Dönmez **sect. nov.** önerildi. Bu yeni seksiyonun ayırıcı karakterleri, tip türün ayrıntılı betim ve çizimi ile düzenleme fotoğrafı verildi.

Anahtar Kelimeler
Karakter, *Dianthus*, morfoloji, petal, seksiyon, taksonomi

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INTRODUCTION

Dianthus L. has around 300 species worldwide and mostly distributed in northern hemisphere [1]. The genus has many cultivars in horticulture because of showy flowers. Generic circumscription of this well-known Linnean genus is not prominently altered by various authors ([2], [3], [4], [5], [6], [7]; [8]) and the recent descriptions ([9], [10], [11], [12]) also basically follow the previous ones.

The genus is divided into five groups under the names *Verruculosi*, *Leiopetali*, *Fimbriati*, *Dentati*, and *Carthusiani* by Boissier [2] and the classification is followed by Reeve [13], and Rechinger [7] for the floristic account of the genus. Apart from the treatment of Boissier, the genus is divided into three subgenera, namely *Carthusianastrum, Caryophyllastrum* and *Proliferastrum* by Williams [3]. These subgenera are also divided into sections, subsections, and further neuter groups in the same monograph. Recent floristic accounts of the genus *Dianthus* also follow similar infrageneric classifications ([4]; [5]; [9]; [12]; [7]; [9]; [11]; [12]) and none of the descriptions given in floras mentioned above have description for the claw with wing.

In the most comprehensive work on the world plant genera the generic circumscription of the genus *Dianthus* has not been altered by Bittrich [1]. Furthermore, none of the recently published floristic accounts and other phylogenetic works [14] have described the claw with wing for the genus.

After dissecting the flowers of the specimen collected from the Thracian region of Turkey, I have recognised a new character for the genus hitherto unknown (Figure 2F) and identified the specimen as *D. pinifolius* Sm. Due to this unusual morphological character, all available materials have been examined for observing structure of the claw in the various herbaria. Furthermore, the area revisited for collecting more materials and observing the population. The specimens collected from the region are easily recognizable by very long leaf sheath, capitate inflorescence and sessile flowers which are characteristics to Group E; *Carthusiani* given in the *Dianthus* account in the Flora of Turkey by Reeve [13].

D. pinifolius is a unique species by having wing on the claw recognised in this study and a distinct species by caespitose habit, long leaf sheets, capitate inflorescence, and dentate petal limb with pink colour. Thus, claw wing is regarded as a new character to be added to the description of the species.

MATERIALS AND METHODS

The presence of petal claw (Figure 1) has been noticed during the identification work of the *Dianthus* specimens collected from the Thracian region of Turkey and it has been identified as *D. pinifolius* (Figure 2). This is a very unusual structure for the genus and this structure has been examined on more than 10 flowers of the same herbarium materials. The area was visited two years later for observing the population and collecting more material. These materials have been also examined for observing the wings. Recently collected and various historical materials have been examined carefully according to the standard herbarium rules at the Geneva Herbarium for observing the wing. Nearly thirty specimens have been examined without damaging the flowers and some of them are mentioned below. The wings can be seen clearly under a stereomicroscope, even without using dissection instruments on well-pressed specimens (eg. *W.Greuter* 11536). On the other hand, most of the species placed in the Sect. *Carthusianastrum* F.Williams have been examined to understand whether they have wings of the petal claw. It was noticed that they have no wings and these specimens are also listed in below. Following the morphological works, a new section, namely *Pinifoli* Dönmez, is described and *D. pinifolius* Sm. is treated as a type species of the new section here.

RESULTS

Dianthus L., Sp. Pl.: 409 (1753).

Annual or perennial herbs, rarely subshrubs; stem mostly thickened at the nodes; leaves grass-like; flowers hermaphrodite or rarely unisexual, solitary or in capitate terminal cymes often subtended by bracts; epicalyx scales two to many;

Figure 1. *Dianthus pinifolius* Sm; A; inflorescence, B; flower.

anthophore often present; calyx tubular with many parallel veins, without membranous commissures, 5-toothed; petals white, pink or red, rarely yellow, limb entire, toothed or fimbriate, without coronal scales; claw long, with two longitudinal ridges or a pair of wing; stamens 10; styles 2, ovary 1-celled on a short gynophore; capsule opening by 4 teeth; seeds numerous, black, peltate, with facial hilum; embryo strait. (2n = 30, 60, 90). About 300 spp., Europe, Asia, especially Mediterranean, Africa. (based on Bittrich [1]).

Dianthus L. Section ***Pinifoli*** Dönmez, **sect. nova** (Figure 2).

Plantae suffutescentes. Flores dense capitati. Capitula foliis squamis membranaceo-coriaceis involucrate. Petala unguis bilamellata.

Type species: *Dianthus pinifolius* Sm. in Sibth. & Sm., Fl. Graec. Prodr. 1: 284.

Dianthus pinifolius Sm. in Sibth. & Sm., Fl. Graec. Prodr. 1: 284.

Densely caespitose perennial, glabrous, finely puberulous below, stem up to 45 cm with sterile rosette, branches arising from base. Rosette leaves linear, falcate, 1-nerved, scabrous at margin, stem leaves 17-28 × 0.7-1 mm, linear, acute, slightly falcate at below, 3-5 nerved, triangular, scabrous at margin; sheaths (2-) 3-8 × times as long as diameter of just below the node. Inflorescence capitate, each branch has single head with (3-) 8-14 flowers; heads have a pair of bract at base, 10-14 × 2-3 mm, longer than bracteoles; each flower has 3-4 pair of bracteoles (epicalyx scales), obovate to abruptly constricted into an aristae, shorter than calyx. Calyx 7-20 × 2-4 mm, teeth 1/6 × tubes, somewhat ventricose. Petal limb (2-) 5-8 (-10) mm, irregularly 3-4 shallowly lobed, ebarbulate, purple to dark purple, claw 6-8 mm with a pair of wing alongside of claw. Stamens 10; filaments 10-12 mm length; anthers oblong, 1.5-2 × 0.2-0.4 mm. Capsule oblong, 6-7 × 2-2.5 mm with 2 styles, opening by longitudinally. Seeds ovate 1.5-2 × 0.8-1.2 mm, verrucose.

Deciduous forest opening, steppe among the fields, Fl. 7.

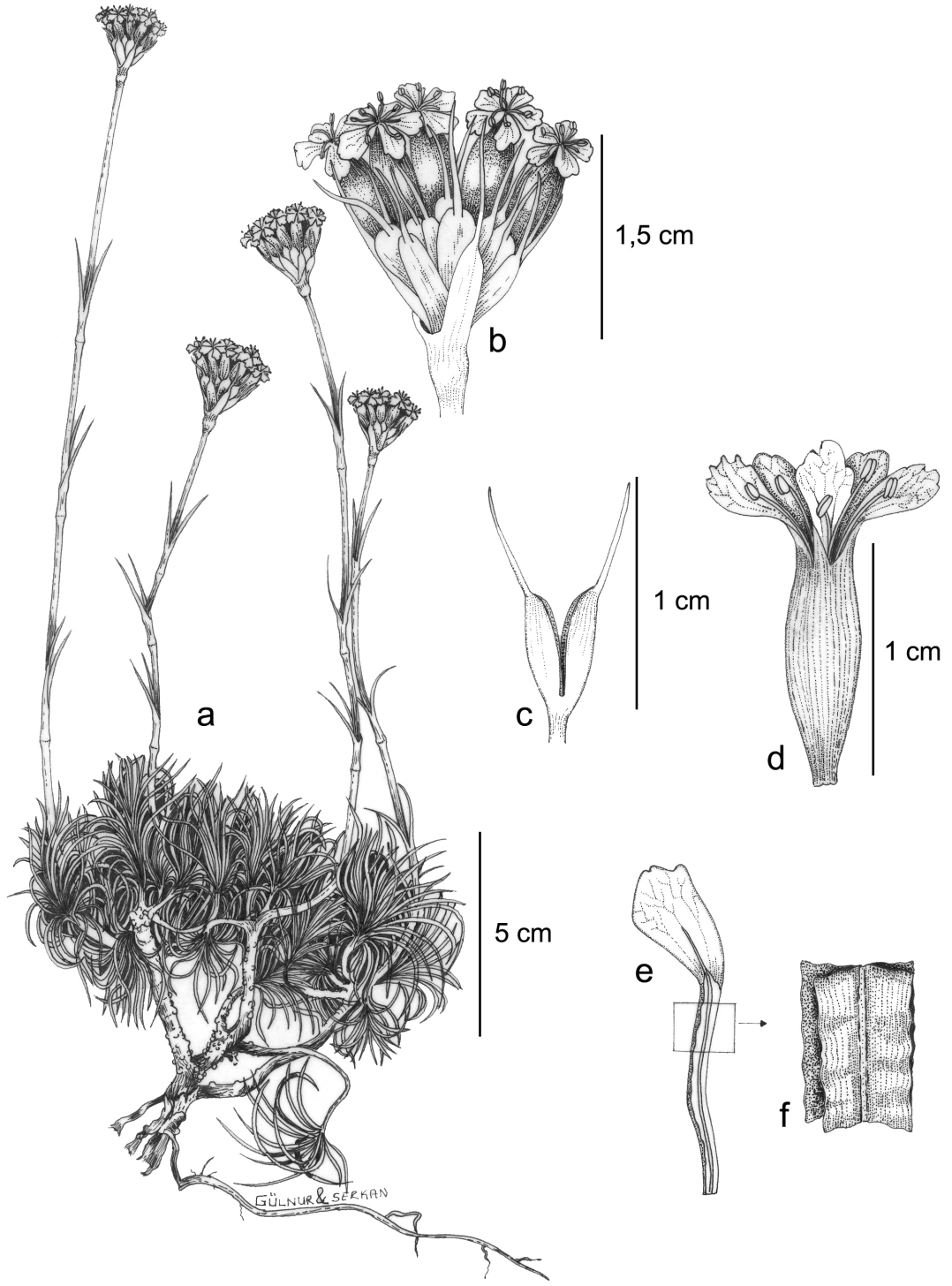

Figure 2. Illustration of *Dianthus pinifolius* Sm; A; habit, B; inflorescence, C; bracteols, D; flower, E; petal, F; three dimensional view of claw and wing.

Turkey-Kırklareli: Kofçaz, around Kocatarla, *Quercus* opening, steppe, 300 m, 6. vii. 2003, *A.A.Dönmez* 11585; Kırklareli: Kofçaz, around Kocatarla, *Quercus* opening, steppe, 41° 56′ 752″ N, 027° 03′ 309″ E, 325 m, 29. vii. 2006, *A.A.Dönmez* 13967-*A.Ocak*; Kırklareli: Kofçaz, 5 km from Elmacık village to Kırklareli, 41° 49′ 615″ N, 027° 11′ 217″ E, 420 m, *Quercus* opening, rocky places, 29. vii. 2006, *A.A.Dönmez* 13973-*A. Ocak*; Kırklareli, 15. km, from Dereköy to Kırklareli, Demirkapı hill, 41° 50′ 237″ N, 027° 18′ 498″ E, 451 m, plantation area, 29. vii. 2006, *A.A.Dönmez* 13979-*A.Ocak*. İstanbul, Kayışdağı, 5. vii. 1950, *Asuman Berk* 62! (ISTE, HUB).

Other Examined specimens of Dianthus pinifolius Sm. (Sect. *Pinifoli* Dönmez)

Bulgaria: Pirin, Dobrotino, 6. vii.1973, *D.Peev sn*. (G!); Serbia: Nisch, Julii 1883, *S.Petrovic sn.* (G!); **Macedonia**: Florina, Kalo Nero mt., Plati, 1000 m, (Petala imberbia, immaculate, *W.Greuter* 11536. (identified as *D. pinifolius* Sm. subsp. *serbicus* Wettst. (G!); **Greece**: Et./Akarn./Evrit. Trichonidos, pass between Chalikion and Prousos, 1350-1400 m, 38 43'N 21 39E, 30.vii.1992, *A.Strid 33783*- (*D. pinifolius* Sm. subsp. *serbicus* Wettst.) (G!); **Greece**: Parnafsi, supra Parhova 3000 feet, 2 jul. 1857, *Guicciardi* s.n. (identified as *D. pinifolius* Sm. subsp. *lilacinus* (Boiss.&Heldr.) Wettst) (G!).

Specimens of the Section *Carthusianum* F.Williams for examining the petal claw.
D. calocephalus Boiss. (Turkey: Antalya, A.A. Dönmez 13678-HUB)
D. lydius Boiss. (Turkey: Yozgat, *A.A.Dönmez* 3801-HUB)
D. cibrarius Clem. (Turkey: Kırıkkale, A.A. Dönmez 2667-HUB)
D. capitatus Balb. ex DC. (Turkey: Bartın, A.A. Dönmez 9073-HUB)
D. giganteus d'urv (Turkey: Bursa, A.A. Dönmez 11657-HUB)
D. pelviformis Heuffel (Eastern Rhodopes, 12. vii. 1984, 209 m, *D.Delipavlov*, Sheets No. 42734! and 41433!-SOA).

Ecology and threat category: Population of the species is confined to the Balkan Peninsula, including the Anatolian part of İstanbul. The habit of the species is mat forming and it has rather strict, nearly spiny basal rosette leaves. Therefore, animals do not graze leaves and it is possible to collect specimens even from over-grazed habitats in the region. However, due to agricultural activities, the specimens are restricted to only slopes, which are unsuitable for agriculture. It has been inferred that the distribution area of the species is decreased by the time. Because the species is unique with wing of the petal claw, it should be monitored and kept in the botanical gardens for ornamentation and gene banks, at least by seeds. Based on the IUCN criteria [15], the Balkan endemic species is provisionally assigned to the Vulnerable (VU).
Distribution: East of the Balkan province Anatolian side of İstanbul.

DISCUSSION

Epipetalous scales and wings of the claw are not present on the genus *Dianthus* according to the surveyed literature. Moreover, all the generic descriptions, including the recently published and the most comprehensive revision by Bittrich [1], mention the absence of the epipetalous scale or wing in the genus. On the other hand, Bittrich mentioned that *Bolanthus* (Ser.) Reichb. has wings on the claw, but not *Dianthus*. However, the present study has revealed that *Dianthus* has wings on petal claws and circumscription of the genus should be enlarged.

Dianthus is one of the morphologically well-studied genus and most nomenclatural problems have been solved [16]; [17]. Furthermore, phylogeny of the family Caryophyllaceae has also been studied [14]. However, this study shows that further morphological studies should be done on both herbarium and freshly collected materials.

Dianthus has been treated under five artificial groups in the Flora of Turkey [13]. The classification follows Boissier's system [2]. The infrageneric classification is adapted to sectional classification by Rechinger [7] for Flora Iranica and the following sections have been published: Sect. *Armerium* F. Williams; Sect. *Verruculosi* Boiss.; Sect. *Leiopetali* Boiss.; Sect. *Dentati* Boiss.; Sect. *Fimbriati* Boiss. and Sect. *Carthusiani* Boiss.

This intrageneric classification helps botanist for understanding of the intrageneric groups of the genus. Beside this, phylogeny and nature of all of the groups require further studies, based on morphologic and molecular data. In consideration of the diagnostic characters of these sections, all of them have some shared characters. The section *Pinifoli* has also share some characters with a unique character, wing of the petal claw. Therefore, proposing it as a new section is a useful taxonomic work and it highlights the mentioned characters in the circumscription of *Dianthus*.

Epipetalous scales and claw structure are important characters for distinguishing the genera from each other in the family Caryophyllaceae. In the recent revisions of the family ([13]; [7]; [10]; [1]) these characters have been treated only for *Bolanthus*-wing of the claw; *Cucubalus*-coronal scales; *Acanthophyllum*-billamellate claw). Hence, this study shows that the presence of claw wing would be a generic character for *Dianthus*.

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