



Original Scientific Report

Lectotypification of the name *Chamaemelum heterolepis*, the basionym of *Tripleurospermum heterolepis* and taxonomic notes on *T. tempsky anum* (Asteraceae)

Huseyin INCEER

Karadeniz Technical University, Faculty of Sciences, Department of Biology, 61080 Trabzon, Turkey
Correspondence: inceer@ktu.edu.tr

ABSTRACT:

Tripleurospermum heterolepis (≡ *Chamaemelum heterolepis*), whose specimens are referred to as syntypes, is a narrow Turkish endemic species assessed as Critically Endangered according to the IUCN categories. *Tripleurospermum tempsky anum* (≡ *Chamaemelum tempsky anum*) is known as endemic to Greece, but is also distributed in Turkey. In this study, the name *C. heterolepis* is lectotypified on a specimen deposited at LD. Additionally, a description of *T. tempsky anum* in the Turkish flora is presented, and its conservation status is indicated. The diagnostic morphological characters which distinguish *T. tempsky anum* from its close relatives are discussed.

Keywords:

Compositae, conservation, nomenclature, typification

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The genus *Tripleurospermum* Sch.Bip. (Bercht. & J. Presl, Anthemideae Cass.) comprises 30-40 species which naturally occur in Europe, temperate Asia, North America and North Africa (OBERPRIELER *et al.* 2007; HIMMELREICH *et al.* 2008; INCEER *et al.* 2018). The genus is critical from both nomenclatural and the taxonomic points of view (see e.g. BREMER & HUMPHRIES 1993; INCEER *et al.* 2018; INCEER & OZCAN 2021), and various taxa have often been assigned to other genera such as *Anthemis* L., *Chamaemelum* Mill., *Chrysanthemum* L., *Matricaria* L., *Pyrethrum* Zinn. and *Tanacetum* L. (POBEDIMOVA 1995; APPLEQUIST 2002; INCEER & HAYIRLIOGLU-AYAZ 2010). Therefore, *Tripleurospermum* has been confused both taxonomically and nomenclaturally with other Anthemideae genera (RAUSCHERT 1974; KAY 1976; JEFFREY 1979).

In the treatment of *Tripleurospermum* for *Flora of Turkey and the East Aegean Islands*, ENAYET HOSSAIN (1975) recognized 26 taxa. Subsequently, two new records and four new taxa (three species and one variety) of *Tripleurospermum* were added to the flora of Turkey (INCEER 2012; INCEER & HAYIRLIOGLU-AYAZ 2014; OZBEK & ONAYLI

2020). At present, the genus includes ca. 32 taxa in Turkey, 16 of which are endemic.

As part of the ongoing taxonomic revision of the genus *Tripleurospermum* in Turkey, we present a note aiming to lectotypify the name *Chamaemelum heterolepis* Freyn & Sintenis based on materials retrieved from several European herbaria, and to provide a description and the conservation status of *T. tempsky anum* (Freyn & Sint.) Hayek in Turkey.

The original material and other specimens were studied at the herbaria ANK, B, E, EGE, G, GAZI, HUB, JE, LD, W, WU and Z (the acronym follows THIERS 2021, continuously updated). Nomenclature rules and plant names followed the *International Code of Nomenclature for algae, fungi, and plants* (TURLAND *et al.* 2018, hereafter ICN).

A lectotype for the name *Tripleurospermum heterolepis* (Freyn & Sint.) Bornm. was designated here, as well as the description of this species and *Tripleurospermum tempsky anum* based on the original materials, live plants and exsiccata collected in field studies (specimens are

deposited at the herbaria E and KTUB). Data on habitat, population size, distribution, phenological and ecological features and threat factors were also recorded in the field. The IUCN assessment follows the criteria from the recent version of the IUCN Red List Categories version 13 (IUCN 2017). The area of occupancy (AOO) was calculated using GeoCAT software (Geospatial Conservation Assessment Tool; BACHMAN *et al.* 2011). A distribution map was drawn by ArcGIS version 10.3.

Tripleurospermum heterolepis (Freyn & Sint.) Bornm. Feddes Repert. 89: 335 (1944).

Basionym: *Chamaemelum heterolepis* Freyn & Sintenis in Freyn (1895: 349).

Lectotype (designated here): Turkey. A7 Gümüşhane, Teke, in campis, 4 July 1894, Sintenis 6088b (LD-1227808 [digital image]!), Fig. 1; Isolectotypes: B-100093725!, G00390393!, JE-00017340 [digital image]!, available at: <https://herbarium.univie.ac.at/database/detail.php?ID=272323>, Z-000003008 [digital image]!, available at: <https://www.herbarien.uzh.ch/en/belegsuche.html>.

– *Tripleurospermum heterolepis* Freyn, nom. inval. (Art. 36.1b of the ICN).

Description. Biennial herb, 20–30 cm long. Stems mainly from the base, corymbosely branched above. Leaves two-three pinnatisect, laciniae lanceolate-filiform, thickly mucronate with white ends. Capitula heterogamous, numerous, radiate, ±densely corymbose, peduncles pubescent, especially dense below the head; involucre 0.6–1.0 cm broad, ovoid or hemispherical; outer bracts ±pubescent, triangular, acute to obtuse, margins whitish and membranous; inner bracts glabrous, oblong, obtuse to subobtuse, margins whitish and membranous. Receptacle ovoid or hemispherical ±solid, epaleate. Ray flowers female, limbs white, broadly elliptic, shallowly 3-lobed at apex. Disc flowers numerous, hermaphrodite, yellow with five deltoid lobes 0.2–0.4 mm, corolla lobes glandular at tips. Achenes obpyramidal, ±incurved, 1.2–1.5 × 0.3–0.5 mm, blackish or dark brown at maturity, non-mucilaginous, dorsal side tuberculate-rugulose, ventral side three-ribbed, ribs very thin, acute, white, fissures tuberculate-rugulose; corona very small, marginiform, white, crenulate, ca. 1/10–1/8 the same length as achene. Flowering and fruiting from June to July.

Total distribution, habitat and life form. *Tripleurospermum heterolepis* is known only from the type locality in NE Anatolia (Fig. 2). This species grows in meadows and along roadsides, and its life form is hemicryptophyte.

Conservation status. Critically Endangered (CR): B1ab (i,ii,iii)+2ab (i,ii,iii) because of its local distribution and small population size in the Turkish flora (INCEER 2015).

Chromosome number. $2n = 4x = 36$ (INCEER & HAYIRLIOGLU-AYAZ 2010).

Typification of the name *Chamaemelum heterolepis* – The name *Chamaemelum heterolepis* was originally described by FREYN (1895) who cited two collections (Sin-



Fig. 1. Lectotype of *Tripleurospermum heterolepis* (Freyn & Sint.) Bornm. (LD-1227808). © Botanical Museum, Lund University, reproduced with permission

tenis 6088b and 6088) both located in the Gümüşhane Province. No holotype was indicated, thus according to Art. 9.6 of the ICN, these collections are to be considered as syntypes, and according to Arts. 9.3 and 9.11 a lectotypification is necessary (TURLAND *et al.* 2018). Specimens of both collections were traced in the herbaria B, G, JE, LD, W, WU, and Z. Sintenis' collection no. 6088b consists of five herbarium sheets (B-100093725!, G00390393!, JE-00017340 [digital image]!, LD-1227808 [digital image]!, Z-000003008 [digital image]!), while Sintenis' collection no. 6088 comprises three herbarium sheets (LD-1227748 [digital image]!, W-1896-0000804 [digital image]!, WU-0001788 [digital image]!). According to Arts. 9.6, 9.11, and 9.12 of the ICN, a lectotype is to be selected from the above mentioned syntypes.

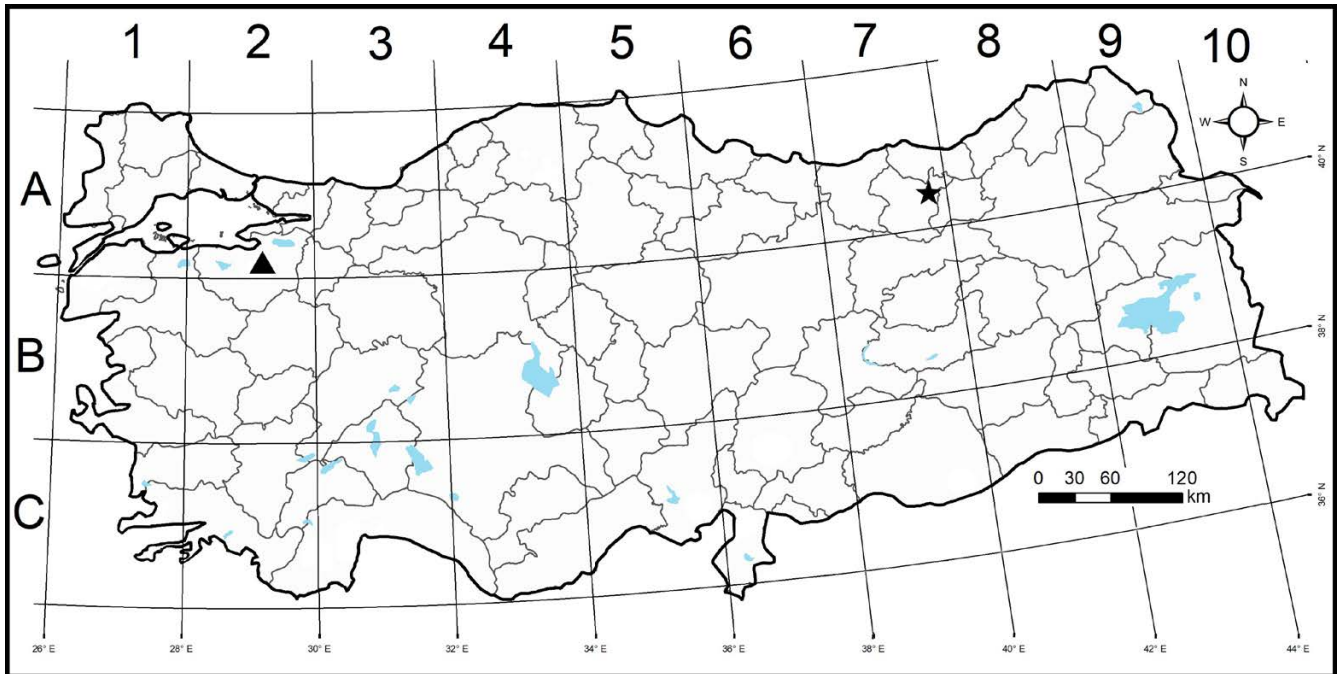


Fig. 2. Distribution of *Tripleurospermum heterolepis* (★) and *T. tempskyanum* (▲) in Turkey.

The sheets mentioned above bear a collection label with the identification annotation “*Chamaemelum heterolepis*” with “n. sp.” in Freyn’s handwriting. In addition, the voucher label has the quotation “determ. J. Freyn” and the authorship appears to be attributed to Freyn and Sintenis. The exsiccata match the morphological description provided by FREYN (1895) and correspond to the current concept of the species (BORNMULLER 1944).

Specimens no. 6088b match the protologue perfectly. LD specimen (LD-1227808) from Sintenis’s personal herbarium appears to be the best preserved and best represents the species description. Therefore, it is the best candidate for typification, and is designated here as the lectotype according to Arts. 9.3 and 9.4 of the ICN (TURLAND *et al.* 2018).

Other original material examined (syntypes): A7 Gümüşhane, prope Ketschi-Kalessi, 5 July 1894, Sintenis 6088 (LD-1227748 [digital image]!, W-1896-0000804 [digital image]! and WU-0071788 [digital image]!).

Additional specimens examined: Turkey. A7 Gümüşhane, Tekke, Keçikaya Village, 1618 m, 4 July 2007, Inceer 382b (KTUB); A7 Gümüşhane, Tekke, Keçikaya Village, 1579 m, 13 June 2009, Inceer 734 (KTUB).

Tripleurospermum tempskyanum (Freyn & Sint.) Hayek. Repert. Spec. Nov. Regni Veg. Beith. 30(2): 655 (1931).

Basionym: *Chamaemelum tempskyanum* Freyn & Sintenis. Bull. Herb. Boissier 5: 781 (1897). *Matricaria tempskyana* (Freyn & Sint.) Rauschert. Folia Geobot. Phytotax. 9: 258 (1974).

Lectotype (designated by STRID & TAN 1991: 452): Greece. Said-Pascha in Pindo tymphaeo, 1896, Sint-



Fig. 3. General habit of *Tripleurospermum tempskyanum*.

nis 744 (LD-1011717 [digital image]! available at: <http://plants.jstor.org/stable/10.5555/al.ap.specimen.ld1011717>).

Description. Perennial herb, 30–50 cm long with short rhizome. Stems solitary to numerous, glabrous or subglabrous, usually erect or ascending, corymbosely branched above. Leaves two-three pinnatisect, laciniae lanceolate-filiform, aristate at tips. Capitula four–seven to numerous, discoid; involucre 0.8–1.2 cm broad, peduncles unequal; outer bracts lanceolate or narrowly triangular-ovate, glabrous or sparsely pubescent; inner bracts oblanceolate or oblong-obtuse, margins brown and membranous. Receptacle hemispherical, epaleate. Corolla lobes of disc flowers glandular at tips. Achenes oblong-obpyramidal, slightly compressed, $1.7\text{--}2 \times 0.4\text{--}0.6$ mm, brown at maturity, non-mucilaginous; dorsal side rugulose; ventral side three-ribbed, ribs thin, white, fissures rugulose; resin glands two, laterally connate; corona small, marginiform, \pm lobulate. Flowering and fruiting from June to July.

Tripleurospermum tempskyanum (Fig. 3) closely resembles *T. disciforme* (C.A. Meyer) Sch.Bip., which is absent from the north parts of Turkey and is distributed in other regions of the country. Thus, the two species are allopatric. *Tripleurospermum tempskyanum* can be easily distinguished from *T. disciforme* by its non-mucilaginous achenes with marginiform corona. *Tripleurospermum tempskyanum* also resembles *T. decipiens* (Fisch. & Mey.) Bornm., from which it is easily distinguished by its perennial habit and hemispherical receptacle. The characteristics mentioned above can be used to separate the species, as shown in the following key:

- 1a:** Achenes non-mucilaginous, corona present **2**
1b: Achenes slightly mucilaginous, corona absent
 *T. disciforme*
2a: Plants perennial; receptacle hemispherical
 *T. tempskyanum*
2b: Plants biennial; receptacle ovoid *T. decipiens*

Specimens examined. Turkey. *Tripleurospermum tempskyanum*: A2 Bursa: Uludağ, near Uludağ Hotels, 1690 m, 27 June 2007, Inceer 354 (KTUB); Uludağ, near hotels, meadows, open slopes, 1900 m, 27 June 2007, Inceer 361 (E, KTUB); Uludağ, near hotels, 1815 m, 25 June 2009, Inceer 751 (KTUB). *Tripleurospermum disciforme*: B2 Kütahya: Tavşanlı, 1022 m, 10 June 2008, Inceer 550 (KTUB); B2 Izmir: Boz Dağ, 1021 m, 6 July 2008, Inceer 592 (KTUB); B2 Manisa: Between Salihli and Boz Dağ, 1046 m, 11 July 2009, Inceer 764 (KTUB). *Tripleurospermum decipiens*: B3 Afyon: Emirdağ, 968 m, 10 June 2008, Inceer 549 (KTUB); B3 Eskişehir: Bozöyük, 880 m, 26 June 2009, Inceer 753 (KTUB); B9 Ağrı: Suluçem, Balık Gölü, 2269 m, 21 June 2008, Inceer 584 (KTUB); C5 Niğde: Ulukışla, Bolkar Dağları, 1650 m, 14 June 2007, Inceer 395 (KTUB).

Total distribution, habitat and life form. *Tripleurospermum tempskyanum* is only known from the Uludağ National Park in Bursa, NW Anatolia (Fig. 2). The results

from the floristic studies show that *T. tempskyanum* has a small geographical distribution in Turkey. It grows in meadows, damp places, and on the woodland margins of *Abies nordmanniana* (Steven) Spach subsp. *equi-trojani* (Asch. & Sint. ex Boiss.) Coode & Cullen on granitic substrates and along roadsides at an altitude of 1690–1900 m a.s.l. The life form of the species is hemicryptophyte.

Tripleurospermum tempskyanum has previously been known as endemic to Greece, where it grows in montane areas in the NW part of the country, mostly on serpentine substrates (STRID & TAN 1991).

Conservation status. The AOO (Area of Occupancy) of the Turkish population is 4 km², and we found just one location (subcriterion B2a). A continuing decline is observed in the AOO [subcriterion B2a(ii)], size and quality of habitat [subcriterion B2a(iii)] and the number of mature individuals [subcriterion B2a(v)]. Such a decline is expected to continue in the future. Therefore, *Tripleurospermum tempskyanum* is assessed here as Critically Endangered – CR B2ab(ii,iii,v) according to IUCN (2017).

The population of this species in Turkey seems to be rare and very local. The population of *Tripleurospermum tempskyanum* is located within the Uludağ National Park next to a tourist resort with many hotels. In that locality alone, the species' population is represented by several hundreds of individuals. The population of *T. tempskyanum* is threatened by trampling, grazing, habitat degradation and fragmentation, as well as disturbance from tourist activities in the National Park. Its population could be threatened with extinction in the near future unless conservation strategies are established and implemented as soon as possible. Reducing the antropogenic pressures, which mainly consist of tourist activities, on its natural habitat is essential for the adequate preservation of this species in Turkey. The *in situ* protection measures involve the limited access of tourists to the growing area and *ex situ* preservation through cultivation in botanical gardens and the elaboration of optimized *in vitro* techniques.

Chromosome number. $2n = 4x = 36$ (INCEER & HAYIRLIOGLU-AYAZ 2010).

Notes. The lectotype of the name *Chamaemelum tempskyanum* was designated by STRID & TAN (1991) on a specimen deposited in LD (barcode LD-1011717). The date of Sintenis' collection no.744 was cited as 9 July 1896 in the protologue, but was annotated as 24 June 1896 on the LD sheet with specimen no.744. As already noted by REICH *et al.* (2021), this is probably due to an error.

The name *Tripleurospermum tempskyanum* has been treated under *Matricaria* (as *Matricaria tempkyana*) by several authors (see e.g. RAUCHERT 1974; KAY 1976; STRID & TAN 1991). *Tripleurospermum tempskyanum* was noted as a new record (INCEER & HAYIRLIOGLU-AYAZ 2010), and was subsequently added to the flora of Turkey without any description (INCEER 2012). Data pertaining to the species' cytology (INCEER & HAYIRLIOGLU-AYAZ 2010), palynology (CETER *et al.* 2013), phytochemistry (COLAK

et al. 2017), molecular phylogeny (INCEER *et al.* 2018) and anatomy (INCEER & OZCAN 2021) were obtained from the Turkish plant population.

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REZIME

Lektotipifikacija imena *Chamaemelum heterolepis*, bazionima vrste *Tripleurospermum heterolepis* i taksonomske napomene o *T. tempskyanum* (Asteraceae)

Huseyin INCEER

Tripleurospermum heterolepis (\equiv *Chamaemelum heterolepis*), čiji se primerci označavaju kao sintipovi, uskoendemična je vrsta sa teritorije Turske, ocenjena kao kritično ugrožena na osnovu IUCN kategorizacije. *Tripleurospermum tempskyanum* (\equiv *Chamaemelum tempskyanum*) je poznata kao endemit Grčke, ali je takođe prisutna i u Turskoj. U ovoj studiji je ime *C. heterolepis* lektotipifikovano na osnovu primerka deponovanog u herbarijumu LD. Dodatno, dat je opis vrste *T. tempskyanum* u turskoj flori i ukazano je na njen konzervacioni status. Takođe su diskutovani dijagnostički morfološki karakteri kojima se vrsta *T. tempskyanum* razdvaja u odnosu na bliske srodnike.

Ključne reči: Compositae, konzervacija, nomenklatura, tipifikacija