www.biodicon.com Biological Diversity and Conservation

ISSN 1308-8084 Online; ISSN 1308-5301 Print 8/1 (2015) 43-61

Research article/Araştırma makalesi

A morphological investigation on non-apendix *Ophrys* L. (Orchidaceae) taxa in Antalya province

İsmail Gökhan DENİZ [*1] Hüseyin SÜMBÜL[2], Ekrem SEZİK [3]

[1] Akdeniz University, Faculty of Education, Department of Biology Education, Antalya, Turkey
[2] Akdeniz University, Faculty of Science, Department of Biology, Antalya, Turkey
[3] Yeditepe University, Faculty of Pharmacy, Department of Pharmacognosy, İstanbul, Turkey

Abstract

In this research, the morphological characteristics of non-appendix 7 *Ophrys* L. taxa which were collected or examined in situ from different localities in Antalya were examined. Typifications, synonym lists, descriptions, ecology, phytogeography and distribution maps are provided for all non-apendix groups of *Ophrys* taxa and relationships to similar taxa are discussed. The morphological descriptions are supported by detailed dissectional hand drawings. As a result of this study, new characteristics which had not been previously described in Turkish Flora were observed. These detailed morphological differences and a useful illustrated identification key with flower diagrams were prepared for all non-appendix *Ophrys* taxa distributed in the Antalya Province. In addition, we added new localities to the known distribution areas of taxa.

Key words: *Ophrys*, Orchidaceae, Antalya, morphology, taxonomy

---------- * ----------

Antalya ili'nde yayılış gösteren eksiz *Ophrys* L. (Orchidaceae) taksonları üzerine morfolojik bir araştırma

Özet

Bu araştırmada, Antalya İli'ndeki farklı lokalitelerden toplanan veya yerinde gözlemlenen eksiz 7 *Ophrys* L. taksonuna ait örneklerin morfolojik özellikleri çalışılmıştır. Tüm taksonlar için tipifikasyonları, sinonim listeleri, betimleri, habitat özellikleri, fitocoğrafik bölgeleri ve yayılış haritaları sunulmuş, morfolojik olarak yakınlık gösterdiği taksonlarla morfolojik özellikleri tartışılmıştır. Morfolojik tanımlar, ayrıntılı disseksiyonel çizimlerle desteklenmiştir. Çalışma sonucunda, Türkiye Florası'nda bu cinse ait taksonların tanımlarında yer almayan ve taksonlar arasında farklılıklar gösteren yeni karakterler tespit edilmiştir. Bu özelliklerin de ilave edilmesi ile Antalya İli'nde yayılış gösteren eksiz *Ophrys* L. taksonlarına ait detaylı tanımlar ve çiçek fotoğraflı daha kullanışlı bir teşhis anahtarı hazırlanmıştır. Bununla birlikte taksonların mevcut yayılış alanlarına tarafımızdan yeni yayılış alanları da eklenmiştir.

Anahtar kelimeler: *Ophrys*, Orchidaceae, Antalya, morfoloji, taksonomi

1. Introduction

Orchid species of the Mediterranean countries contrary to their relatives in the tropic regions are terrestrial plants. This group is referred to as middle zone orchids or soil-growing (terrestrial) orchids. Turkey is one of the richest country in Europe and the Middle East regarding terrestrial orchids. 122 orchid species, belonging to 23 genera have distribution in Turkey (Sezik, 1984; Renz and Taubenheim, 1984; Kreutz, 2000; Kreutz and Çolak, 2009; Özhatay et al., 2009; Güner et al., 2012).

Although Turkey is rich in terms of terrestrial orchids, orchid populations of these species are under serious threat due to collection of tubers for production of salep and animal grazing in these species distribution area. Species belonging to the family Orchidaceae are in danger of extinction from in Turkey and particularly in Antalya province, where these species are extensively spread. Salep is obtained from tmost of (about 85%) tuberous orchid species and an

* *Corresponding author* / Haberleşmeden sorumlu yazar: Tel.: +902423106670; Fax.: +902422261953; E-mail: gdeniz@akdeniz.edu.tr
 BioDiCon. 396-0714

average of 80 million orchid plants are destroyed in Turkey each year to produce salep (Sezik, 2002; Koyuncu et al., 2011).

In order of evolutionary development, Orchidaceae family are presented in the last sections of the Flora of Turkey (Davis, 1965-1985). Generally, it is easier to distinguish the morphological charicteristics of more stable families. One of the most important causes making a problematic genus undistinguishable taxonomically is taxonomic characteristics among the species. In particular, the most important reason of the taxonomic challenges of the *Dactylorhiza*, *Serapias*, *Orchis* and *Ophrys* genus' belonging to the Orchidaceae family found in Turkey is that rather wide variations of the distinguishing morphological characteristics have caused researchers to specify a different opinion on almost every taxon in the past. Orchidaceae taxonomy when considered species or genus hybrids have become inextricable and taxonomic problems have increased exponentially. The best example is *Ophrys*, which contains the most prevalent species of the Orchidaceae family found in Turkey.

Ophrys genus is represented by about 200 species distributed on the European continent, North Africa, Anatolia, the Middle East, and the Caucasus. Recent data indicate that *Ophrys* genus is represented by 65 species in Turkey (Sezik, 1984; Renz and Taubenheim, 1984; Kreutz, 2000; Kreutz and Çolak, 2009). The "Ophrys" term meaning "eyebrow" in ancient Greek first passed into use in the Natural History written by Plinus Secundus (Pliny the Elder) who lived between 23-79 years A.D. (Füller, 1982). Although Linne didn't distinguish Orchidaceae as a seperate family in his work 'Species Plantarum' published in 1753, he identified numerous species belonging to 8 genera of the family (Linne, 1753). One of these genus was *Ophrys* whose type species *O. insectifera* that had long, dense hairy eyebrows at the base of the labellum. Various local names such are used for *Ophrys* species in Turkey as "kazankara", "kedigözü", "keditırnağı" and "tülekdokuyan" (Baytop, 1994).

Approximately three out of every four of the Orchidaceae species are found within the borders of Antalya and Muğla Province in Turkey. In the the light of information obtained from literature and ten years of field studies conducted in Antalya province, it is known that 68 Orchidaceae taxa show distribution in Antalya province (Renz&Taubenheim, 1984; Kreutz, 2000; Kreutz and Çolak, 2009; Deniz, 2010).

The first detailed morphological properties of the Turkish *Ophrys* were reported by Sezik (1984) and Renz & Taubenheim (1984). These studies were followed by a number of taxonomic or ecologic investigations (Aybeke, 2007; Güler et al., 2008). However, until the present study there have been no detailed morphological studies on all *Ophrys* species distributed in the Antalya or Turkey. In this research, detailed morphological features were studied for 7 non-appendix *Ophrys* L. taxa in the Antalya Province of Turkey.

2. Materials and methods

The present study is part of the PhD dissertation entitled "A Taxonomic Investigation on *Ophrys* L. (Orchidaceae) Species in Antalya". Plant samples were collected or examined in situ in the Antalya Province of Turkey between 2004 and 2010. Because *Ophrys* generations in Turkey are under serious threat, as are other tuberous orchids, only a small number of samples were collected in field studies in order to prevent damage to the natural populations. Morphological measurements were made on the samples examined in situ, and field observation forms were completed during field studies. Some collected *Ophrys* specimens for morphological studies were dried according to standard herbarium techniques and preserved in the Akdeniz University herbarium (AKDU).

The Orchids of Turkey (Sezik, 1984; Kreutz and Çolak, 2009), Flora of Turkey (Renz and Taubenheim, 1984; Kreutz, 2000) and the other related floras (Butcher, 1961; Mouterde, 1966; Heywood, 1978; Soo, 1980; Füller, 1982; Pignatti, 1982; Boissier, 1884; Meikle, 1985; Feinbrun-Dothan, 1986; Delforge, 1995; Govaerts, 2003; Pedersen and Faurholdt, 2007) were utilised in the identification of the specimens and confirmed by comparison with the herbarium samples of the examined species in the ANK, EGE, GAZI, HUB, ISTE, ISTF, MUH, VANF and AKDU herbaria. The specimens were evaluated according to IUCN threat categories (Ekim et al., 2000; IUCN, 2014). The abbreviations used in the text are as follows: CR=Critically endangered; EN=Endangered).

3. Results and Discussion

3.1. Taxa in Non-apendix groups of Ophrys L. (Orchidaceae) in Antalya Province

1. *Ophrys speculum* Link subsp. *speculum*
2. *Ophrys iricolor* Desf.
3. *Ophrys omegaifera* H.Fleischm. *israelitica* (H. Baumann & Künkele) G.Morschek & K. Morschek
4. *Ophrys phaseliana* D. Rückbr. & U. Rückbr.
5. *Ophrys cinereophila* Paulus & Gack
6. *Ophrys urteae* Paulus
7. *Ophrys lutea* Cav. subsp. *minor* (Guss) O. & E. Danesch

3.2. Key to Taxa

1. Labellum with dense and long pubescent at the edges; petals brownish purple
O. speculum* subsp. *speculum

1. Labellum glabrous or velvety at the edges; petals yellowish gren
2. Middle and lateral lobes of the labellum inrolled, brown, purple or blackish, sometimes yellow striped edges
3. Labellum base ribbed, lower surface dark brown-purple; speculum distinctly 2 ovoid lobed, shiny blue-purple
O. iricolor

3. Labellum base not ribbed, lower surface yellow-green; speculum distinctly W-shaped, dull gray-purple
4. Labellum straight and narrower than the stigmatic cavity at the base
O. omegaifera* subsp. *israelitica

4. Labellum strongly convex and broader than the stigmatic cavity at the base
5. Inflorescence 1-5 flowered; flowers vertical stance; labellum spotted or mottled
O. phaseliana

5. Inflorescence 5-7 (-10) flowered; flowers horizontal stance; labellum not spotted or mottled
O. cinereophila

2. Middle and lateral lobes of the labellum spreading, yellow
6. Labellum ovoid to round, convex at the middle, lateral lobes broad toward the base and wing like
O. lutea* subsp. *minor

6. Labellum obtriangular to oblong, straight at the middle, lateral lobes narrow toward the base and not wing like
O. urteae

3.3. Taxa Descriptions

3.3.1. *Ophrys speculum* Link subsp. *speculum* in Schrader, J. Bot. 1799 (2): 324 (1800). (Figure 1, 4).

Typus: [Portugal] Lusitania, Setubal (1800).
Synonyms: =*O. vernixia* Brot. Fl. Lusit. 1:24 (1804). =*O. scolopax* Willd., Sp. Pl. 4: 69 (1805), [nom. illeg.]. =*O. ciliata* Biv., Sicul. Pl. 1: 60 (1806). =*O. vernixia* Brot. subsp. *ciliata* (Biv.) Del Prete, Webbia 37: 252 (1984). =*O. vernixia* subsp. *orientalis* Paulus, Ber. Arbeitskreis. Heimische Orchid. 18: 43 (2001). =*O. ciliata* var. *orientalis* (Paulus) Kreutz, Kompend. Eur. Orchid.: 91 (2004). =*O. ciliata* subsp. *orientalis* (Paulus) Kreutz, Orchidee (Hamburg) 57: 101 (2006). =*O. speculum* subsp. *orientalis* (Paulus) Paulus & Salk., Ber. Arbeitskreis. Heimische Orchid. 24(2): 7 (2007). =*O. eos* Devillers & Devillers-Tersch., Naturalistes Belges 90: 289 (2009).
Description: Plant slender, 7-30 cm. Tubers 2 (-3), ovoid to globose, 10-21 x 6-16 mm. Leaves 3-6, generally at the base, oblong-lanceolate to ovoid, acute, 3-7.5 x 1.3-3.1 cm. Inflorescence generally lax, 2-9 flowered. Flowers showy, spreading. Bracts elliptic-spatulate to lanceolate, almost equal in length with ovary at flowering, much longer at fruiting time, 14-27 x 5-9 mm. Sepals oblong to ovoid, curved back at the edges, greenish to brownish-dark purple at the base or whole sepals, 6-10 x 3.5-5 mm; dorsal sepal distinctly concave, incurved over column like helmet; lateral sepals with longitudinal stripes that is darker than dorsal sepal, spreading. Petals lanceolate, curved back, inrolled at the tip, broad at the base, base more ribbed at the outer side, velvety pubescent, purple brownish at the base, more light towards tip, 2-4.5 x 1-1.8 mm. Labellum roundish or narrow elongated, distinctly 3-lobed, with densely black grooved at the base, margins revolute and densely brown to brownish purple villous, 10-16 x 8-12 mm; middle lobe ovoid, convex, emarginate; lateral lobes triangular-oblong, spreading or curved, sometimes erect. Labellum without apical appendix. Speculum glabrous, shining blue, with or without yellow stripes at the edges. Stigmatic cavity smooth and black at the base, 2.5-3 mm broad. Pseudoeyes at the base of labellum, blackish, ribbed. Ovary slightly resupinate at the lower half, 10-18 x 2-4.5 mm. Column 5-5.5 mm; connective rounded, obtuse. Polinaria 2.8-3.4 mm. Capsule cylindrical, 18-24 x 4.5-5.5 mm. Seeds broadly oblong to spatulate, 0.45-0.62 x 0.17-0.22 mm.
Flowering time: March-April; *Fruiting time*: April; *Habitat*: Under and clearing of *Pinus*, maquis places, phrygana, calcareous meadows, olive groves; *Altitudinal range*: 0-700 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Marmara, Aegean, Mediterranean and Central Anatolia Regions (EN).

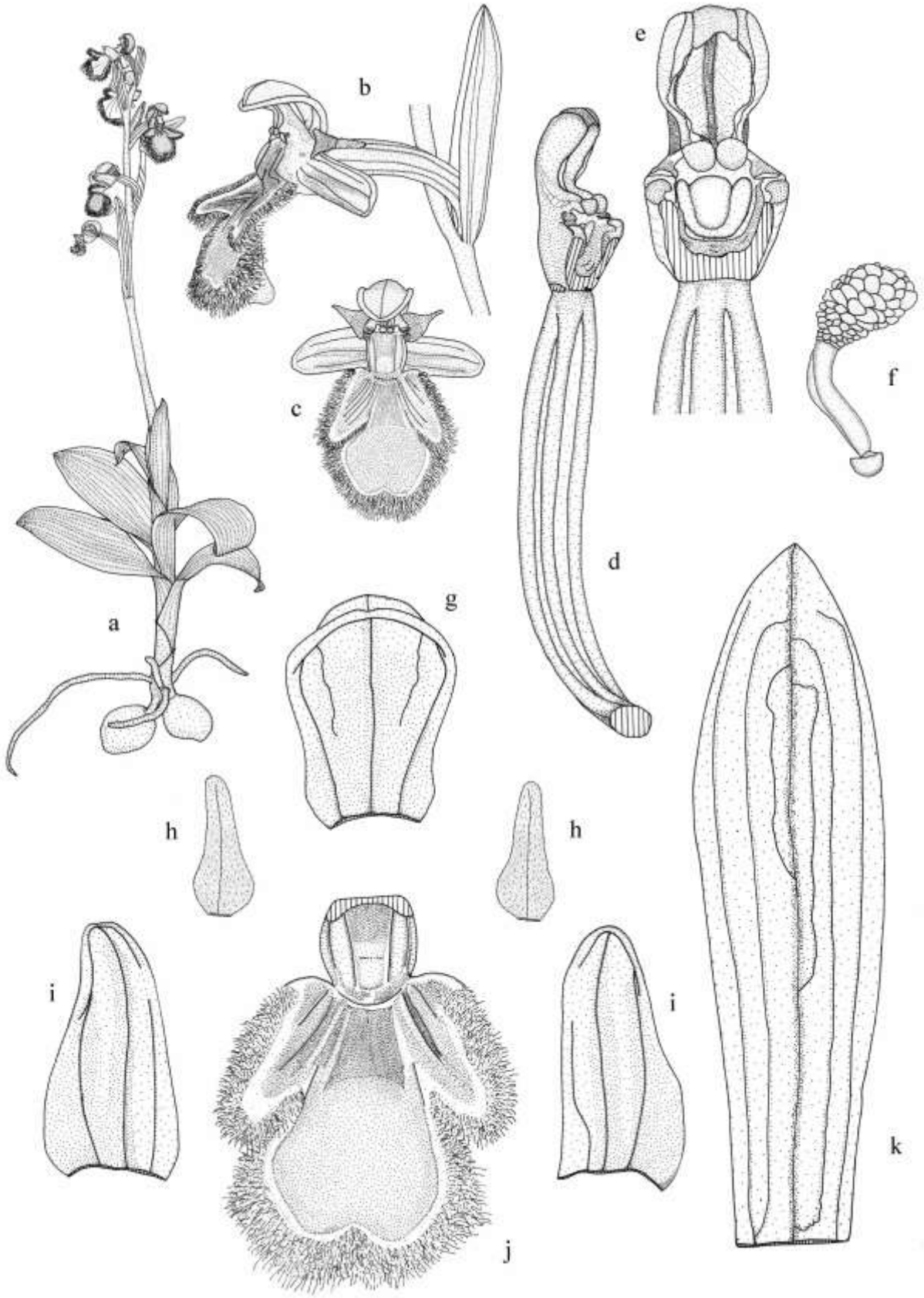

Figure 1. *O. speculum*: a- Habit (x0.5), b- Side view of the flower (x3), c- Front view of the flower (x3), d- Side view of the ovary and column (x6), e- Front view of the column (x6), f- Polinaria (x12), g- Dorsal sepal (x6), h- Petals (x6), i- Lateral sepals (x6), j- Labellum (x6), k- Bract (x6).

Specimens examined: A1 Çanakkale: Arıburnu, 28.iv.1968, A.&T. Baytop (ISTE-12585) - Arıburnu-Suvla road, 8.iv.1975, A. Baytop (ISTE-31439). A2 Bursa: Mudanya, Kumyaka, 5.v.1974, B. Çubukçu, T. Avcıgil (ISTE-27850) - Mudanya, Kumyaka, 5.v.1974, B. Çubukçu, T. Avcıgil (ISTE-27850). İstanbul: Merter Site, 24.iv.1965, N. Tanker (ISTE-8077) - Florya District, 7.iv.1961, A. Baytop (ISTE-6316) - Upper regions of Küçükçekmece, 24.iv.1960, A. Baytop (ISTE-5800) - Opposite slopes of Halkalı Train station, 6.v.1974, A. Baytop, G. Ertem (ISTE-27840a) - Opposite slopes of Halkalı Train station, 17.iv.1973, G. Ertem (ISTE-24177) - Halkalı, behind of the the customs buildings, slopes, 23.iv.1971, N.&E.Özhatay, G. Ertem (ISTE-19372) - Hadımköy, 23.iv.1961, A.&T. Baytop (ISTE-6345) - Yeşilköy, 23.iv.1955, A.&T. Baytop (ISTE-4217) - Yeşilköy, 22.iv.1953, Baytop, Berk (ISTE-3017) - Slopes of Yeşilköy, 22.iv.1974, A. H. Meriçli (ISTE-27573) - Büyükçekmece, End of the Ayazma, damp slopes, 5.v.1974, F. Serin (ISTE-27845) - Bakırköy, Florya, 23.iv.1967, H. Demiriz (ISTF-21985) - Bakırköy, vi.1944, A. Heillbronn, N. Başarman (ISTF-3796) - Pendik, Dolayba, 21.iv.1953, H. Demiriz (ISTF-12285) - Yeşilköy, 22.iv.1953, H. Demiriz (ISTF-12293) - Halkalı, meadows, slopes, 05.iv.1965, Betül Tutel (ISTF-19150) - Küçükçekmece Lake, meadows, 29.iv.1956, Betül Tutel (56/29B) (ISTF-14526) - Küçükçekmece, 29.iv.1956, H. Demiriz (ISTF-14517). Kocaeli: Gebze, Eskihisar, 23.iv.1943, A. Narer (ISTF-2158) - İstanbul-İzmit road, before Gebze-Darıca junction, 22.iv.1973, N.&E. Özhatay (ISTE-24210) - Gebze-Tuzla, 2. km, 130 m, 30.iv.1967, H. Demiriz, Tutel, Enberker (ISTF-21999). B1 İzmir: İzmir-Çeşme road, Before İçmeler, marl terrain, 21.iii.1967, A.&T. Baytop (ISTE-10693) - Ahmetbeyli, maquis places, iii.1966, H. Peşmen (748-b), (EGE-5621) - Akkum, 27.ii.1968, Meyer, Peşmen (EGE-3055) - Bornova, around Ege Üniversitesi housing, 4.iv.1969, N. Zeybek (EGE-8599) - Bornova, Between Hacılarkırı-Sabuncubeli, 10 km from Bornova, maquis places, 13.iii.1967, M. Aydar (EGE-8591) - Bornova, University Campus, behind of the dormitory, fieldedges, 25.iii.1974, Oğuz, Yürül (EGE-11671) - NE of Bornova, slopes, 26.v.1969, K. Fitz (EGE-4399)- Karaburun, Akdağ, 450 m, 25.v.1980, L. Bekat (330), Y. Gemici (EGE-21449) - Between Karaburun-Kaynarpınar, peninsula, 13.iv.1969, K. Fitz (EGE-4242) - Karşıyaka, Between Yamanlar-Kavaklıdere, maquis places, 21.iv.1967, H. Peşmen, M. Aydar (EGE-8601) - Between Yeniköy-Zeytindağ, SW of Bergama, 2.iv.1969, F. Spitzenberger (EGE-23297). Manisa, Manisa Mountain, Mevlevihane, 18.iv.1974, G. Ertem (ISTE-27395). C1 Aydın: Kuşadası District, 19.iv.1971, A.&T. Baytop (ISTE-19151) - Between Kuşadası-Selçuk, 31.iii.1968, Meyer, Peşmen, Oflas, Oğuz, Leblebici (EGE-3038)- Lalelik, Çakman Village, 15.iv.1965, N.&M. Tanker (ISTE-8069b) - Kuşadası, 20 m, 22.iii.1956, Davis (25169), O. Polinin (ANK) - Between Kuşadası-Selçuk, 31.iii.1968, Meyer, Peşmen, Oflas, Oğuz, Leblebici (EGE-2943). İzmir: Meryemana road, maquis places, 26.iv.1967, Peşmen, Aydar (EGE-3045). Muğla: Bodrum, iii.1937, Gleisberg (300), (ANK) - Milas, around Beçin Village, 12.iv.1965, E. Sezik (ISTE-8361) - Milas, Yeniköy, 14.iv.1965, E. Sezik (ISTE-8378). C2 Muğla: Bodrum, Güvercinlik, maquis places, 30 m, 9.iv.2002, Ö. Varol 3996, (MUH) - Cemetery of Düğerek district, 620 m, 03.iv.2003, E. Kaya (600), (MUH) - Fethiye-Hisarönü Village, Belceğiz location, 250 m, 11.v.1967, Peşmen, Oğuz, Leblebici (EGE-3051) - Köyceğiz, Between Çandır-Boğaz, maquis places, 200-250 m, 15.iv.1992, A. Güner (10412), H. Duman, A.A. Dönmez (HUB-36353) - Milas, 2 km to Kızılağaç Village, *P. brutia* forest, 200 m, 9.iii.2002, Ö. Varol (3986), (MUH) - Old Cemetery of Muğla, under *Cupressus*, 670 m, 21.iii.2001, B. Sahrancı (137), (MUH). C3 Antalya: 1.iv.1939, Gassner, (ANK) - Akdeniz Üniversitesi Campus, *Quercus coccifera* forest, 22 m, 19.iii.2006, İ.G. Deniz (2534) (AKDU) - Akkuyu District, maquis places, 15 m, 19.iii.2006, İ.G. Deniz (2532), E. Deniz (AKDU) - Gleisberg 61, (ANK) - Kepez, 28.iii.1957, M. Heilbronn (ISTF-16557) - Kepez, foresty places, 150 m, 28.iv.1994, R.S. Göktürk (3359) - Kumluca, Adrasan, *Pinus brutia* forest, 46 m, 25.iii.2005, İ.G. Deniz (2468), (AKDU) - Kumluca, Olimpos Ancient City, *Pinus brutia* forest, 46 m, 09.iii.2007, İ.G. Deniz (2568), (AKDU) - Kumluca, Between Olimpos Ancient City-Adrasan turnout, *Pinus brutia* forest, meadows, 50 m, 12.iii.2004, İ.G. Deniz (2331), (AKDU) - Manavgat, Bucakşeyhler Village, scrubby places, 25 m, 15.iii.2005, İ.G. Deniz (2455), (AKDU) - Manavgat, Çayiçi District, meadows, 51 m, 16.iii.2006, İ.G. Deniz (2525), H. Kaplan (AKDU) - Manavgat, Manavgat-Oymapınar road, 9.-10. km, *Pinus brutia* forest, 21 m, 20.iii.2004, İ.G. Deniz (2340), (AKDU) - Manavgat, Between Manavgat-Yaylaalan, maquis places, 170 m, 16.iii.2006, İ.G. Deniz (2526), H. Kaplan (AKDU) - Manavgat, Oymapınar-Manavgat road, 5.-6. km, *Pinus brutia* forest, meadows, 117 m, 15.iii.2005, İ.G. Deniz (2450), (AKDU). C4 Antalya: Alanya, Between Demirtaş-Sapadere, *Pinus brutia* forest, meadows, 133 m, 15.iii.2007, İ.G. Deniz (2573), (AKDU). C5 Konya: Ereğli, Aydos Mountain, Delimahmutlu, Otlaktepe vadisi, nemli çayır, 1500 m, 1.vi.1978, S. Erik 2932 (HUB-36352).

3.3.2. *Ophrys iricolor* Desf. in Ann. Mus. Hist. Nat. (Paris) 10:224, (1807). (Figure 2, 4).

Typus: [Orient] Described from the Levant, Tournefort (‘Orchis orientalis fucum referens, flore maximo, scuto azureo’)

Synonyms: =*O. fusca* Link var. *iricolor* (Desf.) Mutel in Mem. Soc. Hist. Nat. Strasbourg 2:4 (1835); =*O. fusca* Link subsp. *iricolor* (Desf.) Richter, PI. Europ. 1:261 (1890).

Description: Plant slender, 8-30(-40) cm. Tubers 2, globose to ovoid, 1.4-2 x 1-1.5 cm. Leaves 3-4, broadly ovoid to lanceolate, obtuse or subacute, shiny and distinctly veined, margins flat or slightly undulate, 5.1-8.6 x 1.3-4 cm. Inflorescence dense, 1-3 (-5) flowered. Flowers showy, spreading. Bracts lanceolate, longer than the ovary, 18-30 x 7-11 mm. Sepals oblong to ovoid, curved back at the edges, greenish to yellowish-green, 11-18 x 6.5-10 mm; dorsal sepal

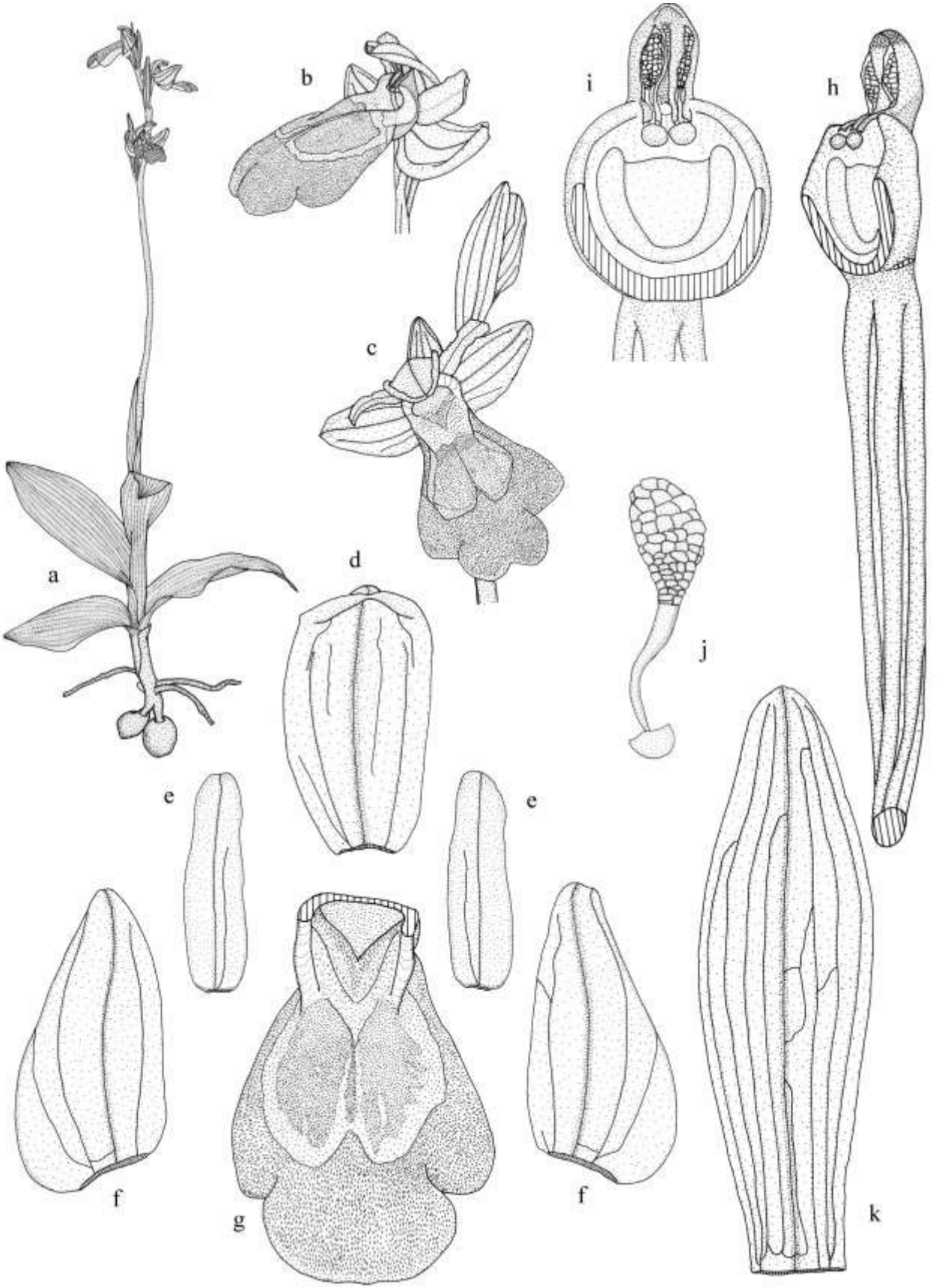
a
b
c
d
e
e
f
f
g
h
i
j
k

Figure 2. *O. iricolor*: a- Habit (x0.4), b- Side view of the flower (x2), c- Front view of the flower (x2), d- Dorsal sepal (x4), e- Petals (x4), f- Lateral sepals (x4), g- Labellum (x4), h- Side view of the ovary and column (x6), i- Front view of the column (x9), j- Polinaria (x12), k- Bract (x6).

distinctly concave, incurved over column like helmet, obovoid to elliptic; lateral sepals spreading, ovoid to lanceolate. Petals oblong, undulate at the edges, glabrous, olive gren to brownish, sometimes purple tinged, 7-12 x 2.4-4 mm. Labellum 3-lobed, slightly convex and subhorizontal attitude, densely and short velvety hairy on upper surface, glabrous at the edges, white at base, generally purplish at the base edges, other parts dark blackish purple, lower surface dark brownish-purplish and glabrous, 15-22 x 11-18 mm, with densely and long whitish hairy V-grooved at the base; middle lobe emarginate and distinctly 2-parted; lateral lobes rounded to subrhomboid, curved back at the edges. Labellum without apical appendix. Speculum on base half of the labellum, distinctly 2-lobed, lobes connected or distance intervals, blackish violet inside, metallic blue outside, glabrous or slightly pubescent. Stigmatic cavity whitish at the base, 4-5.7 mm broad. Pseudoeyes absent. Ovary slightly resupinate at the base, 15-20 x 2-3.2 mm. Column 7.5-8.5 mm; connective rounded, obtuse. Polinaria 4-4.4 mm. Capsule cylindrical, 20-25 x 3-4 mm. Seeds oblong to oblong-spatulate, 0.51-0.82 x 0.19-0.22 mm.
Flowering time: March-April (-May); *Fruiting time*: May-June; *Habitat*: Under and clearing of Pinus, phrygana and maquis places, calcareous damp places; *Altitudinal range*: 0-600 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Marmara, Aegean and Mediterranean Regions (EN).
Specimens examined: B1 İzmir: Balıklıova N of, 0-50 m, 30.iii.1980, G. Taubenheim, J. Renz (ISTF-34646) - Bornova, 12.iv.1967, Peşmen (EGE-5640) - Çeşme, Karadağ, 1200 m, 28.ii.1979, Ş.Yıldırımlı (1262), (HUB-36341) - Kozağaç yanlarındaki kireçli tepeler, iv.1933, O. Schwarz (EGE-23148) - Naldöğenköy, kireçli tepeler, 100 m, iv.1933, O. Schwarz (EGE-23146). C3 Antalya: Akkuyu District, maquis places, 15 m, 19.iii.2006, İ.G. Deniz (2531), E. Deniz (AKDU) - Doyran, around The State Water Works Pond, *Pinus brutia* forest, meadows, 153 m, 14.iii.2006, İ.G. Deniz (2522), H. Kaplan, E. Gürbüz (AKDU) - Kumluca, Between Antalya-Kumluca road-Adrasan, Yazır turnout district, maquis places, 301 m, 09.iii.2007, İ.G. Deniz (2565), (AKDU) - Manavgat-Akseki Between, Taşkesiği District, maquis places, 273 m, 16.iii.2006, İ.G. Deniz (2529), H. Kaplan (AKDU) - Toros District, maquis places, 13 m, 12.iii.2004, İ.G. Deniz (2335), (AKDU). C4 Antalya: Gazipaşa, Between Beyobası-Maha Plateau, *Pinus brutia* forest, meadows, 211 m, 15.iii.2007, İ.G. Deniz (2579), (AKDU).

3.3.3. *Ophrys omegaifera* H.Fleischm. subsp. *israelitica* **(**H.Baumann & Künkele) G.Morschek & K.Morschek, Orchids Cyprus: 126 (1996). (Figure 3,4).

Typus: [Palestine] Galilee in the viccinity of Zefat, 18 ii 1979, *H. Baumann* (holo. STU).
Synonyms: ≡*Ophrys israelitica* H. Baumann & Künkele in Mitteilungsbl. Arbeitskr. Heim. Orch. Baden-Württ. 20(3): 612 (1988).
Description: Plant slender, 7.5-20 cm. Tubers 2, ovoid to globose, 1-1.8 x 0.8-1.6 cm. Leaves 2-5, ovoid to lanceolate or obovoid, acute, 4-8 x 1.4-3.7 cm. Inflorescence dense, 1-4 flowered. Flowers directed upward at first, later spreading. Bracts lanceolate, somewhat longer than the ovary, 15-22 x 4-7.5 mm, Sepals ovoid-oblong, distincly curved back at the edges, greenish-yellow to green, 11-18 x 6.5-10 mm; dorsal sepal distinctly concave, incurved over column like helmet, obovoid to elliptic; lateral sepals spreading, ovoid to lanceolate Petals oblong, undulate at the edges, glabrous, generally darker than the sepals, yellow to brownish at the edges, rarely pubescent, 7-9.5 x 2-3 mm. Labellum 3-lobed, generally plane at base half, convex towards apex, curved back at the edges, densely and short brownish velvety hairy on upper surface, glabrous and narrow yellowish ribbed at the edges, white at the base, creamish to yellow at the base-edges, other parts of the labellum dark brownish to violet brownish, yellowish to greenish and glabrous on lower surface, 10-15 x 9-11 mm, with densely and long whitish hairy V-grooved at the base; middle lobe emarginat and distinctly 2-parted, parts roundish and curved back; lateral lobes rounded, curved back at the edges, narrower to the base. Labellum without apical appendix. Speculum on base half of the labellum, W-shaped, sometimes sectional and mottled, sparse pubescent, grayish-blue to purplish inside, whitish to creamish outside. Stigmatic cavity whitish-yellow to greenish at the base, 4-6 mm broad. Pseudoeyes absent. Ovary generally resupinate at the lower half, 12-20 x 1.8-2.5 mm. Column 6.5-7.5 mm; connective rounded, obtuse. Polinaria 3.5-4 mm. Capsule cylindrical, 17-24 x 7-8 mm. Seeds oblong to narrow spatulate, 0.51-0.64 x 0.15-0.21 mm.
Flowering time: March-April; *Fruiting time*: April; *Habitat*: Maquis, woodlands and shrublands, calcerous places, phrygana; *Altitudinal range*: 0-500 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Mediterranean Region (EN).
Specimens examined: C2 Antalya: Kaş, 7.-8. km of Kalkan-Gömbe road, maquis places, 687 m, 8.iv.2005, İ.G. Deniz (2473), (AKDU) - Kaş, Kalkan-Gömbe road, Sarıbelen Village Cemetery, meadows, 835 m, 8.iv.2005, İ.G. Deniz (2474), (AKDU) - Kaş, Patara Ancient City around, Olive groves meadows, 56 m, 8.iv.2005, İ.G. Deniz (2471), (AKDU). C3 Antalya: Kemer, Kesme District, roadsides, *Pinus brutia* forest, 180 m, 19.iii.2005, İ.G. Deniz (2459), (AKDU) - Kemer, Kesme District, roadsides, *Pinus brutia* forest, 180 m, 09.iii.2007, İ.G. Deniz (2560), (AKDU)-

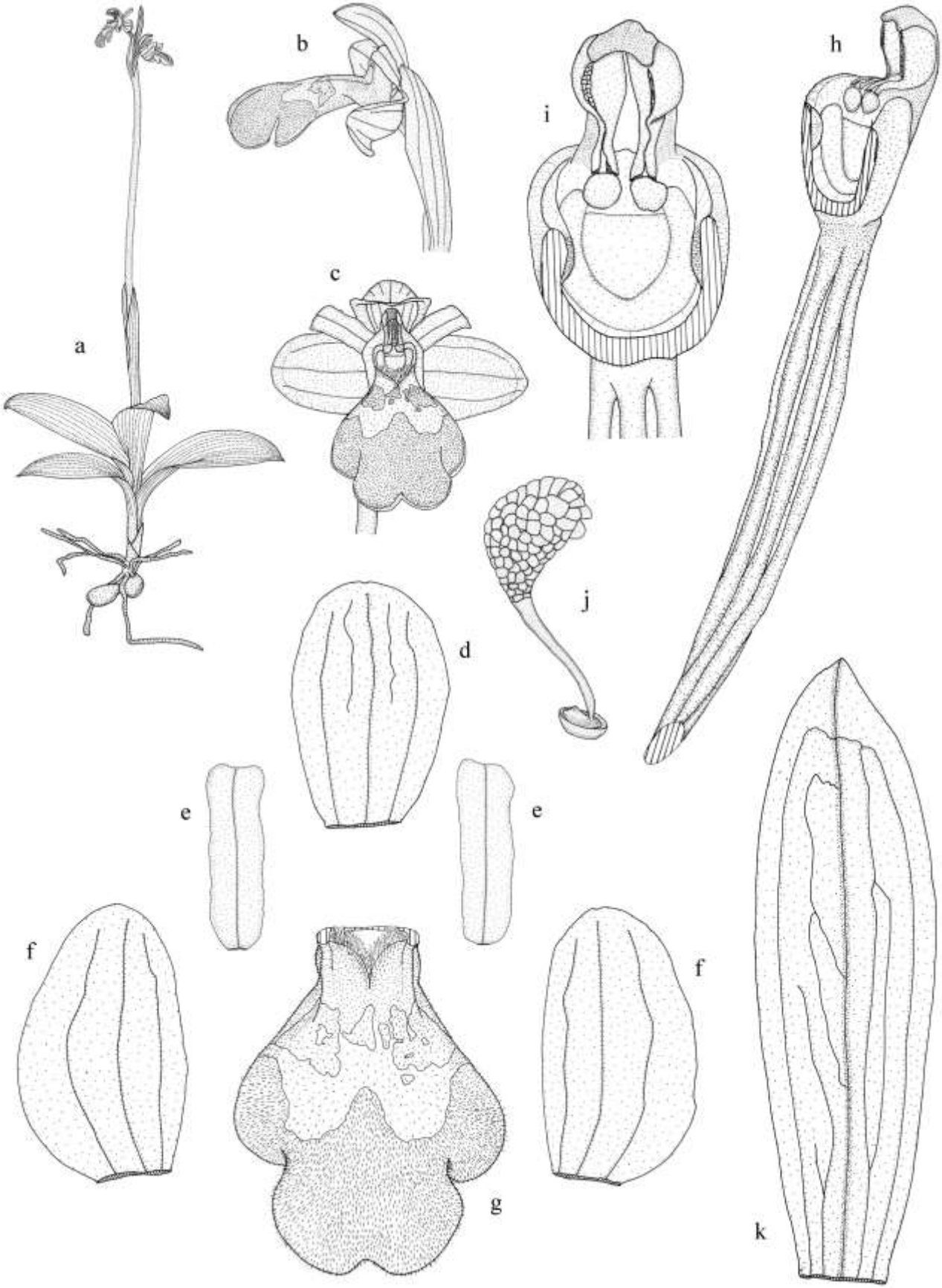

Figure 3. *O. omegaifera* subsp. *israelitica*: a- Habit (x3,5), b- Side view of the flower (x2), c- Front view of the flower (x2), d- Dorsal sepal (x4), e- Petals (x4), f- Lateral sepals (x4), g- Labellum (x4), h- Side view of the ovary and column (x6), i- Front view of the column (x9), j- Polinaria (x12), k- Bract (x6).

Kemer, Kuzdere Valley, roadsides, *Pinus brutia* forest, meadows, 183 m, 12.iii.2004, İ.G. Deniz (2334), (AKDU) - Kumluca, Olimpos Ancient City, *Pinus brutia* forest, edges of the creek, meadows, 35 m, 31.iii.2004, İ.G. Deniz (2362), (AKDU) - Manavgat, Çayiçi District, meadows, 70 m, 15.iii.2005, İ.G. Deniz (2448), (AKDU) - Manavgat, Manavgat-Oymapınar road, 9.-10. km, *Pinus brutia* forest, 21 m, 20.iii.2004, İ.G. Deniz (2339), (AKDU) - Yukarı Karaman, slopes between Yukarı Karaman-Bahtılı, *Pinus brutia* forest, 217 m, 24.iii.2007, İ.G. Deniz (2610), (AKDU) - C4 Antalya: Alanya, Between Demirtaş-Sapadere, *Pinus brutia* forest, 133 m, 15.iii.2007, İ.G. Deniz (2574), (AKDU) - Gazipaşa, Between Beyobası-Maha Plateau, *Pinus brutia* forest, meadows, 192 m, 15.iii.2007, İ.G. Deniz (2575), (AKDU) - C5 İçel: Ulaş, 8 km N of Tarsus to Çamlıyayla, 270 m, 08.04.1980, Renz & Taubenheim 80.76 (ISTF 34.657)

3.3.4. *Ophrys phaseliana* D. Rückbr. & U. Rückbr. in J. Eur. Orchideen 28: 395 (1996). (Figure 5, 9).

Typus: [Turkey] Antalya, Phaselis, 80 m, 26.iv.1996, D.&U. Rückbrodt (holo. B.).
Synonyms: =*O. fusca* Link subsp. *phaseliana* (D.Rückbr. & U.Rückbr.) Kreutz, Kompend. Eur. Orchid.: 96 (2004). =*O. parosica* P.Delforge var. *phaseliana* (D.Rückbr. & U.Rückbr.) P.Delforge, Naturalistes Belges 88: 247 (2007).
Description: Plant slender, 15-40 cm. Tubers 2 , ovoid to globose, 1-1.7 x 0.8-1.6 cm. Leaves 2-6, generally at the base, ovoid to lanceolate, acute, 4-8.5 x 1.4-3.7 cm. Inflorescence lax, 1-5 flowered. Flowers large, directed upward at first, later spreading. Bracts lanceolate, equal in length or longer than ovary, 15-18 x 4-7.5 mm. Sepals oblong-ovoid to elliptic, distincly curved back at the edges, yellowish-green to greenish, 11-16 x 5-8 mm; dorsal sepal distinctly concave, incurved over column like helmet, lateral sepals spreading, Petals oblong, undulate at the edges, sometimes slightly emarginate, glabrous, yellowish-green to greenish, 7.5-12 x 2.5-4 mm. Labellum 3-lobed, directed downward, strongly convex, not pressed on the middle part, curved back at the all edges, brownish at the base, yellowish to brownish ribbed or tessellate at apex part, densely and short brownish velvety hairy on upper surface, edges glabrous, yellowish to greenish at the base-edges, lower surface greenish to pale brown, 13.5-18.5 x 11.5-16.5 mm, with densely and long whitish hairy V-grooved at the base; middle lobe emarginat and distinctly 2-lobed, lobes curved back, apex greenish part spreading; lateral lobes rounded, distant from middle lobe, narrower to the base. Labellum without apical appendix. Speculum on whole labellum, W-shaped, sectional and mottled, sometimes 2-lobed, lobes ovoid, connected or distance intervals, sparse pubescent, grayish-blue to purplish brown inside, grayish blue outside, mottled on apex part of the labellum. Stigmatic cavity whitish-yellow to greenish at the base, 5-6 mm broad. Pseudoeyes absent. Ovary straight, not angled with column, 12-20.5 x 2.3-4 mm. Column 7-8 mm; connective rounded, obtuse. Polinaria 3.5-4.5 mm. Capsule cylindrical, 17-23 x 4.5-6 mm. Seeds broad oblong-spatulate , 0.51-0.65 x 0.15-0.21 mm.

Flowering time: April-May; *Fruiting time*: May; *Habitat*: Openings in forest, phrygana, shrublands, calcerous places; *Altitudinal range*: 0-200 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Antalya and Muğla Provinces. Endemic (CR).
Specimens examined: C3 Antalya: Kumluca, Kumluca-Altınyaka road, 5.-6. km, *Pinus brutia* forest, meadows, 191 m, 17.iv.2007, İ.G. Deniz (2627), (AKDU).

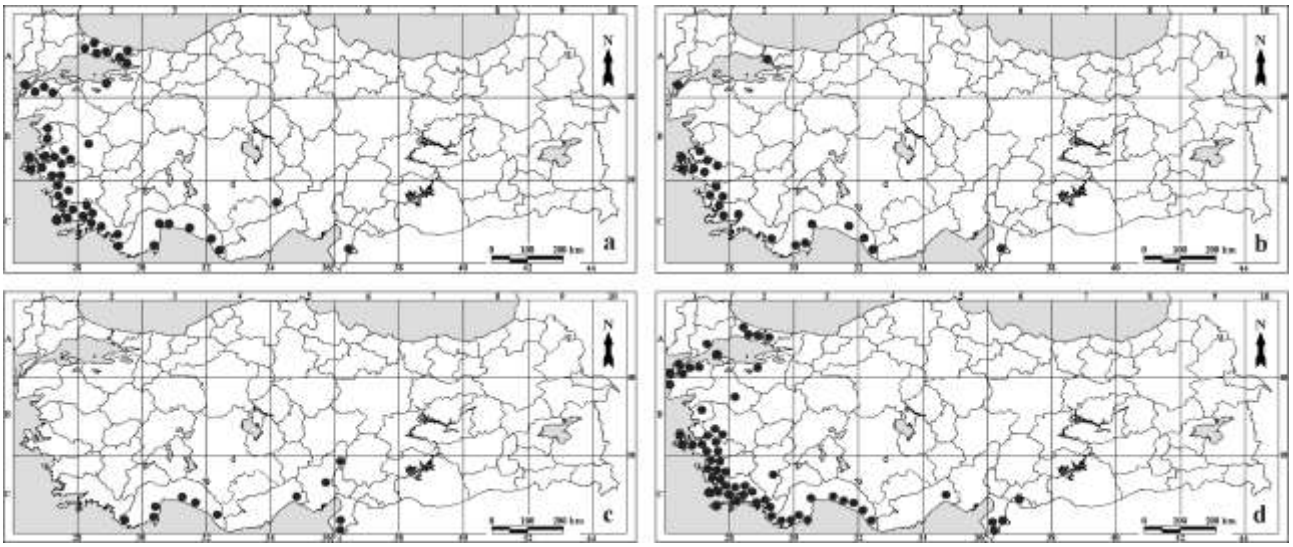

Figure 4. Turkey distribution of (a) *O. speculum* subsp. *speculum*, (b) *O. iricolor*, (c) *O. omegaifera* subsp. *israelitica* and (d) *O. lutea* subsp. *minor*.

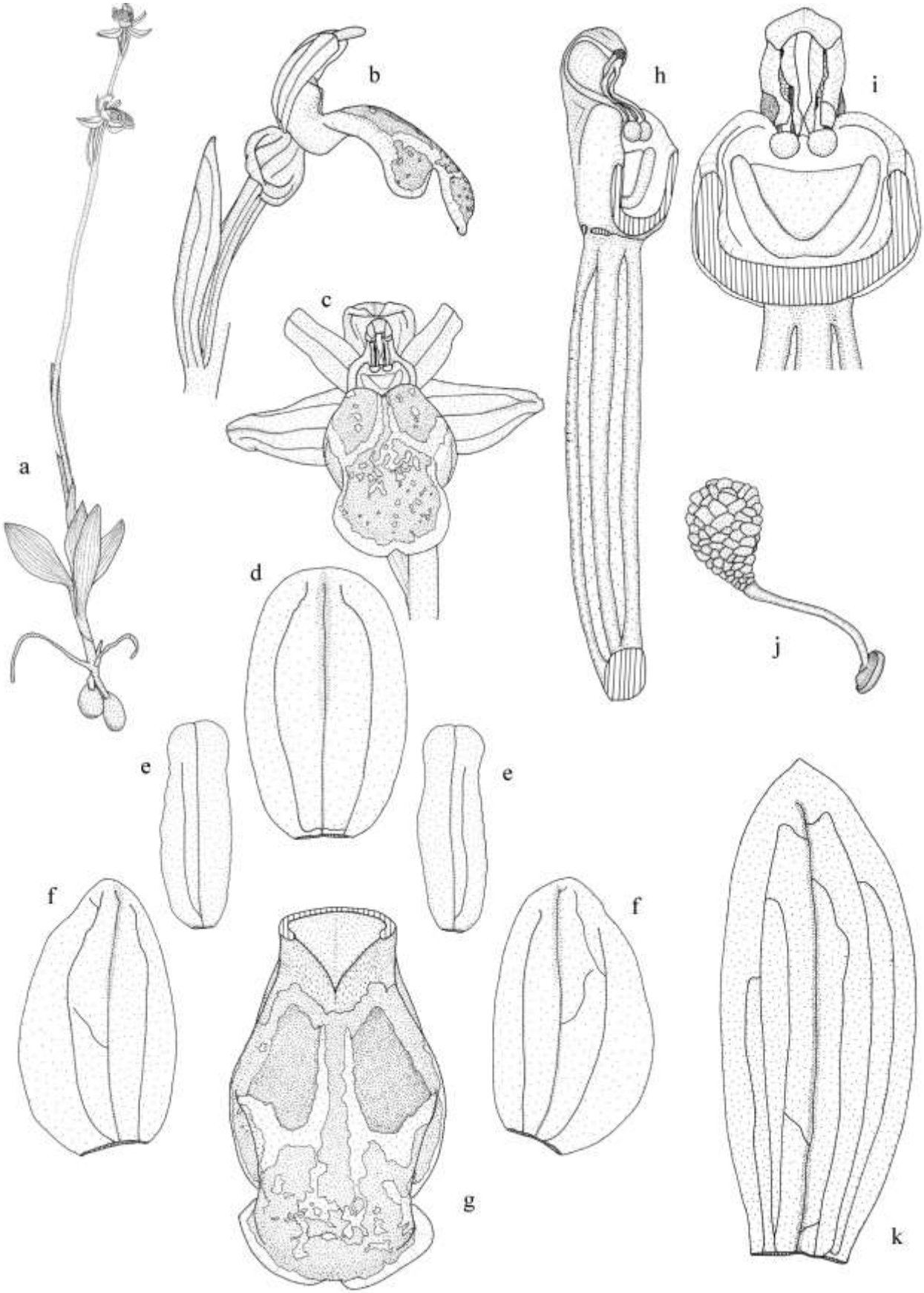

Figure 5. *O. phaseliana*: a- Habit (x0.4), b- Side view of the flower (x2), c- Front view of the flower (x2), d- Dorsal sepal (x4), e- Petals (x4), f- Lateral sepals (x4), g- Labellum (x4), h- Side view of the ovary and column (x5.5), i- Front view of the column (x7), j- Polinaria (x12), k- Bract (x5.5).

3.3.5. *Ophrys cinereophila* Paulus & Gack in J. Eur. Orchideen 30: 170 (1998). (Figure 6, 9).

Typus: [Greece] E. Crete in the vicinity of Nikithianou near Neapolis, 3 iv 1987, *Paulus* (holo. In herb. Paulus, Wien).
Synonyms: =*O. fusca* Link subsp. *cinereophila* (Paulus & Gack) Faurh., Orchidee (Hamburg) 53: 345 (2002). =*O. subfusca* (Rchb.f.) Batt. subsp. *cinereophila* (Paulus & Gack) Kreutz, Orchidee (Hamburg) 57: 102 (2006).
Description: Plant slender, 7-23 cm. Tubers 2 , ovoid to globose, 1-1.6 x 0.6-1.4 cm. Leaves 2-6 , generally at the base, ovoid to lanceolate, acute, 2.2-9.4 x 0.8-3.5 cm. Inflorescence lax, 5-7 (-10) flowered. Flowers small, directed upward at first, later distinctly spreading. Bracts lanceolate, equal in length or somewhat longer than ovary, 11-18 x 3.8-6 mm. Sepals broadly ovoid to lanceolate, distincly curved back at the edges, yellowish to greenish, 7-11 x 4-7.5 mm; dorsal sepal distinctly concave, incurved over column like helmet lateral sepals spreading, Petals oblong, undulate at the edges, rarely slightly emarginate, glabrous, yellowish-green to greenish, 5-9 x 2-2.8 mm. Labellum 3-lobed, directed downward, strongly convex, pressed on the middle part, curved back at the all edges, blackish to dark brown, not striped or tessellate at apex part, densely and short brownish to purplish velvety hairy on upper surface, edges glabrous or lax pubescent, whitish to yellowish at the base-edges, lower surface greenish to pale brown, 7-13 x 5-10.5 mm, with densely and long whitish hairy V-grooved at the base; middle lobe emarginat and distinctly 2-lobed, lobes curved back, apex yellow greenish part spreading; lateral lobes straight or rounded, clerly distant from middle lobe, narrower to the base. Labellum without apical appendix. Speculum on base half of the labellum, W-shaped, 2-lobed, lobes ovoid, always connected, sparse pubescent, grayish-blue to purplish brown inside, grayish blue outside, apex part straight. Stigmatic cavity whitish-yellow to greenish at the base, 3.5-5 mm broad. Pseudoeyes absent. Ovary straight, angled with column, 10-18 x 1.5-3.5 mm. Column 5-6 mm; connective rounded, obtuse. Polinaria 2.5-3.5 mm. Capsule cylindrical, 16-22 x 4.5-5.5 mm. Seeds broad oblong-spatulate, 0.44-0.65 x 0.15-0.21 mm.
Flowering time: March-April; *Fruiting time*: April; *Habitat*: Maquis places, openings in forest, meadows, phrygana; *Altitudinal range*: 0-800 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Aegean and Mediterranean Regions (EN).
Specimens examined: C2 Antalya: Kaş, Kaş-Kasaba road, 7.-8. km, *Pinus brutia* forest, 206 m, 08.iv.2005, İ.G. Deniz (2477), (AKDU). C3 Antalya: Kumluca, Between Adrasan-Olimpos Ancient City, meadows, 50 m, 25.iii.2005, İ.G. Deniz (2465), (AKDU) - Kumluca, Antalya-Kumluca road-Adrasan Between, Yazır turnout district, maquis places, 294 m, 09.iii.2007, İ.G. Deniz (2564a), (AKDU) - Kumluca, 1 km to Olimpos Ancient City, meadows, 50 m, 12.iii.2004, İ.G. Deniz (2332), (AKDU) - Kumluca, around Olimpos Ancient City, *Pinus brutia* forest, 46 m, 09.iii.2007, İ.G. Deniz (2569), (AKDU) - Kumluca, Between Olimpos Ancient City-Çavuşköy, *Pinus brutia* forest, edges of the creek, meadows, 35 m, 31.iii.2004, İ.G. Deniz (2361), (AKDU).

3.3.6. *Ophrys urteae* Paulus, Ber. Arbeitskreis. Heimische Orchid. 26(2): 10 (2009). (Figure 7, 9)

Typus: [Turkey] Antalya, 7.4 km ne. Taşağıl, kleiner Friedhof, 152 m, 18.iv.1998, H.F. Paulus (holo. WU).
Description: Plant slender, 6-8 (-15) cm. Tubers 2 , ovoid to globose, 1-2.3 x 0.7-1.6 cm. Leaves 3-6 , generally at the base, ovoid to broadly lanceolate, acute, 2.5-9 x 1-3.5 cm. Inflorescence generally lax, 1-3 (-6) flowered. Flowers small, spreading. Bracts ovoid to lanceolate, equal in length or somewhat longer than ovary, 9-19 x 4-7 mm. Sepals ovoid-lanceolate to broadly ovoid, curved back at the edges, yellowish to greenish, 12-18 x 5-8 mm; dorsal sepal distinctly concave, incurved over column like helmet lateral sepals spreading, Petals oblong-lanceolate, undulate at the edges, obtuse, glabrous, greenish yellow, sometimes brownish at the edges, 7-9 x 1-3 mm. Labellum obtriangular-oblong, distinctly straight and flat, 3-lobed, dark brownish to blackish violet, 9-12 x 7-11 mm, densely and short brownish to purplish velvety hairy on upper surface, with densely and whitish hairy V-grooved at the base; middle lobe emarginat and distinctly 2-lobed, lobes spreading, apex part generally directed upwards; lateral lobes long and narrow, round at apex, not wing-like, spreading or somewhat directed downward, sometimes undulate with narrow yellow edges, clerly distant from middle lobe. Labellum without apical appendix. Speculum on base half of the labellum, W-shaped, not sectional, sometimes connected 2-lobed, lobes ovoid, sparse pubescent, mat shining dark brownish to blue grayish, nearly to lateral notches. Stigmatic cavity whitish at the base, 4-5 mm broad. Pseudoeyes absent. Ovary straight, 10-16 x 1.3-2.5 mm. Column 4.5-6 mm; connective rounded, obtuse. Polinaria 3-4 mm. Capsule cylindrical, 15-23 x 4-5 mm. Seeds narrow oblong to spatulate, 0.38-0.55 x 0.14-0.18 mm.
Flowering time: March-April; *Fruiting time*: April; *Habitat*: Under and clearing of Pinus, maquis places, phrygana, calcareous meadows, olive groves; *Altitudinal range*: 0-400 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Antalya Province. Endemic (CR).
Specimens examined: C3 Antalya: Manavgat, Oymapınar, 6.-7. km of Oymapınar-Tilkiler road, *Pinus brutia* forest, 155 m, 01.iv.2009, İ.G. Deniz (2868), (AKDU).

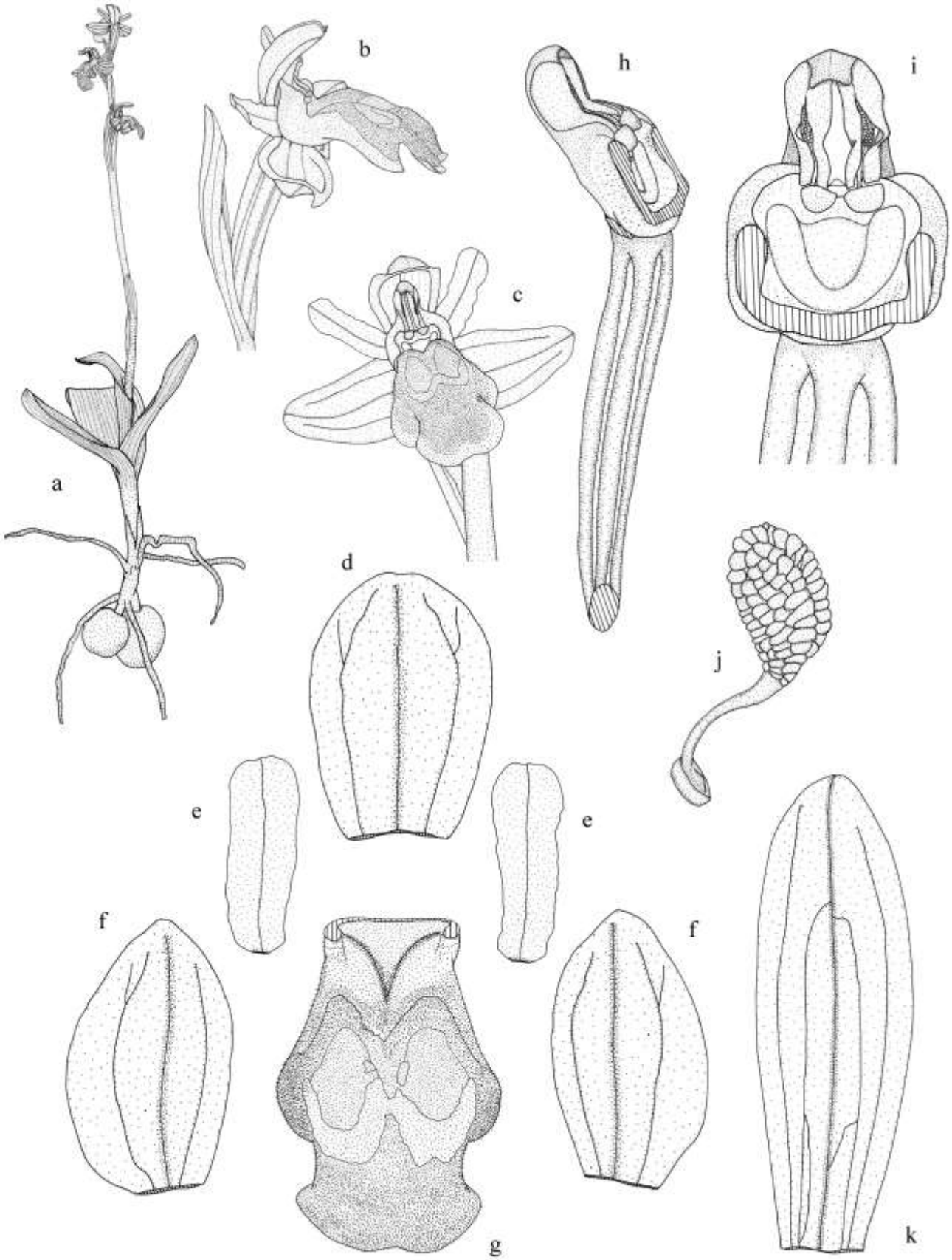

Figure 6. *O. cinereophila*: a- Habit (x0.6), b- Side view of the flower (x3), c- Front view of the flower (x3), d- Dorsal sepal (x6.5), e- Petals (x6.5), f- Lateral sepals (x6.5), g- Labellum (x6.5), h- Side view of the ovary and column (x7.5), i- Front view of the column (x10), j- Polinaria (x18), k- Bract (x7.5).

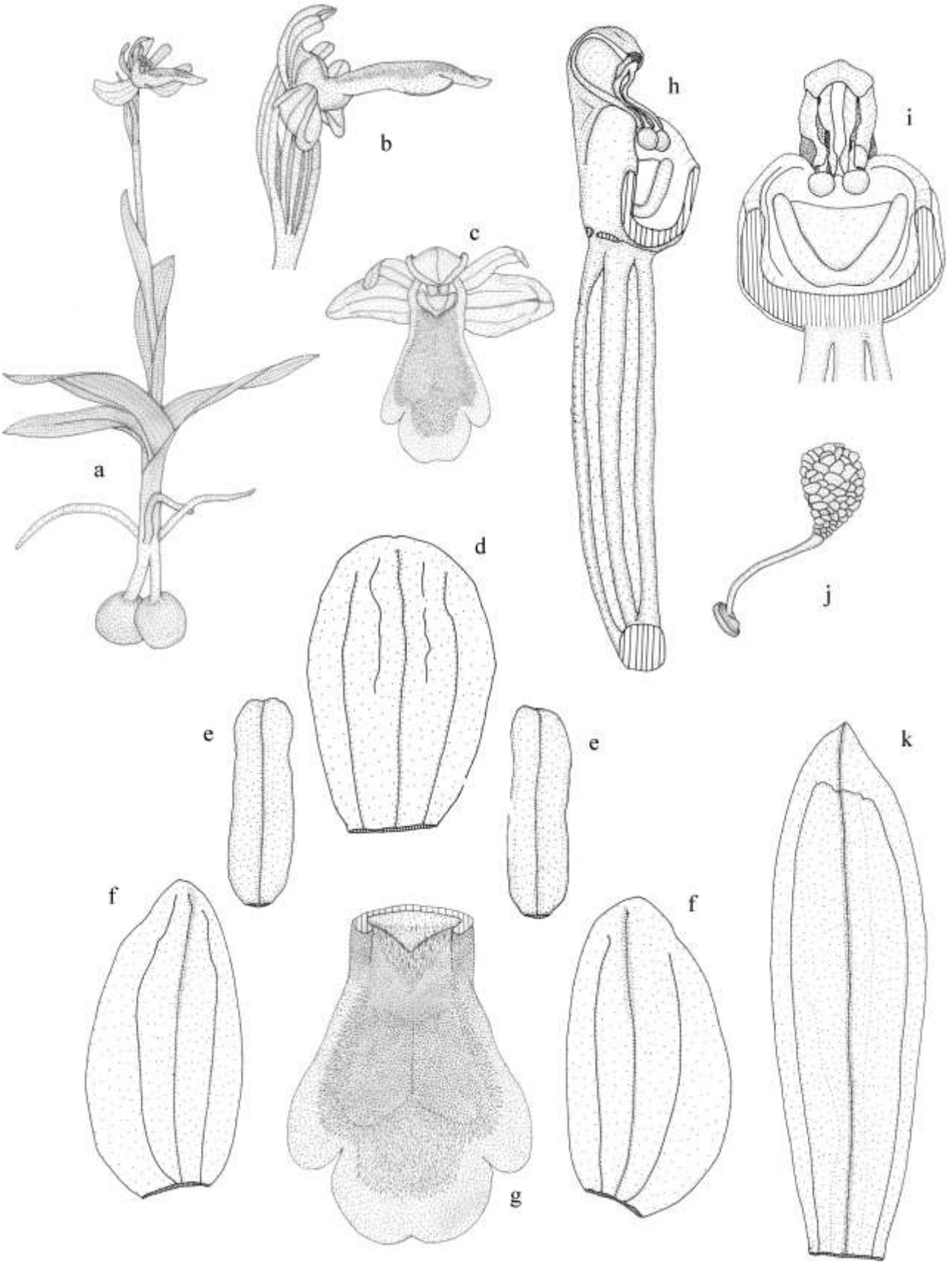

Figure 7. *O. urteae*: a- Habit (x0.9), b- Side view of the flower (x2.5), c- Front view of the flower (x2.5), d- Dorsal sepal (x5), e- Petals (x5), f- Lateral sepals (x5), g- Labellum (x5), h- Side view of the ovary and column (x6), i- Front view of the column (x9), j- Polinaria (x12), k- Bract (x6).

3.3.7. *Ophrys lutea* Cav. subsp. *minor* (Guss.) O. & E. Danesch in Pl. Syst. Evol. 124:82 (1975). (Figure 4, 8).

Typus: [Italy] Sicilya, Palermo, S. Biaggio sotto Cammarata, Gussone.
Synonyms: ≡*Arachnites lutea* (Cav.) Tod. var. *minus* Tod., Orchid. Sicul.: 97 (1842). ≡*O. lutea* Cav. var. *minor* Guss., Fl. Sic. Syn. 2(2):550 (1844). ≡*O. lutea* Cav. f. *sicula* (Tin.) Soo in Feddes Rep. 24:25 (1927).
Description: Plant slender, 7-30 (-40) cm. Tubers 2 , ovoid to globose, 1-2.3 x 0.6-1.7 cm. Leaves 2-6 , generally at the base, ovoidden geniş to lanceolate, acute, 2.2-9.4 x 1-3.5 cm. Inflorescence dense, 1-8 flowered. Flowers small, upward at first, later distinctly spreading. Bracts ovoid to lanceolate, equal in length or somewhat shorter than ovary, 8-20 x 4-8 mm. Sepals ovoid, curved back at the edges, yellowish to greenish, 6.5-9.5 x 3-6 mm; dorsal sepal distinctly concave, incurved over column like helmet; lateral sepals spreading. Petals oblong, generally undulate at the edges, obtuse, glabrous, yellowish green to green, 4-4.5 x 1-1.5 mm. Labellum ovoid-roundish, 3-lobed close to apex part, directed horizontal, convex at middle part, yellow to brownish, sometimes striped or tessellate to lateral and middle lobes, whitish to yellowish at the base, lateral lobes yellow, densely whitish to brownish pubescent, outside glabrous, 8-15 x 8.5-12 mm, with densely and long whitish hairy V-grooved at the base, hairs longer to the staminal part; middle lobe short, emarginat and distinctly 2-lobed, lobes angled to each other, spreading, apex part generally directed upwards; lateral lobes long and broad, wing-like, spreading or somewhat directed downward, sometimes undulate with broad yellow edges, clerly distant from middle lobe. Labellum without apical appendix. Speculum on base half of the labellum, W-shaped, mottled and connected inside or distinctly 2-lobed, lobes ovoid, sparse pubescent, shining grayish-brown to bluish purple inside, whitish-cream to blue outside, not extend to lateral notches. Stigmatic cavity whitish-yellow to greenish , 4-5 mm broad. Pseudoeyes absent. Ovary straight, 11-18 x 1.4-2.4 mm. Column 4.5-5.5 mm; connective rounded, obtuse. Polinaria 2.8-3.2 mm. Capsule, cylindrical, 15-23 x 4-5 mm. Seeds narrow oblong to spatulate, 0.38-0.55 x 0.14-0.18 mm.
Flowering time: March-April; *Fruiting time*: April; *Habitat*: Maquis and forest places, calcareous meadows, phrygana, olive groves, meadows; *Altitudinal range*: 0-600 m; *Phytogeographical status*: East Mediterranean element; *Turkey distribution*: Marmara, Aegean, Mediterranean, Southeastern Anatolia Regions (EN).
Specimens examined: A1 Balıkesir: Marmara Island, Marmara District, Gündoğdu Village, 15.iii.1977, E. Tuzlacı (ISTE-36495). Çanakkale: Arıburnu-Suvla road, 8.iv.1975, A. Baytop (ISTE-31438) - Çanakkale: Gökçeada, Kuzulimanı, 10 m, 10.iv.1976, Ö. Seçmen, E. Leblebici (1296), (EGE-22553). A2 İstanbul: Çatalca, upper parts of the cemetery, 20.iv.2003, İ. Genç (ISTE-82370) - Halkalı, slopes across the train station, 24.iv.1960, A. Baytop (ISTE-5797) - E of Halkalı train station, 23.iv.1971, N.&E. Özhatay, G. Ertem (ISTE-19374) - Çatalca, hills across the cemetery, 1.v.1965, A. Baytop (ISTE-7620) - Hadımköy, SE slopes of the Bahçeşehir, open places, 90 m, 09.iv.1997, E. Üzen, O. Küçüker (ISTF-36940) Bakırköy, Ataköy, edges of the railway, 19.iv.1968, A. Glg., G.San. (ISTF-23119) - Bakırköy, Halkalı train station, meadows, 15.iv.1967, H. Demiriz (ISTF-21955) - Kartal, Cevizli, Ankara roadnun 1 km E of, *Quercus* Between, çayır, 27.iv.1968, A. Çır., O. Sut. (ISTF-23019) - Kartal, Yakacık, openings of the *Quercus coccifera* groves, 16.iv.1968, H. Demiriz, E. Tut., A. Ayd., P. Kok. (ISTF-22965) - Halkalı, meadows, slopes, 05.iv.1965, Betül Tutel (65/13), (ISTF-19153) - Bakırköy, Florya, edges of the railway, meadows, 23.iv.1967, H. Demiriz (ISTF-21984). B1 Balıkesir: Ayvalık, Dolap Island, 10 m, 22.iii.1996, K. Alpınar (ISTE-71315). Manisa: Manisa Mountain, Mevlevihane, 18.iv.1974, G. Ertem (ISTE-27393). Çanakkale: Bozcaada, N regions of the Island, around Killik Hill, 0-50 m, 14.iv.1977, Ö. Seçmen, E. Leblebici (2448), (EGE-20761) - Çanakkale: Bozcaada, around Hacıhasan Hill, 40 m, 14.iv.1976, Ö. Seçmen, E. Leblebici (1494), (EGE-20659) - Çanakkale: Bozcaada, 1 km from the center, 0-50 m, 13.iv.1977, Ö. Seçmen, E. Leblebici (2376), (EGE-20762) - Çanakkale: Bozcaada, Tuzburnu Hill, around Hacımahmu, 70 m, 15.iv.1976, Ö. Seçmen, E. Leblebici (1578), (EGE-20657). İzmir: İzmir Çeşme road, before İçmeler, 21.iii.1967, A.&T. Baytop (ISTE-10965) - İzmir: Akkum, 27.ii.1968, Meyer, Peşmen (EGE-3054) - Bornova, N of Çiçekli Village, 110 m, C. Ödemiş, A. Yayıntaş, U. Zeybek (EGE-23446) - Bornova, Hacılarkırı, Sabuncubeli, 31.iii.1967, M. Aydar (EGE-8619) - Bornova, Between Hacılarkırı-Sabuncubeli, maquis places, 31.iii.1967, M. Aydar (EGE-8593) - Bornova, on marl, iv.1932, N. İ. (EGE-23159) - Çeşme District, 28.iii.1984, Ö. Seçmen (2557) (EGE-28918) - Çeşme-Altınkum, 18.iv.1983, Y. Gemici (1505), Ö. Seçmen, G. Görk, L. Bekat (EGE-21777) - Gümüldür, 200 m, 25.iv.1976, T. Kesercioğlu (EGE-15094) - Kemalpaşa-Karabel road, 19.iv.1967, H. Peşmen, M. Aydar (EGE-8596) - Kemalpaşa-Kavaklıdere road, maquis places, 19.iv.1967, H. Peşmen (EGE-8595) - Seferihisar, 23.iii.1972, T. Gözler, Ödemiş (EGE-9910). B2 Balıkesir: Pelitköy, Karantılık District, olive groves, 0-50 m, 8.iii.2001, Tuğrul Körüklü (188), (GAZI). C1 Aydın: Lalelik, Çakman Village, 15.iv.1965, E. Sezik (ISTE-8069a). Kuşadası, Pino Bay otel road, 90 m, 25.iv.1996, E. Üzen (ISTF-36663) - Güzelbahçe (Priene), 12.iv.1962, A. Pelshenke (EGE-8879). Kuşadası, S slopes, 210 m, 4.iv.1977, G. Oğuz, A. Yayıntaş, (EGE-23448) - Between Kuşadası-Selçuk, 31.iii.1968, Meyer, Peşmen, Oflas, Oğuz, Leblebici (EGE-3031) Söke, Atburgazı District, on Priene road, 28.iii.1968, Meyer, Peşmen, Oflas, Oğuz, Leblebici (EGE-3041). Muğla: Söke-Milas road, egdes of the Bafa Lake, olive groves, 10.iv.1971, A.&T. Baytop (ISTE-19219) - Milas, Yeniköy, 14.iv.1965, E. Sezik (ISTE-8374) - Milas, Yayladağ, Yukarı Mazı Village, 17.iv.1965, E. Sezik (ISTE-8382) - Milas, Kızılağaç, Kazıklı Village, 13.iv.1966, E. Sezik (ISTE-8731) - Taşlıca, Karaçalca District, 300 m, 22.iii.1981, T. Baytop, A. Atilla ISTE-46090). C2 Muğla: Köyceğiz, Yangı Village, calcareous valley,

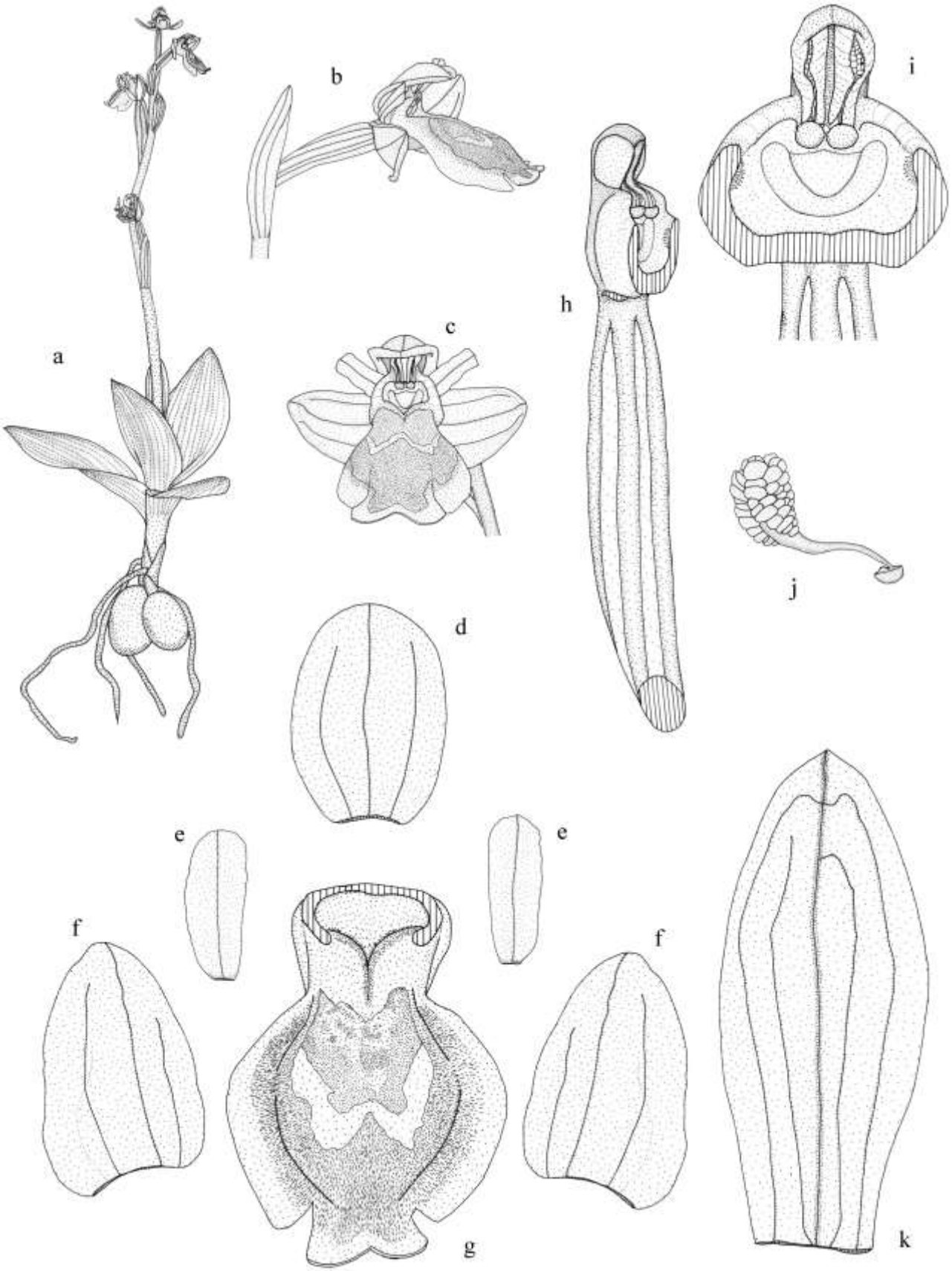

Figure 8. *O. lutea* subsp. *minor*: a- Habit (x0.6), b- Side view of the flower (x2.5), c- Front view of the flower (x2.5), d- Dorsal sepal (x6), e- Petals (x6), f- Lateral sepals (x6), g- Labellum (x6), h- Side view of the ovary and column (x6), i- Front view of the column (x9), j- Polinaria (x12), k- Bract (x6).

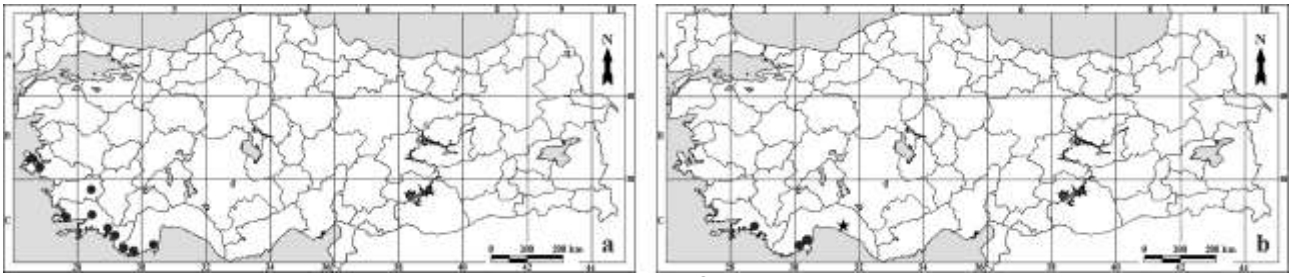

Figure 9. Turkey distribution of (a) *O. cinereophila*, (b) *O. phaseliana* (●) and *O.urteae* (★).

40-220 m, 22.iii.1991, A. Güner (8410), H. Duman, H. Şağban (HUB-36344) - Bodrum, Mumcular, Yılan Yatağı District, roadsides, *Pinus brutia* forest, 150-200 m, 14.iv.2000, M. Karauzun, E. Dalkesen (0049), (VANF). Antalya: Kaş, 7.-8. km of Kaş-Kasaba road, *Pinus brutia* forest, 206 m, 08.iv.2005, İ.G. Deniz (2482), (AKDU) - Kaş, around Patara Ancient City, olive groves, meadows, 62 m, 12.iv.2007, İ.G. Deniz (2621), (AKDU). Denizli: Denizli-Tavas, 23.iii.1957, M. Heilbronn (ISTF-16430). Muğla: Bodrum, Mumcular, Yılanyatağı District, *P. brutia* forest, 150-200 m, 16.iv.2000, M. Karauzun, E. Dalkesen (0049), (MUH) - Datça, city center, around holiday houses, maquis places, 10-20 m, 16.ii.2002, Ö. Varol (3958), (MUH) - Old road Mumcular-Güvercinlik, around second forests store, *P. brutia* forest, 110 m, 17.ii.2001, Ö. Varol (3575), (MUH) - Köyceğiz, Horozlar Village, fieldedges, 10 m, 17.iii.1991, A. Güner (8234), H. Duman, H. Şağban (HUB-36343) - Old cemetery of Muğla, under *Cupressus* groves, 670 m, 21.iii.2001, B. Sahrancı (135), (MUH) - Muğla Cemetery, 620 m, 17.iii.2003, E. Kaya (70), (MUH) - Muğla-Milas, 10 km to Milas, *Pinus* forest, 100-150 m, 16.iv.2000, M. Karauzun, E. Dalkesen (0039), (MUH). C3 Antalya: Between Kemer-Kumluca, 1 km from Olimpos junction, *P. brutia* forest, 350 m, 23.iii.1979, H. Peşmen (4216), A. Güner (HUB-36346) - Kumluca, Adrasan, *Pinus brutia* forest, 46 m, 25.iii.2005, İ.G. Deniz (2469), (AKDU) - Kumluca, Adrasan, Yazır turnout district, maquis places, 294 m, 09.iii.2007, İ.G. Deniz (2564b), (AKDU) - Kumluca, 5.-6. Km of Kumluca-Altınyaka road, *Pinus brutia* forest, meadows, 180 m, 17.iv.2007, 180 m, İ.G. Deniz (2635), (AKDU) - Kumluca, around Olimpos Ancient City, *Pinus brutia* forest, 46 m, 09.iii.2007, İ.G. Deniz (2570), (AKDU) - Between Harbour-Tünektepe, edges of the creek, maquis places, 81 m, 05.iii.2006, İ.G. Deniz (2511), B.E. Tarıkahya, D. Şirin (AKDU) - Manavgat, Çayiçi District, meadows, 70 m, 15.iii.2005, İ.G. Deniz (2446), (AKDU) - Manavgat, Köprülü Kanyon National Park, 5 km N of Sağırin, 148 m, 16.iii.2006, İ.G. Deniz (2524), (AKDU) - Manavgat, Köprülü Kanyon National Park, Between Taşağıl-Sağırin, *Pinus brutia* forest, 56 m, 11.iii.2005, İ.G. Deniz (2443), H. Sümbül, C. Kemaloğlu, Ö. Tufan (AKDU) - Manavgat, 3 km W of Oymapınar Dam Lake, olive groves, 170 m, 15.iii.2005, İ.G. Deniz (2453), (AKDU) - Manavgat, Between Oymapınar-Tilkiler, olive groves, 62 m, 20.iii.2004, İ.G. Deniz (2344a), (AKDU) - Manavgat, Taşkesiği Village, fieldedges, 1000 m, 26.iii.1992, Ali A. Dönmez (3108), R.S. Göktürk, (HUB-36342) - Manavgat, Sorgun Forest, *Pinus brutia* forest, 16 m, 19.iii.2007, İ.G. Deniz (2600), C. Aykurt, A. Barut (AKDU). C4 Antalya: Alanya, Between Demirtaş-Sapadere, *Pinus brutia* forest, meadows, 133 m, 15.iii.2007, İ.G. Deniz (2571), (AKDU) - Gazipaşa, Between Beyobası-Maha Plateau, *Pinus brutia* forest, meadows, 223 m, 15.iii.2007, İ.G. Deniz (2581), (AKDU). C6 Hatay: Güney, Habib Neccar Mountain, Antakya district, 15.iii.1975, A. Baytop (ISTE-31331).

4. Conclusions and discussion

In this part of the present study, morphological characteristics of non-appendix 7 *Ophrys* L. taxa have been discussed and its differerences and relationship with the close taxa were given. The first taxa of the study is *Ophrys speculum* Link subsp. *speculum* with different shape and indumentum structure of the labellum. The specimens of *O. speculum* Link were described as a new species by J.H. Friedrich Link (1800) from the Setubal Province of Portugal. Because the taxa has a blue and shiny labellum, the name was derived from "speculum", which means mirror in Latin. The name of *O. speculum* was not included in the Flora of Turkey at the species level. Renz and Taubenheim (1984) showed it as the synonym of *O. vernixia* subsp. *vernixia*. Putting aside taxonomic similarities and differences between taxa, the fact that the priority rules do not apply, the nomenclature of this taxon is incorrect in Flora of Turkey. Link identified O. speculum in Latin and also showed the location clearly in his book, which was prepared for publication in 1799 and published in 1800. Therefore, the publication is sufficiently correct and valid. Whereas *O. vernixia* Brot was defined in *Flora Lusitanica* in 1804,- four years later, it is remarkable that the type location of both names in close regions of Portugal. Thus, according to 2006 World nomenclature codes and with the decisions taken within the framework of the 17th World International Botanical Congress in 2005, organized in Vienna (Austria), *O. speculum* is in the protected names class and has priority to other names (Menemen and Dönmez, 2006). For all these reasons, *Ophrys speculum* Link should be a valid taxon name in Flora of Turkey. In Turkey the species have two subspecies, *O. speculum* subsp. *speculum* and *O. speculum* subsp. *regis-ferdinandii*, showing distribution in the İzmir, Aydın and Muğla Provinces of Turkey. *O. speculum* subsp. *speculum* differs from subsp. *regis-ferdinandii* with inflorescence 2-9 flowered (not 2-12), the labellum has more dense indumentum and soborbicular (not stretched and narrowly elongate), middle lobe flattened when compared (not convex), lateral lobes triangular-oblong, and not or slighly spreading (not linear-oblong and spreading) characteristics.

The first examples of the *O. iricolor* were collected by Joseph Pitton de Tournefort from the Levant about three hundred years ago. It is not known exactly where he collected these samples during his Anatolian travels in 1701-1702. Some information obtained suggests the location to be Samos or İzmir (Delforge, 1995). Tournefort identified *O. iricolor* as "*Orchis orientalis fucum referens, flore maximo, scuto azureo"*. These examples were named with binomial nomenclature by Par M. Desfontaines and published in Choix De Plantes Corollaire Des Instituts De Tournefort. When defining the species, Desfontaines wrote "*Ophrys irise*" in parentheses because of the metallic blue color of the flowers and like *Iris*. *O. iricolor* is taxonomically close to *O. atlantica* which has distribution in Spain, Algeria, Morocco and Tunisia. At first glance these species differ from each other by labellum shapes. The labellum of *O. atlantica* is downward from base to end of the speculum (deeply concave at middle) and horizontal to the apex whereas *O. iricolor* labellum is slightly convex and in subhorizontal attitude. Furthermore, *O. iricolor* differs from *O. atlantica*; the

petals are shorter and less undulate, the lateral lobe of the labellum short and smaller than the middle lobe, base of the labellum is V-shaped.

The first examples of the *Ophrys omegaifera* subsp. *israelitica* was collected in 1979 by H. Baumann from Zefat in Israel, and published as *O. israelitica* (Baumann and Künkele, 1988). After *O. israelitica* was identified in this region, it was found by the addition of new locations that taxon has a wide distribution area from Israel to Greece. Having a wide distribution area and having been published recently, it can be interpreted that specimens of the taxon were collected by other researchers previously, but had been considered different taxa. Indeed, *O. fleischmanni* and *O. omegaifera* are very close to each other, as observed by Baumann and Künkele (1988), but they have taxonomic differences that can not be ignored. One of the four recorded collected specimens from C5 Icel: Ulas, Tarsus-Çamlıyayla and given in the Flora of Turkey by Renz and Taubenheim are evaluated in ISTF herbaria. Plant samples belonging to *O. israelitica* were examined in the province of Antalya at the many locations listed under the 'specimens examined' title in the present study. According to results of the field observations and evaluation of many herbarium specimens, it is determined that those examples identified as *O. fleischmanni* previously do in fact belong to *O. israelitica*. *O. omegaifera* subsp. *israelitica* is related to *O. omegaifera* subsp. *omegaifera*. It differs from the other subspecies distributed in Turkey by having labellum of dark brownish to violet brownish, plane on base half and convex (labellum not light brown colored, strongly convex base and apex like knee) speculum without omega shaped border.

O. phaseliana was described by Dietrich and Ursula Rückbrodt from Phaselis ancient city (Kemer/Antalya), and then the specimens were described as a new species in 1996 (Rückbrodt and Rückbrodt, 1996). Distribution area of this species, one of the endemic species of the Turkey, named the ancient city where it was discovered, is limited to the provinces of Muğla and Antalya. Despite many field studies in the area of the ancient city, no specimens of the species have been identified. Until 2008, *O. phaseliana* specimens could not be found in any of the locations mentioned in the literature, and this shows us that the species is critically endangered in the Antalya Province. The morphological evaluations in the present study are deduced from a single location where the specimens were found near Kumluca District. *O. phaseliana* is related to *O. cinereophila* distributed in the Antalya Province. The first examples of the *O. cinereophila* were collected from Neapolis (Greece) by H.F. Paulus in 1987 (Paulus, 1998). Distribution area of the species is restricted to the western parts of the Antalya Province, and it is quite remarkable that introduction of the species collected from Aegean Islands and Cyprus to Turkey after publication was just 16 years ago. *O. phaseliana* differs from *O. cinereophila* by 1-5 flowered inflorescence (not 5-7 (-10) flowered), sepals 11-16 x 5-8 mm (not 7-11 x 4-7.5 mm), labellum not pressed on the middle part (*O. cinereophila* labellum pressed on the middle part), yellowish to brownish ribbed or tessellate at apex part (*O. cinereophila* without ribbed or tessellate labellum) and 13.5-18.5 x 11.5-16.5 mm (not 7-13 x 5-10.5).

First examples of *Ophrys urtea* were collected in Taşağıl (Serik/Antalya) in 1998 by H.F. Paulus and it was introduced to the scientific community in 2009 (Paulus, 2009). *Ophrys blitopertha* is one of the species which is added to the Turkish Ophrys in the 11th volume of Flora of Turkey. The distribution area of the species is limited to the Izmir and Mugla Provinces of Turkey, and outside Turkey, it was recorded in the Aegean Islands. The first record of the species in Antalya Province was registered by Kreutz with 20 individuals in Oymapınar (Manavgat) in 1997. Specimens belonging to the species were examined only from this region were identified as *Ophrys blitopertha*. Subsequently, specimens distributed in Tasağıl and Manavgat populations were identified as a new species, *Ophrys urteae* by Paulus (2009) due to differences of labellum wing shape, flowering time and dedicated pollinator. Indeed, the epithet name of *Ophrys blitopertha* comes from its pollinator, *Blitopertha lineolata*. However, the pollinator of *Ophrys urteae* is *Blitopertha nigripennis*. Besides, *O. urteae* differs from *O. blitopertha* by smaller habit and flowers. *O. blitopertha* has very flat and dark labellum which is 9-12 in length (not 12-15 mm).

Ophrys lutea was described by Antonio J. Cavanilles in the Valencia Region of Spain, in 1793 (Cavanilles, 1793). Epithet name of the species was given because of the yellow color of labellum. Due to its morphological characteristics displaying wide variations, *Ophrys lutea* is one of the most frequently transferred-to species or subspecies taxa. *Ophrys lutea* subsp. *minor* which is characterized by small flowers primarily denominated as *Arachnites lutea* var. *minor* by Augustino Todaro in 1842 . Then in 1844, Gussone transferred to the *Ophrys* genus and introduced as *Ophrys lutea* var. *minor*. The transmission of the taxon to subspecies level in Flora of Turkey by O. & E. Danesch took place in 1975. During the publication period, this small flowered variety belonging to *Ophrys lutea* was named as *Ophrys sicula* at species level and *Ophrys lutea* var. *minor* Guss. and *Arachnites lutea* var. *minor* Todaro were showed as basionyms of this name by Vincenzo Tineo in 1846 (Tineo, 1846). When Tineo's study was examined, it is considered that differences with *Ophrys lutea* were only flowers size. In fact it is remarkable that Tineo uses the *Ophrys sicula* name instead of *Ophrys lutea* when transferring a taxon to species level. Soo has issued *Ophrys lutea* subsp. *sicula* by *Ophrys sicula* to subspecies of *Ophrys lutea* in 1927. Instability among Orchidaceae researchers about *Ophrys sicula* name has continued until the present day. Researchers have used various names for the same taxon in different periods and different taxonomic levels. *Ophrys sicula* wasn't included in the 8th and 11th volumes of Flora of Turkey and taxon was evaluated *O. lutea* when first published. *O. lutea* is represented by only one subspecies in our country; *Ohrys lutea* subsp. *minor*. This subspecies is related to *O. minor* subsp. *melena* which is distributed from South Balkan Peninsula to the Island of Crete and introduced by Renz in 1928. It differs from this subspecies by smaller habit and the yellow labellum edges (not orange or dark brownish).

After the present study, taxonomic evaluations will continue with the *Ophrys* taxa in different groups of Antalya and Turkey. The wide variation of the characteristics should not be considered as a new taxon in order not to increase the taxonomic problems of the *Ophrys* genus. Distributions of the taxa should be well examined and unusual morphological samples taken from the ends of the distribution region should be evaluated prioritarily as a variation before publishing as a new taxa. In addition to advanced taxonomic studies, orchid conservation efforts should be carried out to prevent the destruction caused by salep collection. The protection efforts for critically endangered plant species in Antalya are organised and led by the authors of this study (Deniz, 2011). One of the projects is the "*Ophrys lycia* (Lycian Kaş Orchid) Conservation Project" which is in it's second year, supported by The Scientific and Technological Reseach Council of Turkey (TUBITAK). In order to preserve *Ophrys lycia* for future generations, a conservation and research project was created. The other conservation project led by the authors is "Five Wonders of Antalya". The project is being carried out by the Association for the Conservation of Antalya Orchids and Biodiversity (CAOB), Akdeniz University and Antalya Regional Directorate of Forestry and supported by the Turkey's Life Grant Programme of WWF-Turkey. The project focuses on five critically endangered species in urgent need of protection and one of them is *Ophrys climacis* Heimeier & Perschke (Kemer Orchid). The current distribution range of the plants is being assessed by field studies. The required combinations

of environmental and ecological factors needed for the growth of the plant species are being studied, and seeds are being collected and stored in Turkey's Seed and Gene Bank. Informing the relevant institutions about the studies on endangered species is required for these and similar studies. Projects which integrate nature conservation efforts and interdisciplinary studies are pioneers for future regional projects.

Acknowledgements

We would like to thank Akdeniz University Scientific Research Projects Coordination Unit (20.02.0121.03) and TUBITAK (partly supported by TBAG-Ç-SEK/23 103T008) for financial support.

References

Aybeke, M. 2007. Pollen and Seed Morphology of Some *Ophrys* L. (Orchidaceae) Taxa, Journal of Plant Biology, 50/4: 387-395.

Baumann, H., Künkele, S. 1988. Neue Beiträge zur Taxonomie europäischer und mediterraner Orchideen. *Arbeitskreis Heimische Orchideen*, 20/3: 610-651.

Baytop, T. 1994. Türkçe Bitki Adları Sözlüğü. Türk Dil Kurumu Yayınları, Ankara.

Boissier, E. 1884. Flora Orientalis. Vol. 5, Geneve Botany Press, Geneve.

Butcher, R. W. 1961. British Flora. Vol. 2, Leonard Hill Limited, London.

Cavanilles, A.J. 1793. *Ophrys lutea* Cav. In: Icon.

Davis, P.H. 1965-1985. Flora of Turkey and the East Aegean Islands. Vol. 1-9, Edinburg University Press, Edinburg.

Delforge, P. 1995. Orchids of Britain and Europe (Collins Field Guide). Harper Collins publishers, London.

Deniz, İ.G. 2010. Orchids of Antalya, XIII. Optima Meeting, Antalya. 122.

Deniz, İ.G. 2011. *Ophrys lycia* (Lycian Kaş Orchid) Conservation Project, Bağbahçe, 37: 26-27.

Desfontaines, P. M. 1808. Choix De Plantes Corollaire Des Instituts De Tournefort. De L'imprimeire De Levrault, Rue Meizeres, No: 8, Paris.

Ekim,T., Koyuncu, M., Vural, M., Duman, H., Aytaç, Z. and Adıgüzel, N. 2000. Türkiye Bitkileri Kırmızı Kitabı (Eğrelti ve Tohumlu Bitkiler), Türkiye Tabiatını Koruma Derneği-Van Yüzüncü Yıl Üniversitesi Yayını, Ankara.

Feinbrun-Dothan, N. 1986. Flora Palaestina. Vol. 4, The Israel Academy of Sciences and Humanities Press, Jerusalem.

Füller, F. 1982. *Ophrys*. A. Ziemsen Verlag, Wittenberg Lutherstadt.

Govaerts, R. 2003. World Checklist of Monocotyledons Database in Access: 1-71827. The Board of Trustees of the Royal Botanic Gardens, Kew.

Güler, N., Sezik, E., Olgun, G. 2008. Morphological and Chorological Studies on Orchids (Orchidaceae) of the Ida Mountains (NW-Turkey): I.- J. Eur. Orch. 40/2: 177-224.

Güner, A., Aslan, S., Ekim, T., Vural, M. & Babaç, M.T. (Eds.). 2012. Türkiye Bitkileri Listesi (Damarlı Bitkiler). Nezahat Gökyiğit Botanik Bahçesi ve Flora Araştırmaları Derneği Yayını. İstanbul.

Heywood, V. H. 1978. Flowering Plants of the World. Oxford University Press, England.

IUCN Standards and Petitions Subcommittee. 2014. Guidelines for Using the IUCN Red List Categories and Criteria. Version 11. Prepared by the Standards and Petitions Subcommittee.

Koyuncu, O., Yaylacı, Ö.K., Öztürk, D., Erkara, İ.P., Savaroğlu, F., Osoydan, K., Ardiç, M. 2011. Distribution, elements of destruction and evaluation of risk categories of Orchids in Osmaneli (Bilecik/Turkey) and its environs. Biological Diversity and Conservation (BioDiCon), Volume 4/1. 122-133.

Kreutz, C.A.J. 2000. *Ophrys*. In: A. Güner, N. Özhatay, T. Ekim, K. H. C. Başer (Eds.), Flora of Turkey and the East Aegean Islands. Vol. 11, Edinburgh University Press, Edinburgh.

Kreutz, C.A.J., Çolak, H.A. 2009. Türkiye Orkideleri. Rota Yayınları, İstanbul.

Link, J.H.F. 1800. *Ophrys speculum*, J. Bot. (Schrader) 2: 324.

Linne, C. 1753. Species Plantarum. Vol. 1-2, Laurentius Salvius, Holmiae (Stockholm).

Meikle, R. D. 1985. Flora of Cyprus. Vol. 2, Royal Botanic Gardens Press, Kew.

Menemen, Y. and Dönmez, A.A. 2006. Uluslararası Botanik Adlandırma Yasası (Viyana Yasası Türkçe Çevirisi), Doğan Matbaacılık, Ankara.

Mouterde, P. 1966. Nouvelle Flore Du Liban et de la Syrie. Vol. 2, Dar El-Machreq Éditeurs, Beyrouth, Liban.

Özhatay, N., Kültür, Ş., Aslan, S. 2009. Check-list of additional taxa to the Supplement Flora of Turkey IV. Turk J Bot 33: 191-226.

Paulus, H.F. 1998. Der *Ophrys fusca* s. str.-Komplex auf Kreta und anderer Ägäisinseln mit Beschreibung von *O. blitopertha, O. creberrima, O. cinereophila, O. cressa, O. thriptiensis* und *O. creticola* ssp. nov. (Orchidaceae). *Journal Europäischer Orchideen*, 30: 157-201.

Paulus, H. F. 2009. Bestäubungsbiologie einiger Ophrys-Arten der Süd-Türkei (Prov. Antalya) mit Beschreibung einer weiteren "Käfer-fusca" *Ophrys urteae* spec. nov. (Orchidaceae und Coleoptera, Scarabaeidae). *Ber. Arbeitskrs. Heim. Orchid.* 26/2: 6-24.

Pedersen, H.A and Faurholdt, N. 2007. *Ophrys*: The Bee Orchids of Europe. Royal Botanic Gardens Press, Kew.

Pignatti, S. 1982. Flora D'Italia. Vol. Terzo, Edagricole Press, Roma.

Renz, J., Taubenheim, G. 1984. *Ophrys*. In: P.H. Davis (Editor), Flora of Turkey and the East Aegean Islands. Vol. 8, Edinburgh University Press, Edinburgh.

Rückbrodt, D., Rückbrodt, U. 1996. *Ophrys phaseliana*, eine neue *Ophrys* aus dem komplex *Ophrys fusca s.* str. aus der südwestlichen Türkei. *Journal Europäischer Orchideen*, 28: 391-403.

Sezik, E. 1984. Orkidelerimiz - Türkiye'nin Orkideleri, Sandoz Kültür Yayınları, İstanbul.

Sezik, E. 2002. Turkish Orchids and Salep. *Acta Pharmaceutica Turcica*, 44: 151-157.

Soo, R. 1980. *Ophrys*. In: T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters, D. A. Webb (Eds.), Flora Europaea, Vol. 5, Cambridge University Press, Cambridge.

Tineo, V. 1846. *Ophrys sicula* Tin. In: Plant Rar. Sicilia.

(Received for publication 18 July 2014; The date of publication 15 April 2015)