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Two hybrid orchids described from Malta: *Ophrys* ×*tumentia* nothosubsp. *tumentia* and *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii*

Keywords
Orchidaceae; *Ophrys caesiella; Ophrys iricolor* subsp. *hospitalis; Ophrys iricolor* subsp. *vallesiana*; *Ophrys* ×*tumentia* nothosubsp. *tumentia*; *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii*; Malta.

Summary
Mifsud, S. (2014): Two hybrid orchids described from Malta: *Ophrys* ×*tumentia* nothosubsp. *tumentia* and *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii*.- J. Eur. Orch. 46 (3/4): 686-700.
Two hybrid orchids of *Ophrys caesiella* with, respectively, the very early flowering *Ophrys iricolor* subsp. *hospitalis* and the later flowering *Ophrys iricolor* subsp. *vallesiana* are described from Malta. The descriptions of these two hybrids are supported by respective intermediate characters found flowering in sympatric association with their parent orchids.

Zusammenfassung

Mifsud, S. (2014): Von Malta werden zwei Hybriden beschrieben: *Ophrys* ×*tumentia* nothosubsp. *tumentia* and *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii*.- J. Eur. Orch. 46 (3/4): 686-700.
Es handelt sich jeweils um Hybriden mit *Ophrys caesiella*, einerseits mit der sehr früh blühenden, von Malta beschriebenen *Ophrys iricolor* subsp. *hospitalis* und andererseits mit der später blühenden *Ophrys iricolor* subsp. *vallesiana*. Die Beschreibungen dieser beiden Hybriden zeigen in der Blüte jeweils einen intermediären Charakter zwischen den jeweiligen Eltern auf.

* * *

1. Background

As established by MIFSUD & LEWIS (2011), two distinct *Ophrys iricolor* s.l. taxa are found on Malta distinguished from each other by their phenology and morphology. The first taxon flowers mainly in January, with a few last flowers in the first week of February. In addition to its early flowering time, as conveyed by MIFSUD & LEWIS (2011): "Typical plants are short (6 –16 cm high) with 2 – 5 flowers and small leaves. The labellum is medium sized (11– 14 (– 15) mm long). The basal ridges are pronounced as is normal for the *O. iricolor* s.l. group. The labellum colour is reddish to dark brown, sometimes with a purple tinge and often with a thin yellow margin. The speculum is milky blue to dull greyish blue, sometimes with darker blobs. The underlip is usually entirely green."

This orchid was previously attributed to the early-flowering *O. mesaritica* which grows on Crete. However, DELFORGE (2012) distinguished it morphologically from *O. mesaritica* mainly based on different floral dimensions. In view of this distinction, he named the Maltese early-flowering *Ophrys* as a new species: *O. hospitalis* Delforge. On the basis that the rank of subspecies was more appropriate for *mesaritica, vallesiana* and other taxa within the *O. iricolor* s.l. group, as listed by KREUTZ (2004) and BAUMANN et al. (2006), this was subsequently renamed *O. iricolor* subsp. *hospitalis* S. Mifsud & L. Lewis (MIFSUD & LEWIS 2013).

As also stated by MIFSUD & LEWIS (2011), another Maltese *O. iricolor* s.l. taxon flowers from distinctly later; between the last week of February into end of March. This is generally taller (12 – 32 cm high) than the early flowering *O. iricolor* subsp. *hospitalis* and has more (4 – 9) flowers and larger leaves. In addition, the labellum is larger (typically 15 – 17 mm long) and generally dull brown with a purple tinge and a dull greyish blue speculum. The underlip is normally red with a clear–cut yellowish–green border about 1 – 1.5 mm wide. These plants were attributed to *O. vallesiana,* a taxon first described from Tunis. For consistency with above, the subspecific name *O. iricolor* subsp. *vallesiana* (Devillers-Tersch. & Devillers) Paulus & Gack is now considered more appropriate by the authors.

Ophrys caesiella is a member of the *O. fusca* s.l. group ("Pseudophrys") first described from Malta by DELFORGE (2000) and recently united with *O. gazella* (=*O. africana*) (MIFSUD & LEWIS 2013). The labellum is narrow, straight or slightly curved, typically 10-13 mm long by 9-11.5 mm wide with long dark brown- hairs and a narrow yellow border. It has two rather weak, rounded basal crests separated by a shallow groove. The speculum is greyish-blue. The underlip is green.

In this paper, basal crests are referred to the base of lips with rounded humps, shallow or pronounced, while basal ridges are referable to the special basal crests diagnostic of *O. iricolor* s.l. group which have narrow acute edges inclined obliquely towards the exterior and hence looking like small ridges. This jargon is adapted from DELFORGE (2006).

As illustrated in Fig. 1, the flowering times of these two *O. iricolor* subspecies in Malta overlap with *O. caesiella* for a short time, normally from about the last 2 weeks of January to the beginning of February for *O. iricolor* subsp. *hospitalis* and the end of February to the beginning of March for *O. iricolor* subsp. *vallesiana*. Gene flow can therefore occur from the two subspecies of *O. iricolor* to *O. caesiella* forming a sympatric hybrid population, a well-documented evolutionary process in Mediterranean *Ophrys* populations (e.g. SOLIVA & WILDMER 2003).

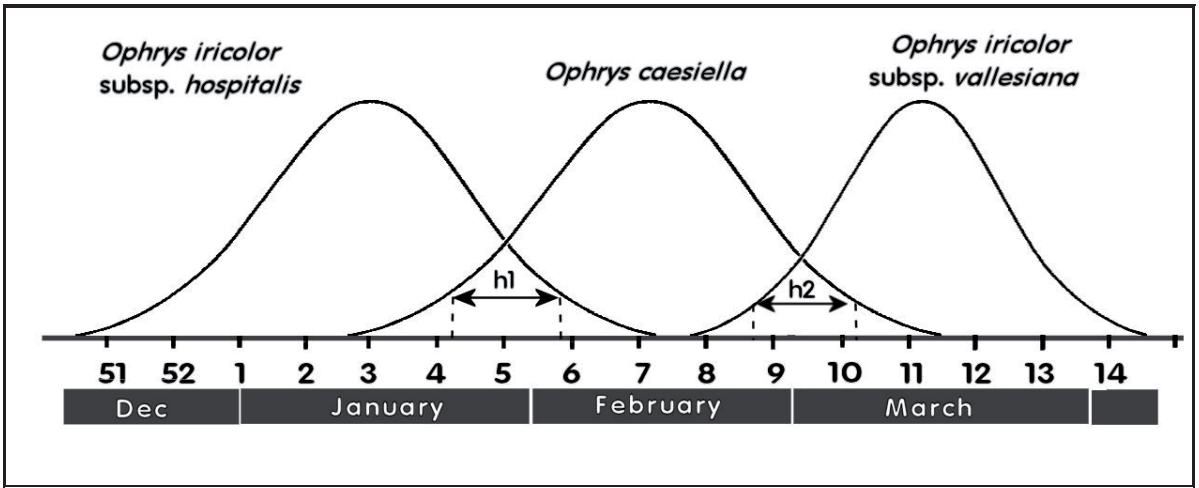

Fig. 1: Model of flowering period of *Ophrys iricolor* subsp. *hospitalis* (end December to end of January), *O. caesiella* (mid January to mid March) and *O. iricolor* subsp. *vallesiana* (end February to end March), hence a short overlapping period (about two weeks) at h1 and h2 for the respective parent species. Numbers represent the start of a week in the Gregorian calendar.

Present at il-Palma and San Martin (limits of Wardija), Bajda ridge (Xemxija), and Red Tower (Mellieha) are scattered populations of orchids similar to *Ophrys caesiella* but with prominent and swollen basal crests and a variably geniculated labellum (MIFSUD & LEWIS 2011). Since the morphology of these plants is variably intermediate between *O. caesiella* and *O. iricolor* s.l and since they grow with or close to both species, it was suggested by MIFSUD & LEWIS (2011) that they are hybrids of *O. caesiella* and *O. iricolor* s.l. but were not formally described.

2. Field observations

Surveys were carried out in three sites where numerous specimens of *O. caesiella* × *O. iricolor* s.l. have been previously found growing with their parents: San Martin and il-Palma (Wardija) and Red Tower (Mellieha) (MIFSUD & LEWIS 2011) or only their parents as at Ta' Isopu (Nadur, Gozo) (MIFSUD & LEWIS 2013). The main aim of these surveys was to reconfirm the presence of the hybrids and parents growing together ideally on the same day and same spot, re-examine the morphologies of the hybrid swarms for further support and to collect voucher specimens in order to name the hybrid(s).

During a survey at San Martin on 5 February 2014, many *O. caesiella* in full flower (Fig. 2a-b) and a smaller number of *O. iricolor* subsp. *hospitalis* with only their last flowers remaining (Fig. 2e-f) were found growing together, accompanied by several morphologically intermediate plants forming a hybrid swarm. Representative hybrid specimens (e.g. Fig. 2c-d) clearly possessing features of both parents were subsequently collected from this location on 8 February 2014. As expected, the March-flowering *O. iricolor* subsp. *vallesiana* was not found in flower at this time and therefore these intermediate plants were not *Ophrys caesiella* × *Ophrys iricolor* subsp. *vallesiana*.

During a survey at Red Tower, Malta on 1 March 2014, numerous *O. caesiella* specimens (Fig. 3a-c) were found together with a few solitary specimens of *O. iricolor* subsp. *vallesiana* (Fig. 3g-i) about 200m away. During this survey, as well on earlier surveys in January 2014 and in previous years, the early-flowering *O. iricolor* subsp. *hospitalis* was absent from this site; indeed that subspecies has never been recorded there. During this survey, several plants morphologically intermediate between *O. caesiella* and *O. iricolor* subsp. *vallesiana* (Fig. 3d-f) were also found growing with the *O. caesiella* population In the absence of *O. iricolor* subsp. *hospitalis*, these intermediate plants were clearly *O. caesiella* × *O. iricolor* subsp. *vallesiana*, as previously concluded (MIFSUD & LEWIS 2011).

Two further searches for hybrids and respective parents growing together were also made in the garigue around at il-Qortin ta' Issopu (Nadur, Gozo) where *O. iricolor* subsp. *hospitalis* (MIFSUD & LEWIS 2011) had previously been found growing about 400m away from a large population of *O. caesiella* discovered later by MIFSUD & LEWIS (2013). When *O. iricolor* subsp. *hospitalis* was found in last flowers during late January 2014, the *O. caesiella* population was still in leaf rosettes, while in early March of the same year, *O. caesiella* was found in flower, but the small population of *O. iricolor* subsp. *hospitalis* was in fruit and flowerless.

Fig. 2: *Ophrys caesiella* × *Ophrys iricolor* subsp. *hospitalis* (*Ophrys* ×*tumentia* nothosubsp. *sancti-martinii*) and its parents from San Martin and il-Palma, Wardija area, San Pawl il-Bahar, Malta, asl 180 m, 5.2.2014, (phot. SM):

a-b. *Ophrys caesiella* (parent);

c-d. *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii* (hybrid);

e-f. *Ophrys iricolor* subsp. *hospitalis* (parent);

g. Parents at sides and intermediates in middle showing the subtle morphological differences namely the basal crests exhibited as small swellings in *O. caesiella* (right) to pronounced swellings in hybrids to a ridged plateaux in *O. iricolor* subsp. *hospitalis* (left).

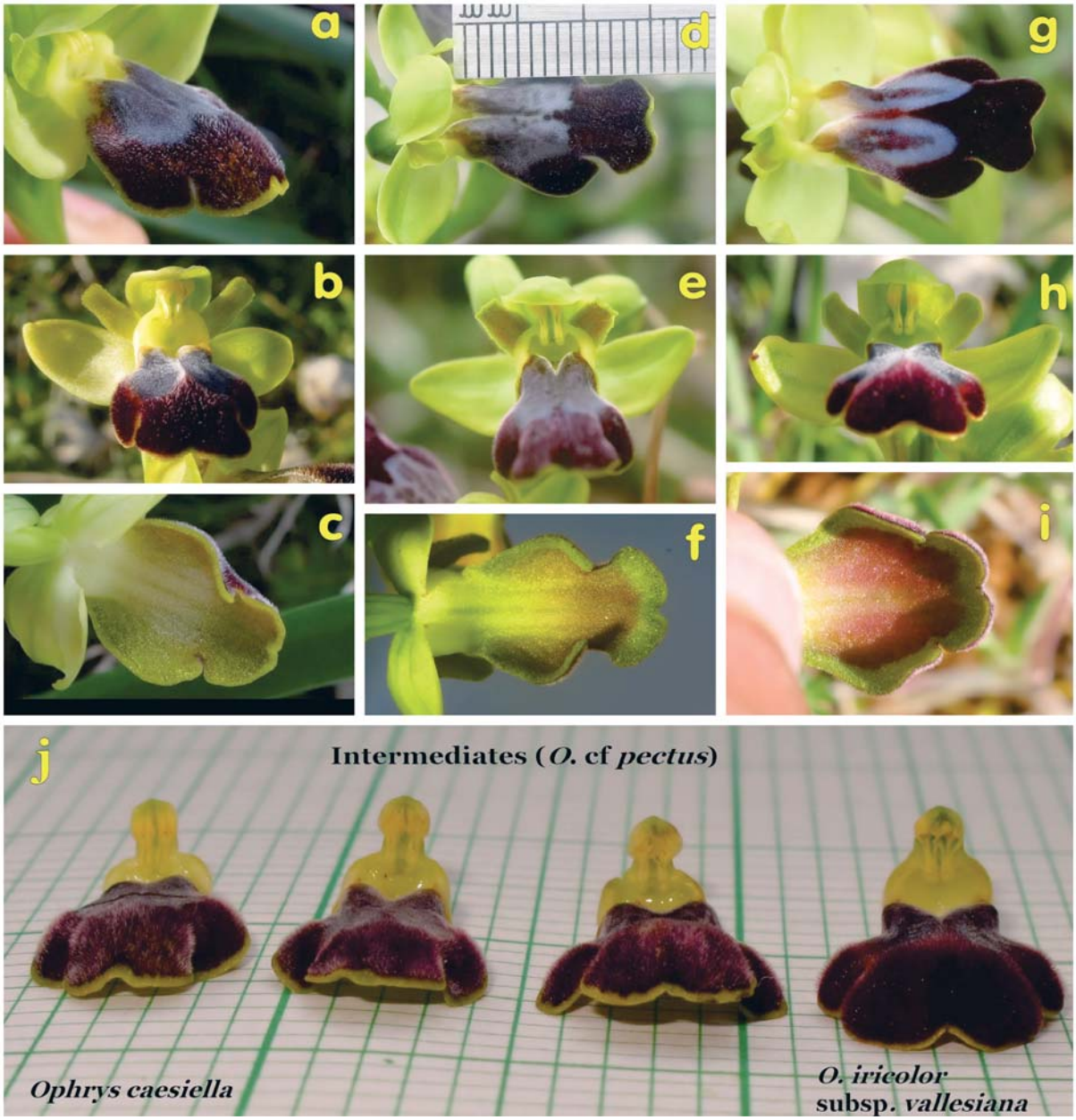

Fig. 3: *Ophrys caesiella* × *Ophrys iricolor* subsp. *vallesiana* (*Ophrys* ×*tumentia* nothosubsp. *tumentia*) and its parents from Red Tower area, Mellieha, Malta, asl 160 m, 1.3.2014. (phot. SM):
a-b-c. *Ophrys caesiella* (parent);
d-e-f. *Ophrys* ×*tumentia* nothosubsp. *tumentia* (hybrid);
g-h-i. *Ophrys iricolor* subsp. *vallesiana* (parent);
j. Parents at sides and intermediates in middle showing the morphological progression of critical characters, namely the basal crests changing from the small swellings in *O. caesiella* (left) to pronounced swellings in the central intermediates to a ridged plateau in *O. iricolor* subsp. *vallesiana* (right).

Nevertheless, few hybrids with swollen basal crests were spotted amongst the *O. caesiella* population but their number was in lower frequency from the other populations in mainland Malta and showed less variability and introgression. Although the parents were not found in flower simultaneously on this survey, it cannot be excluded that hybridisation events never took place in the past.

3. Discussion

As is often the case with Ophrys hybrids, for example, the hybrid swarms of *O. iricolor* s.l. and *O. lupercalis* reported by STÖKL et al. (2008), the plants in the *O. caesiella* × *O. iricolor* s.l. hybrids found at San Martin and Red Tower vary in morphology between the extremes of these parent taxa. However, for simplicity, this discussion and the diagnoses below are directed to *O. caesiella* × *O. iricolor* s.l. hybrids in which morphological features of both parents are evident.

MIFSUD & LEWIS (2011: 626-627) explained in detail the reasons for concluding that the plants referred to in that a paper as "*O.* cf. *pectus*", are hybrids of *O. caesiella* and *O. iricolor* s.l., now referable to *O.* ×*tumentia* s.l. To support further this conclusion, this year's surveys have permitted to find respective parents of both hybrids flowering close together at the same day, while careful examination of the hybrid swarms gave further evidence about the intermediate characters of their parents. In this respect, the most distinctive character for *O.* ×*tumentia* s.l. is the shape of the basal crests of the lip, which are swollen and raised up usually forming a deep or prominent groove. This particular shape is the result of an intermediate form between the rounded and shallow crests of *O. caesiella* and the raised, ridged plateau-like crests of *Ophrys iricolor* s.l. as illustrated in Fig. 2g and 3j. Few hybrids even possessed an obscure iricolor-like plateau with rounded edges as in Fig. 4c and Fig. 5c. Similarly, DANESCH & DANESCH (1972: 375) have also reported a hybrid between *O. fusca* subsp *leucadica* and *O. iricolor* stating that hybrids are characterised by pronounced lip bases with hinted edges (shown swollen in their photo); underlips faded red and recalling that of *O. iricolor* and lip sizes vary between those of their parents. Images of *O. caesiella* from South Sicily from reputable websites (EOH 2014; JMM 2014; OBE 2014) have lip bases without swollen crests. It is deduced that these images comes from pure *O. caesiella* populations with negligible introgression from *O. iricolor* s.l.

In addition, a specimen of *O. caesiella* × *O. iricolor* subsp. *vallesiana* with prominent rounded basal crests and a strongly geniculated labellum was illustrated first as *O. bilunulata* × *O. mesaritica* (DELFORGE 1993: 100, Fig. 6)

and then as *O. pectus* from Malta by (DELFORGE 2006: 407). Consistent with conclusion stated here, DELFORGE (1993) also perceived that the morphology of the il–Palma plants was clearly intermediate that of *O. bilunulata* [now *O. caesiella* on Malta] and *O. mesaritica* (= O. *iricolor* subsp. *hospitalis*)

With regards to *O. caesiella* × *O. iricolor* subsp. *vallesiana*, apart they possess more prominent basal crests, they often possess a red underlip with a clear-cut green border as that of *O. iricolor* subsp. *vallesiana* but usually less intense or faint. STÖKL et al. (2008), also ascribed specimens from Sardinia, Italy with iricolor-like red underlips but without the typical iricolor's ridges as hybrids between *O. lupercalis* and *O. iricolor*. *O. caesiella* × *O. vallesiana* tend to be more robust, taller and with longer labellum (up to 15mm) than is normal for *O. caesiella* s.str. Typical specimens of *O. caesiella* × *Ophrys iricolor* subsp. *hospitalis* are illustrated in Figs. 2 and 4, together with the parent taxa for comparison. Typical specimens of *O. caesiella* × *Ophrys iricolor* subsp. *vallesiana* are illustrated in Figs. 3 and 5, together with the parent taxa for comparison. Further illustrations are contained in MIFSUD & LEWIS (2011).

The two hybrids are quite similar to each and an important morphological difference is the more frequent presence a red underlip with a clear-cut green border in *O. caesiella* × *O. iricolor* subsp. *vallesiana* than in *O. caesiella* × *O. iricolor* subsp. *hospitalis*, which often have a green underlip. Besides that, specimens of *O. caesiella* × *O. iricolor* subsp. *hospitalis* were usually smaller plants with smaller lips as indicated in Table 1.

However, the most significant difference between the two hybrids is their flowering times, namely early February in the case of *O. caesiella* × *O. iricolor* subsp. *hospitalis*, and late February to mid-March in the case of *O. caesiella* × *O. iricolor* subsp. *vallesiana*. Needless to say, identification of the hybrid concerned is most reliably supported by identification of which *O. iricolor* subspecies is growing nearby.

The account given above is a rather simplistic approach and should be concluded by giving further accent on the range of variability observed in these hybrid swarms. As expected in hybrid swarms, there is a progressive variation of a character state of one parent to the state of the other parent in corresponding intermediates. In this case, such variable character states include the size of the lip, the degree of swelling of the basal prominences and the intensity of the red-green pattern of the underlip (MIFSUD & LEWIS 2011: Figs. 1-12).

Fig. 4: *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii* hybrid swarm from San Martin and il-Palma, limits of San Pawl il-Bahar, Malta, asl 180 m, 5.2.2014, (phot. SM):

a. typical specimen with well-defined rounded swollen basal crests, yellow margin, lip around 12-13mm;

b. affinity *caesiella* with slightly reduced but still prominent swellings, smaller lip and caesiella-like yellow margin;

c. affinity *iricolor* subsp. *hospitalis* with swollen basal crests but obscurely resembling the plateaux and ridges of *O. iricolor* s.l.

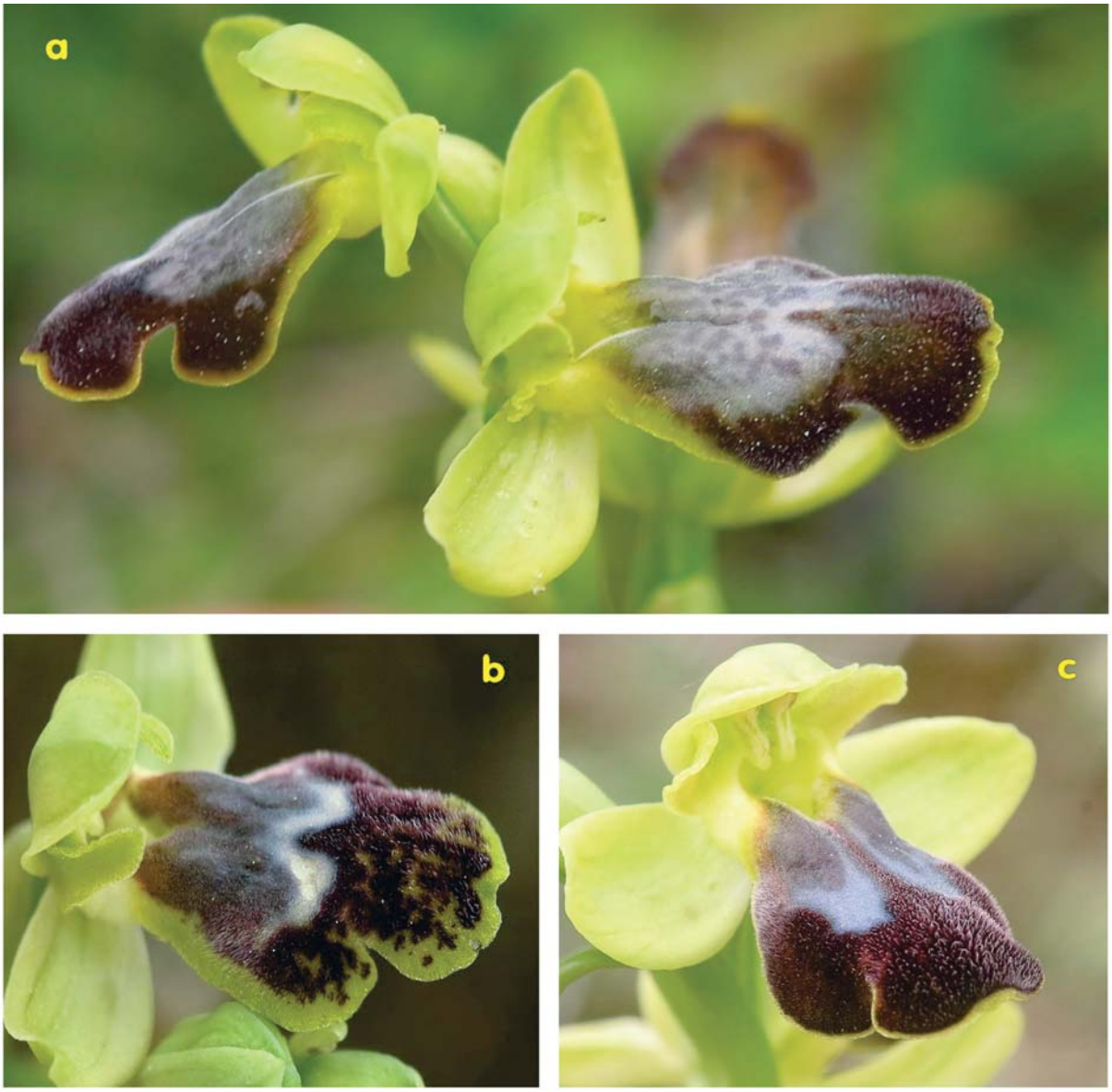

Fig. 5: *Ophrys* ×*tumentia* nothosubsp. *tumentia* hybrid swarm from Red Tower area, Mellieha, Malta, asl 160 m, 1.3.2014. (phot. SM):

a. typical specimen with well-defined rounded swollen basal crests, yellow margin, lip 14mm and a reddish-pink underlip with a clear-cut green border (not shown here, but refer to Fig. 3f);

b. affinity *caesiella* with slightly reduced but still prominent swellings, smaller lip and caesiella-like yellow margin and pale speculum;

c. affinity *iricolor* subsp. *vallesiana* with rounded, upraised basal crests but obscurely resembling the ridges of *O. iricolor* s.l.

Moreover, hybrid swarms composed of more than two parents is considerd plausible at il-Palma and San Martin where *O. iricolor* subsp. *hospitalis*, *O. caesiella* and *O. iricolor* subsp. *vallesiana* share a patchy distribution (MIFSUD & LEWIS 2011) and hence creating a larger gene pool.

The hybrid *O. caesiella* × *O. iricolor* subsp. *hospitalis* have an endemic parent and consequently it is likewise endemic to the Maltese islands. The parents of *O. caesiella* × *O. iricolor* subsp. *vallesiana* are found in other territories such as in Tunisia (LE FLOC'H, BOULOS & VELA 2010) and the possibility that hybrids are also present outside Malta cannot be excluded, but until this is confirmed, this hybrid is currently considered as an endemic too. These hybrids are constituted by less than 800 specimens in few stations, with a fragmented distribution and habitat suffering from several threats and pressures. Their Redlist status is hence suggested to be critically endangered with criteria B1ab(i,ii,iii,iv,v). As a result, they should be included in Schedule VI (animal and plant species of national interest in need of strict protection) of the next amendment of the corresponding Legal Notice (LN311, 2006) which currently includes their respective parents. Many orchid species are strictly protected in Malta and this study was covered by a permit from the competent authority (currently the Malta Environment Planning Authority).

4. Hybrids of *Ophrys caesiella* × *Ophrys iricolor* (*Ophrys* ×*tumentia*)

The two hybrids are now formally named as follows:

4.1 *Ophrys* ×*tumentia* S. Mifsud nothosp. nat. nov.

(Ophrys caesiella P. Delforge × *Ophrys iricolor* Desfontaines)

nothosubsp. *tumentia*

(*Ophrys caesiella* P. Delforge × *Ophrys iricolor* subsp. *vallesiana* (J. Devillers-Terschuren & P. Devillers) H. F. Paulus & Gack)

Diagnosis: Closely resembling *O. caesiella* but distinguished from that species by its more prominent, wide, rounded and swollen basal crests. Distinguished from *O. iricolor* subsp. *vallesiana* by possessing prominent basal crests which are more rounded and wider than the narrow basal ridges of *O. iricolor* subsp. *vallesiana* and are separated by a wider groove. Distinguished from *O. caesiella* × *O. iricolor* subsp. *hospitalis* (*O.* ×*tumentia* nothosubsp. *sancti-martinii*) by its later flowering time (late February to mid- March compared with early February); also, usually has a faint to prominent red underlip with a clear-cut green border whereas *O. caesiella* × *O. iricolor* subsp. *hospitalis* has a green underlip.

Holotype: Red Tower, Mellieha, Malta; Sloped garigue facing north, 1.3.2014, Argotti Botanical Gardens, Malta (ARG), collection no. SMIFS21, leg. S. Mifsud (Fig. 6b).

Isotype: Red Tower, Mellieha, Malta; Sloped garigue facing north, 1.3.2014, Royal Botanic Garden, Edinburgh (E), collection no. SMIFS23, leg. S. Mifsud.

Etymology: The specific epithet *tumentia* refers to the two swellings at the base of the lip, the most distinctive character for the hybrid.

4.2 *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii* S. Mifsud nothosubsp. nat. nov.

(*Ophrys caesiella* P. Delforge × *Ophrys iricolor* Desfontaines subsp. *hospitalis* (P. Delforge) S. Mifsud & L. Lewis)

Diagnosis: Closely resembling *O. caesiella* but distinguished from that species by its more prominent, wide, rounded and swollen basal crests. Distinguished from *O. iricolor* subsp. *hospitalis* by possessing prominent basal ridges which are more rounded and wider than the narrow basal ridges of *O. iricolor* subsp. *hospitalis* and are separated by a wider groove. Distinguished from *O. caesiella* × *O. iricolor* subsp. *vallensiana* (*O.* ×*tumentia* nothosubsp. *tumentia*) by its earlier flowering time (early February compared with late February to mid- March); also, has a green underlip whereas *O. caesiella* × *O. iricolor* subsp. *vallesiana* usually has a faint to prominent red underlip with a clear-cut green border.

Holotype: San Martin, Wardija, San Pawl il-Bahar, Malta; sloped garigue with stepic communities such as *Asphodelus aestivus,* 8.2.2014, Argotti Botanical Gardens, Malta (ARG), collection no. SMIFS20, leg. S. Mifsud (Fig. 6a).

Isotype: San Martin, Wardija, San Pawl il-Bahar, Malta; sloped garigue with stepic communities such as *Asphodelus aestivus,* 8.2.2014, Royal Botanic Garden, Edinburgh (E), collection no. SMIFS22, leg. S. Mifsud.

Etymology: The specific epithet *tumentia* refers to the two swellings at the base of the lip, the most distinctive character for the hybrid. The nothosubspecific epithet *sancti-martinii* derives from the location of the holotype at San Martin, Malta.

Fig. 6: Holotype specimens in liquid preservative:
a. *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii* collected from San Martin, San Pawl il-Bahar, Malta (8-2-2014), accession SMIFS20;
b. *Ophrys* ×*tumentia* nothosubsp. *tumentia* collected from Red Tower area, Mellieha, Malta (1-3-2014), accession SMIFS21.

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Table 1. Characters of the holotypes of *Ophrys* ×*tumentia* nothosubsp. *sancti-martinii* and *Ophrys* ×*tumentia* nothosubsp. *tumentia*

Character	***Ophrys* ×*tumentia* nothosubsp. *sancti-martinii***	***Ophrys* ×*tumentia* nothosubsp. *tumentia***
Location	Wardija, San Pawl il-Bahar, Malta	Red Tower, Mellieha, Malta
Observed in flower	05. Feb 14	01-Mar-14
Habitat	Sloped rocky ground with labiate-garigue vegetation, slightly degraded and steppic at parts.	Sloped rocky ground with labiate-garigue vegetation.
Plant length	15cm	21cm
Leaf size	5.5 x 2.0cm	7.0cm x 3.5cm
No. of flowers	5	5
Sepals Size	11 x 6.5mm	11 x 6mm
Sepals shape	Broad lanceolate to triangular with a blunt rounded tip; pale green.	Broad lanceolate to triangular with a blunt rounded tip; pale green.
Size upper petals	7mm x 2.5mm	7.5mm x 2.5mm
Shape upper petals	Oblong, green with a brownish edge	Oblong with an obtuse tip, olive-green colour.
Labellum Size	12mm x 10.5mm	14mm x 12.5mm
Lip Profile	Slightly pendant, sub-horizontal	Almost horizontal
Lip Angle	35 deg	33 deg
Underlip	Completely yellowish-green	Red centre with a clear-cut broad, bright green border
Speculum	Metallic greyish-blue, with darker speckles.	Metallic dull blue, with slightly darker speckles;
Basal crests	Prominent, swollen and rounded, relatively wide and separated by a deep groove	Prominent, swollen and rounded, relatively wide and separated by a deep groove