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Anacamptis × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. *(Orchidaceae),* a new hybrid

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Abstract. *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. is described and illustrated. It is a hybrid of *A. collina* and *A. papilionacea* subsp. *grandiflora.* Its known distribution and current situation in Spain are here presented, as well as its relationships with other hybrids of the *A. papilionacea* group.

Resumen. Se describe e ilustra *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov., un híbrido de *A. collina* y *A. papilionacea* subsp. *grandiflora.* Se ofrece su distribución y situación actual en España, así como su relación con otros híbridos del grupo de *A. papilionacea*.

Keywords. *Anacamptis,* hybrid, Murcia, nomenclature, *Orchidaceae, Orchis,* Spain, taxonomy.

Palabras clave. *Anacamptis,* España, híbrido, Murcia, nomenclatura, *Orchidaceae, Orchis,* taxonomía.

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INTRODUCTION

Anacamptis × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. is a hybrid of *A. collina* (Banks & Sol. ex Russell) R.M.Bateman & al. *(Orchis collina* Banks & Sol. ex Russell, bason.) and *A. papilionacea* subsp. *grandiflora* (Boiss.) Kreutz *(Orchis papilionacea* var. *grandiflora* Boiss., bason.). *Anacamptis collina* is a species that occurs along the coasts of the Mediterranean reaching, along the Tigris and Euphrates rivers, the Persian Gulf and Azerbaijan. It has stems 10–50 cm tall with 3–20 flowers; lateral petals 5.8–10.7 mm long with one nerve; labellum 7.6–11.8 × 7.8–12.3 mm without macules, with scarce papillae; spur 4.6–7.8 × 3–4.7 mm, sac-shaped. This species exhibits little variability (Aedo 2005; Kretzschmar & al. 2007; Delforge 2016), except for a variety with yellowish flower, which must be referred as *Orchis collina* var. *flavescens* Soó, and some specimens with a somewhat laxer inflorescence recently described in Badajoz as *Anacamptis collina* f. *laxi-spicata* F.M.Vázquez (Vázquez Pardo 2009).

Anacamptis papilionacea (L.) R.M.Bateman & al. *(Orchis papilionacea* L., bason.) is a species that also inhabits the Mediterranean, reaching the east of Asia Minor and the Caspian Sea; in the Iberian Peninsula and northern Africa it reaches the Atlantic coast. It has stems 11–55 cm tall with 6–22 flowers; lateral petals 10–17.2 mm long with 3–4 nerves; labellum (9)13.7–21(26) × (7)14.3–23.6(27) mm, with pink stripes or macules, with abundant papillae; spur 8.7–13.5 × 1.4–2,5 mm, cylindrical. It shows a great variability, on which consensus has not yet been achieved. It is discussed whether it is a single taxon across the Mediterranean and the Near East (Aedo 2005) or it groups several entities (Baumann 1986; Baumann & al. 2007; Kretzschmar & al. 2007; Delforge 2016). A genetic analysis performed few years ago revealed a low variability, but it relied exclusively on material collected in the central Mediterranean, just where the typical subspecies is abundant (Arduino & al. 1995). We consider here the subspecific rank as the most appropriate for these taxa, because the morphological variations are associated to particular geographic areas (Kretzschmar & al. 2007), and because when two of these entities cohabit no transition blurring their traits is observed (Scopece & al. 2009).

Thus, there are various opinions about the number of taxa that *A. papilionacea* includes —four in Baumann (1986), five in Baumann & al. (2007), six in Kretzschmar & al. (2007), and up to eight in Delforge (2016)—, and also

about their taxonomic rank, since Baumann (1986), Baumann & al. (2007), and Kretzschmar & al. (2007) consider them as subspecies, while Delforge (2016) considers them as varieties. These different views regarding the number of entities in the eastern Mediterranean, where the diversity of the group is greater.

However, there is agreement in separating at least four entities, one inhabiting the western Mediterranean, another one the central Mediterranean, and two more the eastern Mediterranean. Two of them have a lip 13–18(19.5) × (12.7)13–25 mm, wide, more or less rounded, flabellate *[A. papilionacea* subsp. *grandiflora* in the western Mediterranean, and *A. papilionacea* subsp. *heroica* (E.D.Clarke) Kreutz in the eastern Mediterranean] and two others with lip 8.5–13 × 7–13(14) mm, narrow, more or less cuneate *[A. papilionacea* subsp. *papilionacea* in the central Mediterranean and *A. papilionacea* subsp. *schirwanica* (Woronow) H.Kretzschmar & al. in the eastern Mediterranean]. This matches the criteria of Baumann (1986), which is the most conservative one. To these four taxa, we should add another subspecies of the eastern Mediterranean with small lip, *A. papilionacea* subsp. *palaestina* (H.Baumann & R.Lorenz) H.Kretzschmar & al., close to the *«papilionacea-schirwanica* group», but with obovoid lip with rounded apex, and with lines or points that do not appear in the last group.

We follow here the criterion of Bateman & al. (2003), including *Orchis papilionacea* and *Orchis collina* in *Anacamptis* Rich. as in several recent general studies (Akbaç 2012; Tison & al. 2014; Claessens & Kleynen 2016; GIROS 2016). The concept of the genus *Orchis* L. has changed over time; a detailed study of its evolution can be found in Kretzschmar & al. (2007). We apply here a cladistic monophyletic criterion to separate genera, so that *Orchis papilionacea* and *Orchis collina* are placed in *Anacamptis,* as is shown in molecular biology studies on the ITS region of ribosomal DNA (Bateman & al. 1997; Bateman & al., 2003), and in a more recent research that also includes the mitochondrial cox1 intron and the plastid *rp116* intron (Inda & al. 2012) to nrITS. Likewise, the ornamentation of seeds supports this approach (Gamarra & al. 2012). After the reorganization of *Orchis,* other studies have separated out the genus even further. Thus, Tyteca & Klein (2008) created a new genus *(Herorchis* D.Tyteca & E.Klein), where they included the plants that we consider here in *Anacamptis,* whereas Delforge (2009) also considered different genera for *Orchis* s.l., although he left *Anacamptis* as a monospecific genus and recovered the genus *Vermeulenia* A.Löve & D.Löve (Löve & Löve 1972) for *A. papilionacea* and *A. collina.*

Regarding the described hybrids of *A. collina* and *A. papilionacea* s.l., the first of them, which was described from a Syrian specimen, was *Orchis* × *dueluekae* Hautz. (Hautzinger 1976: 52, 1978: 69); for this hybrid *A. papilionacea* s.l. should have been ascribed to *A. papilionacea* subsp. *palaestina,* since this subspecies lives in Syria, while *A. papilionacea* subsp. *papilionacea* does not (Baumann & Lorenz 2005; Kretzschmar & al. 2007: 148). Some years later, Luz & Schmidt (1981) revised the type —deposited in the herbarium W— of *Orchis* × *dueluekae,* and concluded that it was in fact *Orchis collina.* In their paper, they provided a monochrome image of the type, which actually has the appearance of *Orchis collina:* despite of the bad quality of the image, the spur and the labellum are typical for this taxon. Unfortunately, we have recently looked for that sheet in W without success —Ernst Vitek, pers. comm.—. In their description of the hybrid, Luz & Schmidt (1981) proposed *Orchis collina* and *Orchis caspia* Trautv. as parents, where the second taxon is not, apparently, a synonym of *A. papilionacea* subsp. *palaestina,* a subspecies not present in the area, but of *A. papilionacea* subsp. *schirwanica.* The type was collected in Galilee —Israel— and deposited in the herbarium STU. They included two images of the parents and the hybrid, where the intermediate traits of the Israeli specimen can indeed be observed. They described it as *Orchis* × *dafnii* W.Schmidt & Luz.

The other hybrid that has been described so far in the group comes from the Italian Peninsula and is a hybrid of the nominal subspecies of *A. papilionacea* and *A. collina* (Kohlmüller 1993). It was collected in Mount Gargano, where only the nominal subspecies is present (Kretzschmar & al. 2007: 148), so that there is no doubt about the parents. A former reference must be assigned to the same hybrid, although as *O.* × *dueluekae,* from Surbo —Lecce, NE Italy— (D'Emerico & al. 1989).

The finding of a group of deviant specimens of *A. papilionacea* by Pedro Solano, as well as a solitary individual a few kilometers away from those by Juan Monpeán later, gave us an indication to consider them as belonging to a hybrid between *A. collina* and *A. papilionacea* subsp. *grandiflora,* two early flowering species which cohabit in the area.

MATERIAL AND METHODS

Positioning data have been taken with a GARMIN GPS device, using DATUM ETRS 89. Thirty-two morphological characters were considered, comprising sixteen qualitative characters, sixteen quantitative characters, and one phenological character. The morphological data of the parents are based on previously published works (Aedo 2005; Kretzschmar & al. 2007) and on data taken from alive individuals and herbarium specimens from Murcia (see table 1). The RAL colour palette (Ral Colours 2017) has been used to define the colours of bracts and flowers, in order to objectify a trait that can be relevant in orchids

Table 1. Comparison of characters of *Anacamptis collina* (Banks & Sol. ex Russell) R.M.Bateman & al., *A. papilionacea* subsp. *grandiflora* (Boiss.) Kreutz and their hybrid, *A.* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. —data of the parents taken from Aedo (2005).

	A. collina	***A.* × *dafnii* nothosubsp. *solanoi*, nothosubsp. nov.**	***A. papilionacea* subsp. *grandiflora***
Number of basal leaves	(2)3–6	2–5	(3)4–9
Basal leaves lenght and width	1.1–9.4(12) × 1.3–3.2 cm	4.8–6 × 1.6–2.4 cm	3–14(18) × 0.8–1.7(2) cm
Basal leaves form	broadly lanceolate	broadly lanceolate	lanceolate
Margin of basal leaves	not undulate	not undulate	undulate
Number of upper stem leaves	1–3(4)	4	1–4(5)
Upper stem leaves (colour in the inflorescence)	not tainted	not tainted	sometime stained red
Overal height of the stem and the inflorescence	(10)14–31(40) cm	17–48 cm	(11)18–38(55) cm
Inflorescence lenght	4.5–9.6(13) cm	7.5–10.5(24) cm	3.9–11.8 cm
Inflorescence form	cylindrical	cylindrical	subglobular or ± cylindrical (compact)
Number of flowers per inflorescence	4–15(22)	10–15(19)	6–15(22)
Basal flower bract	19.7–38.5 × 3.7–9.1 mm	24–30 × 5–10 mm	21–44 × 4–12.1 mm
Bracts colour	pearl pink (RAL 3033)	signal violet (RAL 4008)	signal violet (RAL 4008)
Ovary	13.2–23 mm	12–14 mm	14.8–24.1 mm
Gynostegium	3–5 mm	3–4 mm	3–5 mm
Stigmatic cavity	wide, rounded	wide, rounded	narrow
Sepals colour	wine red (RAL 3005)	signal violet (RAL 4008)	signal violet (RAL 4008)
Connivent sepals	no	yes	yes
Lateral sepals lenght	8.6–13.1 × 2.3–4 mm	10 × 3–4 mm	(8)13.2–21,4 × (4)5.2–8,1 mm
Number of nerves of sepals	3	3	3–5
Central sepal lenght	7.8–12.1 × 2.2–4.5 mm	12–14 × 3–4 mm	10.2–19.2 × 2,7–6.3 mm
Lateral petals lenght	5.8–10.7 × 1.6–3.3 mm	14–15 × 5–6 mm	10–17.2 × 2–4.6 mm
Number of nerves of lateral petals	1	3–4	3–4
Lateral petals colour	beige red (RAL 3012)	traffic purple (RAL 4006)	traffic purple (RAL 4006)
Labelum lenght and width	7.6–11.8 × 7.8–12.3 mm	13–18 × 10–17 mm	(9)13.7–21(26) × (7)14.3–23.6(27) mm
Outline shape of labelum	flabellate, flat or with revolving edges	flabellate almost round, flat	flabellate, flat or slightly concave
Labelum colour	signal violet (RAL 4008), sometimes white with Broom yellow (RAL 1032) margin	traffic purple (RAL 4006)	white with lines Signal violet (RAL 4008)
Markings type of labelum	–	no macules or very few at the mouth of the throat	pink stripes or macules
Colour of the zone of the labellum proximal to the spur	white	white	same coloration as the rest of the labellum
Surface (especially markings) papillate of labelum	scarce papillae, < 0.1 mm, conical	abundant papillae, 0.1–0.2 mm, conical	abundant papillae, > 0.2 mm, cylindrical
Spur lenght	4.6–7.8 × 3–4.7 mm	9–10 × 3 mm	8.7–13.5 × 1.4–2.5 mm
Spur form	sac-shaped	flattened sac-shaped	cylindrical
Spur colour	white (sometimes light pink, RAL 3015)	light pink (RAL 3015)	light pink (RAL 3015)
Flowering period	January-February	February-March	March-April

(Serra & Soler 2012). The separation between the previously described hybrids and the new one are summarized in the table 2. The nomenclature, synonymy and types of the involved taxa are summarized in the appendix 1. The scarce number of specimens of populations mentioned in Additional material studied prevent us to collect them. Thus, to support such records, photographs of specimens of the different populations have been provided in the appendix 2.

RESULTS

Anacamptis × ***dafnii*** nothosubsp. ***solanoi*** Serra & López Esp., nothosubsp. nov. *[A. collina* (Banks & Sol. ex Russell) R.M.Bateman, Pridgeon & M.W.Chase × *A. papilionacea* subsp. *grandiflora* (Boiss.) Kreutz].

Table 2. Comparison of characters of *Anacamptis* × *dafnii* (Wolfg. Schmidt & R.Luz) H.Kretzschmar & al. nothosubsp. *dafnii, A.* × *dafnii* nothosubsp. *camparonensis* (Kohlmüller) H.Kretzschmar & al., and A. × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. —data taken from Luz & Schmidt (1981), Kohlmüller (1993), and Kretzschmar & al. (2007).

	A.* × *dafnii* nothosubsp. *dafnii	***A.* × *dafnii* nothosubsp. *camparonensis***	***A.* × *dafnii* nothosubsp. *solanoi***
Overal height of the stem and the inflorescence	13.1–27.1 cm	18 cm	17–48 cm
Inflorescence lenght	4.2–11.4 cm	7.5 cm	7.5–10.5(24) cm
Number of flowers	13	7–8	10–15(19)
Bracts lenght	20–30 mm	25 mm	24–30 mm
Bracts width	3.5–5.5 mm	–	5-10 mm
Sepals lenght	9–11 mm	12 mm	10 mm
Sepals width	3–3.5 mm	5 mm	3-4 mm
Number of nerves of sepals	4–5	3–5	3
Lateral petals lenght	8–9 mm	7 mm	14–15 mm
Lateral petals width	2 mm	3 mm	5–6 mm
Number of nerves of lateral petals	2–3	3	3–4
Labellum lenght	9–11 mm	11 mm	13–18 mm
Labellum width	8–10 mm	10 mm	10–17 mm
Outline shape of labelum	crenated	entire	flabellate almost round, flat
Markings type of labelum	pink stripes or macules	–	no macules or very few at the mouth of the throat

Type: Spain, Murcia, Cartagena, Colada del Cedacero, 30SXG7465, 50 m a.s.l., ubi inter parentes, 20–II–2016, *L. Serra, P. Solano, J. A. López Espinosa & A. Bort* s.n. (holo-: VAL 232771!). Figs. 1, 2b, 3.

LISD: urn:lsid:ipni.org:names:77174191-1

It differs from A. collina by its bigger lateral petals and the presence of 3-4 nerves; connivent sepals; labellum wider, without macules or with very few, more intense colour; spur longer, less sac-shaped but flattened; papillae of labellum a little longer and more abundant. It differs from the second parent —A. papilionacea subsp. grandiflora— by its broadly lanceolate leaves, cylindrical inflorescence, elongated, never compact nor subglobous; clearly smaller lateral sepals; labellum somewhat smaller, purple, with hardly any lines or macules and flattened, sac-shaped spur; papillae of labellum a little smaller and more scarce.

Stems 17–29(48) cm, glabrous, with 2–5 basal leaves 4.8–6 × 1.6–2,4 cm, broadly lanceolate, in rosette, glabrous, without macules, smooth; top stem leaves 4, without macules, the upper ones similar to the bracts. Inflorescence 7.5–10.5(24) cm, cylindrical, with 10–15(19) flowers, sessile, opening from the base to the apex. Bract of the basal flower 24–30 × 5–10 mm, signal violet in colour —RAL 4008—, lanceolate, glabrous. Sepals free, glabrous, signal violet in colour —RAL 4008—, with 3 nerves, lanceolate, more or less connivent, the lateral sepals 10 × 3–4 mm, the central sepals 12–14 × 3–4 mm. Lateral petals 14–15 × 5–6 mm, with 3–4 nerves, lanceolate, glabrous, traffic purple in colour —RAL 4006—. Labellum 13–18 × 10–17 mm, more or less flat, and almost rounded, with margin whole or slightly sawed, traffic purple in colour —RAL 4006—, without macules or with very few in the throat, this one white. Spur 9–10 × 3 mm, slightly sac-shaped but flattened, arched down, light pink in colour —RAL 3015—, with a green or pink line in its ventral part. Gynostegium 3–4 mm. Ovary 12–14 mm, glabrous.

Etymology.—Hybrid dedicated to Pedro Solano, its first discoverer, an Enviromental Agent deeply committed to ensure its conservation.

Habitat.—The area studied is located on marshes and sandstones of the Messinian, in a semi-arid ombrotype and a thermomediterranean thermotype. In spite of the scarce rainfall of the area, the proximity of the sea and the shady spots of nearby hills increase the humidity, so that it coexists in the clearings of these shrubs, in its classic locality, with *Ophrys bilunulata* Risso, *Ophrys lupercalis* Devillers-Tersch. & Devillers, *Ophrys lutea* Cav., *Ophrys speculum* Link, *Ophrys tenthredinifera* Willd., in addition to both parents. Other geophytes that appear in the area are *Arisarum vulgare* Targ.-Tozz, *Asphodelus cerasiferus* J.Gay, *Dipcadi serotinum* (L.) Medik., *Gynandriris sisyrinchium* (L.) Parl. and *Romulea*

Fig. 1. General appearance of the type of *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. [VAL 232771].

columnae Sebast. & Mauri. All of them appear in the clearings left by the dwarf-shrubs *Fumana hispidula* Loscos & J.Pardo, *Helianthemum viscarium* Boiss. & Reut., *Globularia alypum* L., *Rosmarinus officinalis* L., *Stipa tenacissima* L., *Teucrium carolipaui* C.Vicioso ex Pau, *T. carthaginense* Lange, *Thymus hyemalis* Lange, and *Sideritis pusilla* subsp. *carthaginensis* (Pau ex Font Quer) Alcaraz & al.

Phenology.—It begins to bloom at the end of January in Murcia, coinciding with the end of the flowering period of *A. collina*. Its flowering does not coincide with that of its parents for a couple of weeks, ending in late February or early March, just when the flowering of *A. papilionacea* subsp. *grandiflora* becomes more widespread. It has been observed in Badajoz from February to early April, and it has been observed in Almería and Málaga in March.

Distribution.—At the moment, it has been found in the provinces of Almería, Badajoz, Málaga and Murcia, in Spain (fig. 4), but its presence is likely in areas where both parents coexists. Accordingly, it could be located in the future in other Spanish localities, the southern Portugal, Morocco, Algeria, Tunisia, Sardinia, and Sicily.

Since its initial finding in 2016, it has been observed in other nearby localities, and the places already known have offered more individuals, probably thanks to the better environmental conditions and the greater sampling effort (see table 3). Even so, it is very scarce compared to the parents.

Table 3. Number of individuals in the studied populations in Murcia.

Locality	no. individuals 2016	no. individuals 2017
Colada del Cedacero	13	21
Atamaría	1	2
Sierra Gorda	2	7
Sierra Minera	0	23
Total	16	53

Additional material studied.—SPAIN. ALMERÍA. Adra, Sierra del Calar, pr. Cortijo del Collado, 30SVF9070, 18–III–2017, photograph by J.A. Sánchez Pérez and E. Capilla [1 individual].

BADAJOZ. Atalaya, 29SQC24, 27–III–2011, photograph by F. Montaño —http://proyectoorquidea-extremadura.blogspot.com.es/2011_03_01_archive.html—; sierra de Los Santos de Maimona, 29SQC35, II–2011, photograph by L. Romero & J. Montero, —http://proyectoorquidea-extremadura.blogspot.com.es/2011/02/orchis-collina-x-orchis-papilionacea.html—; Campiña Sur, 30STH44, 1–IV–2015, photograph by Cosetano —http://foro.infojardin.com/threads/orquideas-silvestres-ibericas-de-2015.19053/page-10.

MÁLAGA. Alhaurín el Grande, Puerto de los Pescadores, Sierra de Mijas, 30SUF4753, 302 m a.s.l., 11–III–2017, photograph by J.A. Díaz Rodríguez [1 individual].

MURCIA. Cartagena, Colada del Cedacero, 30XG7465, 50 m a.s.l., 20–II–2016, *L. Serra, A. Bort, J.A. López Espinosa* and *P. Solano* s.n. (VAL 232771) [loc. class., 17 individuals]; ibid., 30SXG7365, 28–II–2017, photograph by P. Solano [4 individuals]; ibid., Casa de las Cenizas, Atamaría, 20–II–2016, 30SXG9262, 140 m a.s.l., photograph by L. Serra, A. Bort and J.A. López Espinosa [1 individual]; ibid., 30SXG9263, 25–II–2017, photograph by C. Portillo, M.C. Casas, L. Caballero and C. Núñez López [1 individual]; ibid., Sierra Gorda, 30SXG8263, 85 m a.s.l., 11–II–2016, photograph by J.L. Sánchez Vidal [1 individual]; ibid., 28–II–2017, photograph by J.A. López Espinosa [7 individuals]; ibid., Sierra Minera, La Peraleja, 30SXG8463, 95 m a.s.l., 2–III–2017, photograph by P. Solano [8 individuals]; ibid., 30SXG8564, photograph by P. Solano [14 individuals]; La Unión, Sierra Minera, El Lazareto, 30SXG8764, 155 m a.s.l., 22–II–2017, photograph by J. García [1 individual].

DISCUSSION

Anacamptis × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. differs from *A.* × *dafnii* nothosubsp. *dafnii* by its bigger bracts, fewer nerves in the sepals, lateral petals and labellum wider and bigger, and labellum with no macules or very few at the mouth of the throat. It differs from *A.* × *dafnii* nothosubsp. *camparonensis* (Kohlmüller) H.Kretzschmar & al. for its higher number of flowers per inflorescence, smaller lateral sepals, and wider and bigger lateral petals and labellum (see table 2).

It is currently acknowledged that hybridization is one of the main factors for speciation (Abbott & al. 2013), especially in plants (Whitman & al. 1999: 426; Mallet 2005), but when the hybrid cohabits with any of the parents and these are legally protected, the risk of disappearance of the parental species due to genetic dilution with the hybrid places decision makers with a complex dilemma, the alternatives being: (i) to intervene in the hybridization process and the possible consolidation of a taxon; (ii) to

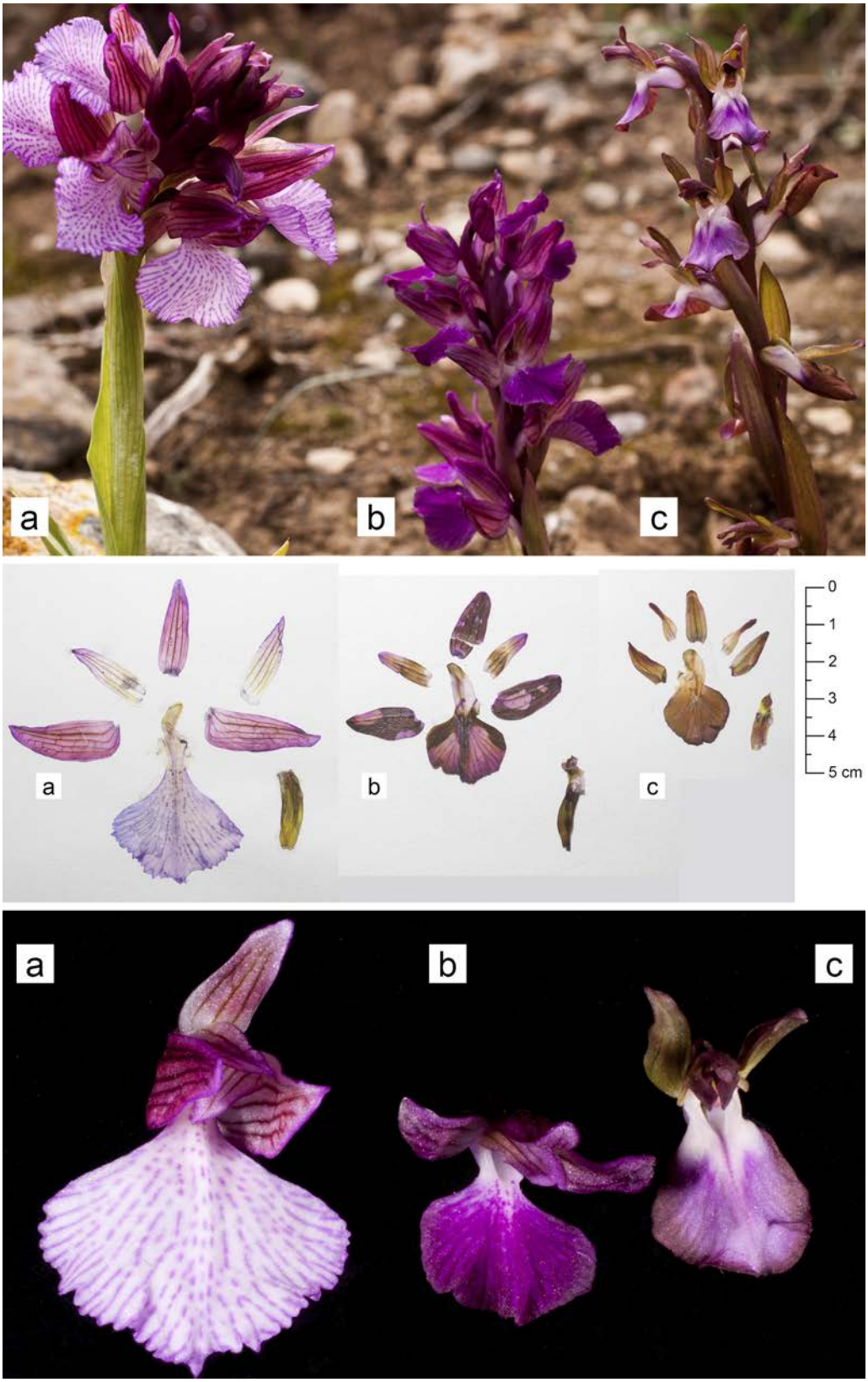

Fig. 2. Inflorescence —upper—, dissection of the flower —middle—, and flower —bottom—: **a,** *Anacamptis papilionacea* subsp. *grandiflora* (Boiss.) Kreutz; **b,** *A.* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov.; **c,** *A. collina* (Banks & Sol. ex Russell) R.M.Bateman & al. [a, LSH 12463; b, VAL 232771; c, LSL 12464].

Fig. 3. Flower detail of the type of *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. [VAL 232771].

eradicate the hybrid in order to preserve the protected population of the scarce species (Fay & al. 2007).

The taxonomic complexity of some Mediterranean orchid genera, and the existence of active evolutionary processes with the participation of hybrids, complicate the application of protection regulations conceived for groups which are more evolutionarily stable or have a clearer taxonomy. Therefore, the management of populations affected by hybridization/speciation processes demands a preservation bias (Vereecken & al. 2010: 235; Serra & Soler 2012: 241). Some countries are developing guidance for the management of hybrids with preservation value. In those procedures, the origin of the hybrid (natural/anthropogenic) and the conservation status of the parental species are considered (Jackiw & al. 2015).

The case we are dealing with is a small population of a hybrid cohabiting with large populations of its parents, which are not endangered. In such circumstances we consider of interest the conservation of the hybrid, as is the case with *Narcissus* × *perez-larae* Font Quer (Marques & Draper 2006) in the Valencian Community: the hybrid, very scarce, does not pose any risk to the survival of any the parental species, and has been protected.

In the case of Mediterranean orchids, the strategy of presenting a spur without nectar to deceive pollinators is effective only if these can find food in other taxa of the surroundings. This is the case of *A. papilionacea* subsp. *palaestina, A. israelitica* (H.Baumann & Dafni) R.M.Bateman & al. and their hybrid *A.* × *feinbruniae* (H.Baumann & Dafni) H.Kretzschmar & al. (Vereecken & al. 2010: 233), studied in Israel, in which nectar producing species, like *Asphodelus ramosus* L. *(Asphodelus microcarpus* Viv.), live near those orchids. In our case it is highly likely that the abundant presence

Fig. 4. Populations located in Spain of *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov. (red dots).

of *Asphodelus cerasiferus* J.Gay cohabiting with *A. papilionacea* subsp. *grandiflora* has the same effect, increasing the numbers of pollinators of the hybrid.

For all these reasons, it would be necessary to take some *in situ* conservation measures in the areas where these processes are occurring. Specifically, a flora micro reserve could be established in the classic locality where the hybrid appears, following the example of the Valencian Community (Laguna & al. 2004). Furthermore, it should be noted that the risk of disappearance of these species and the ecological and evolutionary processes in place is high, as part of the hillocks in which the new hybrid lives are considered as building land by the urban regulations of Cartagena.

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REFERENCES

Abbott R., Albach D., Ansell S., Arntzen J.W., Baird J.E., Bierne N., Boughman J., Brelsford A., Buerkle C.A., Buggs R., Butlin R.K., Dieckmann U., Eroukhmanoff F., Grill A., Ahan S.H., Hermansen J.S., Hewitt G., Hudson A.G., Jiggins C., Jones J., Keller B., Marczewski T., Mallet J., Martínez-Rodríguez P., Most M., Mullen S., Nichols R., Nolte A.W., Parisod C., Pfennig K., Rice A.M., Ritchie M.G., Seifert B., Smadja C.M., Stelkens R., Szymura J.M., Vainola R., Wolf J.B.W. & Zinner D. 2013. Hybridization and speciation. *Journal of evolutionary biology* 26: 229–246. https://doi.org/10.1111/j.1420-9101.2012.02599.x

Aedo C. 2005. *Orchis. In* Aedo C. & Herrero A. (eds.), *Flora iberica* 21: 114–146. Real Jardín Botánico de Madrid CSIC, Madrid.

Akbaç F. 2012. *Anatolia Orchids.* Say Dagitim. Istanbul.

Arduino P., Cianchi R., Rossi W., Corrias B. & Bullini L. 1995. Genetic variation in *Orchis papilionacea (Orchidaceae)* from the Central Mediterranean region: taxonomic inferences at the intraspecific level. *Plant systematics and evolution* 194 (1/2): 9¬-23.

Bateman R.M., Pridgeon A.M. & Chase M.W. 1997. Phylogenetics of subtribe *Orchidinae (Orchidoideae, Orchidaceae)* based on nuclear ITS sequences. 2. Infrageneric relationships and reclasification to achieve monophyly of *Orchis sensu stricto. Lindleyana* 12 (3): 113¬-141.

Bateman R.M., Hollingsworth P.M., Preston J., Yi-Bo L., Pridgeon A.M. & Chase M.W. 2003. Molecular phylogenetics and evolution of *Orchidinae* and selected *Habenariinae (Orchidaceae). Botanical journal of the Linnean Society* 142: 1–40. https://doi.org/10.1046/j.1095-8339.2003.00157.x

Baumann H. 1986. Zur Polymorphie yon *Orchis papilionacea* L. *Jahresbericht des Naturwissenschaftlichen Vereins in Wuppertal* 39: 87–97.

Baumann H. & Lorenz R. 2005. Beitrage zur Taxonomie europaischer und mediterraner Orchideen. *Journal Europäischer Orchideen* 37: 939–974.

Baumann H., Künkele S. & Lorenz R. 2007. *Guía de Orquídeas de Europa. Groenlandia, Azores, Norte de África y Oriente Medio.* Ediciones Omega, Sabadell.

Bock B. 2011. Révisions nomenclaturales et taxonomiques (note n° 1). *Bulletin de la Société Botanique du Centre-Ouest* 42: 263–278.

Burdet H.M., Charpin A. & Jacquemoud F. 1982. Types nomenclaturaux des taxa ibériques décrits par Boissier ou Reuter. II. Iridacées à Potamogetonacées. *Candollea* 37: 381–395.

Claessens J. & Kleynen J. 2016. *Orchidées d'Europe. Fleur et pollinisation.* Biotope éditions, Mèze.

Delforge P. 2009. Orchis and monophyly. *Naturalistes Belges. Bulletin mensuel* 90 (Orchid. 22): 15–35.

Delforge P. 2016. *Orchidées d'Europe, d'Afrique du Nord et du Proche-Orient* ed. 4. Delachaux et Niestlé, Paris.

D'Emerico S., Medagli P. & Ruggiero L. 1989. *Orchis × dulukae* Hautzinger: un hybride presque impossible découvert dans les Pouilles (Italie). *L'Orchidophile* 87: 131–133.

Fay M.F., Smith R.J., Zuiderduin K., Hooper E., Samuel R., Bateman R.M. & Chase M.W. 2007. How does hybridization influence the decision making process in conservation? The genus *Orchis (Orchidaceae)* as a case history. *Lankesteriana* 7 (1–2): 135–137.

Gamarra, R., Ortúñez, E., Galán Cela, P. & Guadaño, V. 2012. Anacamptis versus Orchis (Orchidaceae): seed micromorphology and its taxonomic significance. *Plant systematics and evolution* 298: 597–607. https://doi.org/10.1007/s00606-011-0569-1

GIROS 2016. *Orchidee d'Italia. Guida alle orchidee spontanee. Cornaredo.* Il Castello, Cornaredo.

Hautzinger L. 1976. Nomenclature und systematische Beiträge zur Familie *Orchidaceae. Verhandlungen der Zoologisch-Botanischen Gesellschaft in Wien* 115: 40–54.

Hautzinger L. 1978. Genus *Orchis* L. *(Orchidaceae);* Sectio *Robustocalcare* Hautzinger. *Annalen des Naturhistorischen Museums in Wien* 81: 31–73.

Inda L.A., Pimentel Pereira M. & Chase M.W. 2012. Phylogenetics of tribe *Orchideae (Orchidaceae: Orchidoideae)* based on combined DNA matrices: inferences regarding timing of diversification and evolution of pollination syndromes. *Annals of Botany* 110: 71–90. https://doi.org/10.1093/aob/mcs083

Jackiw R.N., Mandil G. & Hager H.A. 2015. A framework to guide the conservation of species hybrids based on ethical and ecological considerations. *Conservation Biology* 29 (4): 1040–1051. https://doi.org/10.1111/cobi.12526

Kohlmüller R. 1993. Neufund einiger Hybriden am Monte Gargano. *Die Orchidee* 44 (2): 95–98.

Kretzschmar H., Eccarius W. & Dietrich H. 2007. *The Orchid Genera Anacamptis, Orchis, Neotinea* ed. 2. EchinoMedia, Bürgel.

Laguna E., Deltoro V., Pérez Botella J., Pérez Rovira P., Serra L., Olivares A., & Fabregat C. 2004. The role os small reserves in plant conservation in a region of high diversity in eastern Spain. *Conservation biology in practice* 119: 421–426. https://doi.org/10.1016/j.biocon.2004.01.001

Löve A. & Löve D. 1972. *Vermeulenia* — A new genus of orchids. *Acta botanica neerlandica* 21 (5): 553–554. https://doi.org/10.1111/j.1438-8677.1972.tb00809.x

Luz R. & Schmidt W. 1981. *Orchis* × *dafnii* hybr. nat. nov. - ein neuer Orchis-Bastard aus Israel. *Mitteilungsblatt, Arbeitskreis heimische Orchideen Baden-Württemberg* 13 (4): 447–454.

Mallet J. 2005. Hybridization as an invasion of the genome. *Trends in Ecology & Evolution* 20 (5): 229–237. https://doi.org/10.1016/j.tree.2005.02.010

Marques I. & Draper D. 2006. Creating management guidelines for hybrid plants. The case of *Narcissus* × *perezlarae* Font Quer. *In* Aguilella A., Ibars A., Laguna E. & Pérez-Rocher B. (eds.), *Proceedings of the 4th European Conference on the Conservation of Wild Plants, Planta Europa* [CD-ROM]. Generalitat Valenciana and Universitat de Valencia, Valencia.

McNeill J., Barrie F.R., Buck W.R., Demoulin V., Greuter W., Hawksworth D.L., Herendeen P.S., Knapp S., Marhold K., Prado J., Prud'homme van Reine W.F., Smith G.F., Wiersema J.H. & Turland N.J. 2012. *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code).* Koeltz Scientific Books, Koenigstein.

Ral Colours 2017. German RAL Institute. Website: http://www.ralcolor.com/ [accessed: 28-II-2017].

Scopece G., Juillet N., Müller A., Schiestl F.P. & Cozzolino S. 2009. Pollinator attraction in *Anacamptis papilionacea (Orchidaceae):* a food or a sex promise? *Plant Species Biology* 24: 109–114. https://doi.org/10.1111/j.1442-1984.2009.00244.x

Serra L. & Soler J.X. 2012. *Ophrys* × *castroviejoi (Orchidaceae),* nuevo híbrido para España. *Anales del Jardín Botánico de Madrid* 69 (2): 237–242. https://doi.org/10.3989/ajbm.2328

Tison J.-M., Jauzein P. & Michaud H. 2014. *Flore de la France méditerranéenne continentale.* Naturalia Publications, Turriers.

Tyteca D. & Klein E. 2008. Genes, morphology and biology - The systematics of *Orchidinae* revisited. *Journal Europäischer Orchideen* 40 (3): 501–544.

Vázquez Pardo F.M. 2009. Revisión de la familia *Orchidaceae* en Extremadura (España). *Folia Botanica Extremadurensis* 3: 5–362.

Vereecken N.J., Dafni A. & Cozzolino S. 2010. Pollination syndromes in Mediterranean orchids - Implications for speciation, taxonomy and conservation. *The Botanical review, interpreting botanical progress* 76: 220–240.

Whitham T.G., Martinsen G.D., Floate K.D., Dungey H.S., Potts B.M. & Keim P. 1999. Plant hybrid zones affect biodiversity: tools for a genetic based understanding of community structure. *Ecology* 80 (2): 416–428. https://doi.org/10.1890/0012-9658(1999)080[0416:PHZABT]2.0.CO;2

APPENDIX 1. Nomenclature, synonymy, and types.

1. ***A. collina*** (Banks & Sol. ex Russell) R.M.Bateman, Pridgeon & M.W.Chase, Lindleyana 12 (3): 120 (1997); *Orchis collina* Banks & Sol. ex Russell, Nat. Hist. Aleppo ed. 2, 2: 264 (1794). Type: [Syria], prope Aleppo, *P. Russell* s.n. [lecto-, designated by Kretzschmar & al. (2007: 145): BM!].

Orchis × *dueluekae* Hautz., Verh. Zool.-Bot. Ges. Wien 115: 52 (1976) [«dülükae», corrected according with art. 60.6 (McNeill & al. 2012)]; *Anacamptis* × *dueluekae* (Hautz.) B.Bock, Bull. Soc. Bot. Centre-Ouest 42: 266 (2011). Type: Syria, Dülük Baba, 4000′, V–1907, *M. Haradjian 1210* [holo-: W, revised by Luz & Schmidt (1981)].

2. ***A.*** × ***dafnii*** (Wolfg. Schmidt & R.Luz) H. Kretzschmar, Eccarius & H.Dietr., Orchid Gen. Anacamptis, Orchis, Neotinea ed. 2: 427 (2007); *Orchis* × *dafnii* Wolfg. Schmidt & R.Luz, Mitt. Arbeitskreis Heimische Orchid. Baden-Württemberg 13: 451 (1981). [*A. collina* × *A. papilionacea* subsp. *palaestina* (H.Baumann & R.Lorenz) H.Kretzschmar, Eccarius & H. Dietr.]. Type: Israel, Galilea, ad oppidum mazzuva, 100 m a.s.l., 12–III–1980, *W. Schmidt* and *R. Luz* s.n. (holo-: STU!).

3. ***A.*** × ***dafnii*** nothosubsp. ***camparonensis*** (Kohlmüller) H.Kretzschmar, Eccarius & H.Dietr., Orchid Gen. Anacamptis, Orchis, Neotinea ed. 2: 427 (2007); *Orchis* × *dulukae* nothosubsp. *camparonensis* Kohlmüller, Orchidee (Hamburg) 44 (2): 96 (1993); *A.* × *dulukae* nothovar. *camparonensis* (Kohlmüller) B.Bock, Bull. Soc. Bot. Centre-Ouest 42: 266 (2011). *[A. collina* × *A. papilionacea* subsp. *papilionacea*]. Type: Italia, Monte Gargano (Puglia), 10 km WNW Vieste, 24–III–1991, *R. Kohlmuller* s.n. (holo-: M!). Note: In the combination of *A.* × *dulukae* nothovar. *camparonensis,* the second parental was considered to be *A. papilionacea* var. *expansa* (Bock 2011), even though Kohlmüller (1993) explicitly referred to *A. papilionacea* subsp. *papilionacea.*

4. ***A. papilionacea*** subsp. ***grandiflora*** (Boiss.) Kreutz, Ber. Arbeitskreis. Heimische Orchid. 24 (1): 148 (2007); *Orchis papilionacea* var. *grandiflora* Boiss., Voy. Bot. Espagne 2 (19): 592–593 (1842); *Orchis papilionacea* subsp. *grandiflora* (Boiss.) Malag., Acta Phytotax. Barcinon. 1: 64 (1968). Type: [Spain], in montibus ad Astapam, IV–1838, *[Haenseler* s.n.] [lecto-, designated by Burdet & al. (1982: 393): G!].

APPENDIX 2. Specimens of the different populations of *Anacamptis* × *dafnii* nothosubsp. *solanoi* Serra & López Esp., nothosubsp. nov.: **a,** Murcia, Cartagena, Atamaría (L. Serra, 20-II-2016); **b,** Málaga, Alhaurín el Grande, sierra de Mijas, (J.A. Díaz Rodríguez, 11-III-2017); **c,** Murcia, Cartagena, Colada del Cedacero, (L. Serra, 18-II-2017); **d,** Murcia, Cartagena, Sierra Gorda, (J.A. López Espinosa, 28-II-2017).