

Contribution to the knowledge of spatial distribution of Croatian orchids, results of fieldwork 2014-2019

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Abstract

The results of six seasons of personal field observations of species belonging to the family of Orchidaceae are compared with existing data in the Flora Croatica Database. Of 80 observed taxa, 20 were found within the borders of a sheet of the 1:100.000 topographical maps from which they were not yet logged in the FCD ("new" sheets). Among remarkable findings are those of *Ophrys gargarica* and *Ophrys lutea* subsp. *lutea* which belong to the rarest orchid taxa in Croatia. *Neotinea maculata* was discovered in North Dalmatia and for the first time *Orchis pauciflora* could be logged in FCD for Velebit Nature Park. Likewise, *Cephalanthera damasonium* and *Neotinea ustulata* were newly included in the database for Pelješac Peninsula, while *Anacamptis papilionacea* was found for the first time on the island of Brač.

Keywords: Flora Croatica Database, observations, Orchidaceae

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Sažetak

U radu se iznose rezultati šest sezona terenskih opažanja vrsta iz porodice Orchidaceae, te uspoređuju s postojećim podacima u bazi podataka Flora Croatica (FCD). Od ukupno 80 zabilježenih svojiti njih 20 je pronađeno unutar polja topografske karte 1:100000 za koje ranije nije bilo podataka u FCD-u. Ističu se zanimljivi nalazi *Ophrys gargarica* i *Ophrys lutea* subsp. *lutea*, koje su među najrjeđim vrstama orhideja u Hrvatskoj. Vrsta *Neotinea maculate* po prvi puta je zabilježena za područje sjeverne Dalmacije, dok je vrsta *Orchis pauciflora* po prvi puta zabilježena u Parku prirode Velebit, *Anacamptis papilionacea* na otoku Braču, a *Cephalanthera damasonium* i *Neotinea ustulata* na poluotoku Pelješcu.

Ključne riječi: Flora Croatica database, opažanja, Orchidaceae

With this article I intend to contribute to the knowledge of spatial distribution of wild orchids in Croatia. In period 2014-2019 I frequently visited all western and southern Croatian counties: Istria, Primorje-Gorski Kotar, Karlovac, Lika-Senj, Zadar, Šibenik-Knin, Split-Dalmatia and Dubrovnik-Neretva. I gave much attention to recording localities in order to increase our knowledge of spatial distribution of Croatian orchids. The vast majority of these observations have been assimilated in the Flora Croatica Database (FCD) (Nikolić 2005-onwards).

Regarding the taxonomical division of the family Orchidaceae in this article I largely follow the accepted names from the World Checklist of Selected Plant Families (WCSP 2021). For a number of species, I depart from this division and for those I follow the division by Kreutz (2004, 2005, 2007). I favor a more detailed classification for a number of taxa not accepted by WCSP, being: *Anacamptis coriophora* subsp. *fragrans* (subspecies of *Anacamptis coriophora* (L.) R.M.Bateman, Pridgeon & M.W.Chase), *Ophrys illyrica* and *O. tommasinii* (subspecies of *Ophrys araneola* Rchb.), *Ophrys leucadica* (subspecies of *Ophrys fusca* Link), *Ophrys dinarica*, *O. medea*, *O. tetraloniae* and *O. untchjii* (subspecies of *Ophrys holosericea* (Burm.f.) Greuter), *Ophrys rhodostephane* and *O. zinsmeisteri* (subspecies of *Ophrys oestriifera* Rchb.), *Ophrys liburnica* (subspecies of *Ophrys sphegodes* Mill.), and *Ophrys neglecta* (subspecies of *Ophrys tenthredinifera* Willd.). *Dactylorhiza fuchsii* and *D. saccifera* are included in WCSP as subspecies of *D. maculata* L. Soó. However, the species rank is to be preferred for these. *Ophrys bertolonii* subsp. *flavicans* is preferred over the hybridogenic name in WCSP. I prefer the more commonly used name *Serapias neglecta* subsp. *ionica* over *S. orientalis* (Greuter) H. Baumann & Künkele. *Ophrys garganica* O. Danesch & E. Danesch is introduced under its first validly described name.

In the discussion of the results I strongly focus on findings outside the known range of species, as presented by the herbarium material,

literature sources and field observations in the FCD. Regarding the FCD it should, however, be noted that a large number of old and new sources have not yet been incorporated (Jeričević et al. 2014). Up to date distribution maps with data from all publications about Croatian orchids are not at hand. Pezzetta (2018, 2020) lists per species locations of orchids in Istria and Dalmatia recorded in 90 and 140 publications respectively, of which the majority has been published over the last twenty years.

Two grids were used to analyze the distribution, being the grid of 55 official Croatian 1:100000 scale topographical map (TK) sheets, with each grid cell covering approximately 55 by 39 kilometers, and the finer MTB grid, which consists of cells of approximately 11 by 13 kilometers. The MTB grid matches the TK grid, which consists of three MTB-cells in easterly direction and five MTB-cells in northerly direction for each TK map sheet.

Overall results

In period 2014-2019 I observed 80 orchid species with certainty (Tab. 1). The spatial distribution of all orchid observations is presented in Fig. 1. On average, the species were found in 5.4 TK sheets. The most widely distributed taxa are *Anacamptis morio* (19 sheets), *Anacamptis pyramidalis* and *Limodorum abortivum* (both in 18 sheets), *Neotinea tridentata* (16 sheets) and *Cephalanthera damasonium* and *Ophrys apifera* (both in 13 sheets). *Epipactis microphylla* was observed in two “new” TK sheets (with no previous FCD-records) and 22 taxa were found in one “new” TK sheet. A check has been made for the existence of possible earlier observations in these new TK-sheets in the Global Biodiversity Information Facility (GBIF). This showed that there are no previous relevant observations, with the exception of *Serapias lingua*. However, for this species the existing record in GBIF was done outside the national border (De Vries & Lemmens 2021). On average, each species was found in 11.5 MTB grid cells. The top six species found in 13 or more TK sheets also made up for the top six by number of MTB grid cells; and they were

each found in 34 to 52 MTB grid cells. On average, each species was found in 3.9 “new” MTB grid cells (with no previous record). More than half of the taxa were found in none to three new MTB grid cells. The largest absolute number of new MTB grid cells was filled by *Limodorum abortivum* – 21. Eight taxa were found in 10-15 new MTB grid cells. Species observed in at least 5 MTB grid cells, of which at least half (and up to 63%) of these cells are “new” for the FCD, are *Dactylorhiza fuchsii*, *Epipactis microphylla*, *Neotinea maculata*, *Platanthera chlorantha* and *Serapias lingua*. For *Anacamptis morio*, *Anacamptis pyramidalis* and *Neotinea tridentata* less than a quarter (and at least 17%) of the grid

cells in which I observed them had not previously been FCD-logged. By number of recorded localities *Ophrys sphegodes* subsp. *atrata* takes the first place (420 localities) followed by *Anacamptis morio* (312 localities). Between 200 and 300 observations were included in the FCD of *Anacamptis pyramidalis*, *Cephalanthera damasonium*, *Ophrys apifera*, *Orchis purpurea* and *Orchis quadripunctata*. With 28.3-35.0 observations per TK-sheet, *Ophrys incubacea*, *Orchis italica* and *Platanthera bifolia* show the highest density of localities. Seven taxa were found only once and of those only one specimen was found of *Epipactis leptochila*, *Ophrys biscutella* and *Ophrys lutea* subsp. *lutea*.

Table 1. Distribution data of orchids observed in Croatia from 2014 to 2019. Source nomenclature: WCSP accepted, except (2) WCSP synonym, (3) Kreutz 2004, (4) Kreutz 2005, (5) Kreutz 2007, (6) first valid description of taxon.

| Species | Source | Number of FCD-logged localities | Number of TK 1:100.000 sheets | Of which new sheets | Number of MTB grid cells | Of which new grid cells | Share of new grid cells (%) | Average number of MTB grid cells per TK 1:100.000 sheet |
|---|--------|---------------------------------|-------------------------------|---------------------|--------------------------|-------------------------|-----------------------------|---|
| <i>Anacamptis coriophora</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase | | 2 | 1 | 0 | 1 | 1 | 100 | 1.0 |
| - subsp. <i>fragrans</i> (Pollini) R.M.Bateman, Pridgeon & M.W.Chase | (2) | 112 | 7 | 0 | 17 | 6 | 35 | 2.4 |
| <i>Anacamptis laxiflora</i> (Lam.) R.M.Bateman, Pridgeon & M.W.Chase | | 91 | 8 | 0 | 19 | 6 | 32 | 2.4 |
| <i>Anacamptis morio</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase (including subsp. <i>picta</i> (Loisel.) Jacquet & Scappat.) | | 312 | 19 | 0 | 52 | 9 | 17 | 2.7 |
| <i>Anacamptis palustris</i> (Jacq.) R.M.Bateman, Pridgeon & M.W.Chase | | 7 | 3 | 0 | 3 | 1 | 33 | 1.0 |
| <i>Anacamptis papilionacea</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase | | 88 | 5 | 1 | 8 | 4 | 50 | 1.6 |
| <i>Anacamptis pyramidalis</i> (L.) Rich. | | 291 | 18 | 0 | 46 | 8 | 17 | 2.6 |
| <i>Cephalanthera damasonium</i> (Mill.) Druce | | 241 | 13 | 0 | 35 | 13 | 37 | 2.7 |
| <i>Cephalanthera longifolia</i> (L.) Fritsch | | 116 | 9 | 0 | 20 | 9 | 45 | 2.2 |
| <i>Cephalanthera rubra</i> (L.) Rich. | | 16 | 6 | 0 | 8 | 4 | 50 | 1.3 |
| <i>Cypripedium calceolus</i> L. | | 3 | 2 | 0 | 3 | 1 | 33 | 1.5 |
| <i>Dactylorhiza fuchsii</i> (Druce) Soó | (3) | 37 | 5 | 0 | 8 | 5 | 63 | 1.6 |
| <i>Dactylorhiza incarnata</i> (L.) Soó | | 28 | 2 | 0 | 4 | 2 | 50 | 2.0 |
| <i>Dactylorhiza majalis</i> (Rchb.) P.F.Hunt & Summerh. | | 6 | 2 | 0 | 2 | 0 | 0 | 1.0 |
| <i>Dactylorhiza romana</i> (Sebast.) Soó | | 1 | 1 | 0 | 1 | 0 | 0 | 1.0 |
| <i>Dactylorhiza saccifera</i> (Brongnart) Soó | (3) | 5 | 1 | 0 | 2 | 1 | 50 | 2.0 |

| Species | Source | Number of FCD-logged localities | Number of TK 1:100.000 sheets | Of which new sheets | Number of MTB grid cells | Of which new grid cells | Share of new grid cells (%) | Average number of MTB grid cells per TK 1:100.000 sheet |
|---|--------|---------------------------------|-------------------------------|---------------------|--------------------------|-------------------------|-----------------------------|---|
| <i>Dactylorhiza sambucina</i> (L.) Soó | | 17 | 3 | 0 | 4 | 0 | 0 | 1.3 |
| <i>Dactylorhiza viridis</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase | | | 3 | 0 | 6 | 3 | 50 | 2.0 |
| <i>Epipactis atrorubens</i> (Hoffm.) Besser | | 15 | 1 | 0 | 4 | 0 | 0 | 4.0 |
| <i>Epipactis greuteri</i> H.Baumann & Künkele | | 3 | 2 | 1 | 2 | 2 | 100 | 1.0 |
| <i>Epipactis helleborine</i> (L.) Crantz | | 91 | 7 | 0 | 14 | 6 | 43 | 2.0 |
| <i>Epipactis leptochila</i> (Godfery) Godfery | | 1 | 1 | 0 | 1 | 0 | 0 | 1.0 |
| <i>Epipactis microphylla</i> (Ehrh.) Sw. | | 40 | 12 | 2 | 22 | 13 | 59 | 1.8 |
| <i>Epipactis muelleri</i> Godfery | | 14 | 3 | 1 | 6 | 6 | 100 | 2.0 |
| <i>Epipactis palustris</i> (L.) Crantz | | 16 | 3 | 0 | 3 | 1 | 33 | 1.0 |
| <i>Epipactis purpurata</i> Sm. | | 1 | 1 | 0 | 1 | 1 | 100 | 1.0 |
| <i>Goodyera repens</i> (L.) R.Br. | | 1 | 1 | 1 | 1 | 1 | 100 | 1.0 |
| <i>Gymnadenia conopsea</i> (L.) R.Br. | | 130 | 6 | 0 | 18 | 3 | 17 | 3.0 |
| <i>Gymnadenia odoratissima</i> (L.) Rich. | | 5 | 1 | 0 | 2 | 1 | 50 | 2.0 |
| <i>Himantoglossum adriaticum</i> H.Baumann | | 99 | 8 | 1 | 15 | 5 | 33 | 1.9 |
| <i>Himantoglossum robertianum</i> (Loisel.) P.Delforge | | 88 | 5 | 0 | 10 | 4 | 40 | 2.0 |
| <i>Limodorum abortivum</i> (L.) Sw. | | 182 | 18 | 1 | 45 | 21 | 47 | 2.5 |
| <i>Neotinea maculata</i> (Desf.) Stearn | | 55 | 7 | 1 | 12 | 4 | 33 | 1.7 |
| <i>Neotinea tridentata</i> (Scop.) R.M.Bateman, Pridgeon & M.W.Chase | | 261 | 16 | 0 | 34 | 8 | 24 | 2.1 |
| <i>Neotinea ustulata</i> (L.) R.M.Bateman, Pridgeon & M.W.Chase (including var. <i>aestivalis</i> (Kümpel) Tali, M.F.Fay & R.M.Bateman) | | 151 | 9 | 1 | 21 | 11 | 52 | 2.3 |
| <i>Neottia nidus-avis</i> (L.) Rich. | | 123 | 10 | 0 | 30 | 13 | 43 | 3.0 |
| <i>Neottia ovata</i> (L.) Bluff & Fingerh. | | 55 | 7 | 0 | 14 | 4 | 29 | 2.0 |
| <i>Ophrys apifera</i> Huds. | | 271 | 13 | 0 | 38 | 15 | 39 | 2.9 |
| <i>Ophrys araneola</i> Reichenbach subsp. <i>illyrica</i> (S. & K. Hertel) Kreutz | (3) | 79 | 1 | 0 | 1 | 0 | 0 | 1.0 |
| - subsp. <i>tommasinii</i> (Visiani) Kreutz | (3) | 53 | 6 | 0 | 10 | 4 | 40 | 1.7 |
| <i>Ophrys argolica</i> subsp. <i>biscutella</i> (O.Danesch & E.Danesch) Kreutz | | 1 | 1 | 0 | 1 | 0 | 0 | 1.0 |
| <i>Ophrys bertolonii</i> Moretti | | 79 | 10 | 0 | 19 | 3 | 16 | 1.9 |
| <i>Ophrys bertolonii</i> Moretti subsp. <i>flavicans</i> (Visiani) K. Richter | (3) | 5 | 2 | 0 | 3 | 0 | 0 | 1.5 |
| <i>Ophrys bombyliflora</i> Link | | 5 | 3 | 1 | 3 | 2 | 67 | 1.0 |
| <i>Ophrys holosericea</i> (N.L. Burman) Moench sensu lato | | 15 | 5 | 1 | 8 | 3 | 38 | 1.6 |
| - subsp. <i>dinarica</i> (Kranjčev & P. Delforge) | (3) | 3 | 1 | 0 | 3 | 2 | 67 | 3.0 |
| - subsp. <i>medea</i> (Devillers & Devillers-Tersch.) Kreutz | (4) | 5 | 1 | 1 | 3 | 3 | 100 | 3.0 |
| - subsp. <i>tetraloniae</i> (W.P. Teschner) Kreutz | (3) | 3 | 1 | 0 | 2 | 1 | 50 | 2.0 |
| - subsp. <i>untchjii</i> (M. Schulze) Kreutz | (3) | 34 | 4 | 0 | 9 | 3 | 33 | 2.3 |

| Species | Source | Number of FCD-logged localities | Number of TK 1:100.000 sheets | Of which new sheets | Number of MTB grid cells | Of which new grid cells | Share of new grid cells (%) | Average number of MTB grid cells per TK 1:100.000 sheet |
|---|--------|---------------------------------|-------------------------------|---------------------|--------------------------|-------------------------|-----------------------------|---|
| <i>Ophrys fusca</i> Link subsp. <i>leucadica</i> (Renz) H. Kretschmar | (3) | 7 | 2 | 0 | 3 | 1 | 33 | 1.5 |
| <i>Ophrys garganica</i> O.Danesch & E.Danesch | (6) | 1 | 1 | 1 | 1 | 1 | 100 | 1.0 |
| <i>Ophrys insectifera</i> L. | | 21 | 5 | 1 | 8 | 4 | 50 | 1.6 |
| <i>Ophrys lutea</i> Cav. sensu stricto | | 1 | 1 | 1 | 1 | 1 | 100 | 1.0 |
| - subsp. <i>minor</i> (Todaro) O. & E. Danesch | (3) | 19 | 4 | 0 | 11 | 4 | 36 | 2.8 |
| <i>Ophrys oestrifera</i> F.A.M. von Bieberstein subsp. <i>rhodostephane</i> (J. Devillers-Terschuren & P. Devillers) Kreutz | (3) | 156 | 11 | 0 | 31 | 8 | 26 | 2.8 |
| - subsp. <i>zinsmeisteri</i> (A. Fuchs) Kreutz | (3) | 13 | 3 | 0 | 3 | 1 | 33 | 1.0 |
| <i>Ophrys sphegodes</i> Mill. sensu lato | | 17 | 2 | 0 | 4 | 0 | 0 | 2.0 |
| - Mill. sensu stricto | | 2 | 1 | 0 | 1 | 1 | 100 | 1.0 |
| - subsp. <i>atrata</i> (Rchb.f.) A. Bolòs | (3) | 420 | 12 | 1 | 31 | 10 | 32 | 2.6 |
| - subsp. <i>liburnica</i> (Devillers & Devillers-Tersch.) Kreutz | (5) | 141 | 7 | 0 | 15 | 4 | 27 | 2.3 |
| <i>Ophrys tenthredinifera</i> Willdenow subsp. <i>neglecta</i> (Parlatore) E.G. Camus, P. Bergon & A. Camus | (3) | 4 | 2 | 1 | 3 | 1 | 33 | 1.5 |
| <i>Orchis anthropophora</i> (L.) All. | | 141 | 7 | 0 | 16 | 5 | 31 | 2.3 |
| <i>Orchis italica</i> Poir. | | 190 | 6 | 0 | 17 | 4 | 24 | 2.8 |
| <i>Orchis mascula</i> (L.) L. (including subsp. <i>speciosa</i> (Mutel) Hegi) | | 23 | 5 | 0 | 8 | 4 | 50 | 1.6 |
| <i>Orchis militaris</i> L. | | 6 | 4 | 1 | 6 | 2 | 33 | 1.5 |
| <i>Orchis pauciflora</i> Ten. | | 157 | 8 | 1 | 19 | 3 | 16 | 2.4 |
| <i>Orchis purpurea</i> Huds. | | 217 | 12 | 0 | 29 | 11 | 38 | 2.4 |
| <i>Orchis quadripunctata</i> Cirillo ex Ten. | | 278 | 11 | 0 | 26 | 3 | 12 | 2.4 |
| <i>Orchis simia</i> Lam. | | 24 | 7 | 1 | 7 | 1 | 14 | 1.0 |
| <i>Orchis spitzelii</i> Saut. ex W.D.J. Koch | | 6 | 2 | 0 | 2 | 1 | 50 | 1.0 |
| <i>Platanthera bifolia</i> (L.) Rich. | | 198 | 7 | 0 | 22 | 9 | 41 | 3.1 |
| <i>Platanthera chlorantha</i> (Custer) Rchb. | | 31 | 5 | 0 | 9 | 5 | 56 | 1.8 |
| <i>Serapias bergonii</i> E.G. Camus | | 9 | 1 | 0 | 3 | 2 | 67 | 3.0 |
| <i>Serapias cordigera</i> L. | | 14 | 2 | 0 | 2 | 0 | 0 | 1.0 |
| <i>Serapias lingua</i> L. | | 69 | 9 | 1 | 13 | 7 | 54 | 1.4 |
| <i>Serapias neglecta</i> De Notaris subsp. <i>ionica</i> E. Nelson | (3) | 5 | 2 | 1 | 2 | 2 | 100 | 1.0 |
| <i>Serapias parviflora</i> Parl. | | 125 | 7 | 0 | 17 | 5 | 29 | 2.4 |
| <i>Serapias vomeracea</i> (Burm.f.) Briq. | | 57 | 7 | 0 | 13 | 2 | 15 | 1.9 |
| <i>Spiranthes aestivalis</i> (Poir.) Rich. | | 24 | 1 | 0 | 1 | 0 | 0 | 1.0 |
| <i>Traunsteinera globosa</i> (L.) Rchb. | | 10 | 1 | 0 | 4 | 1 | 25 | 4.0 |

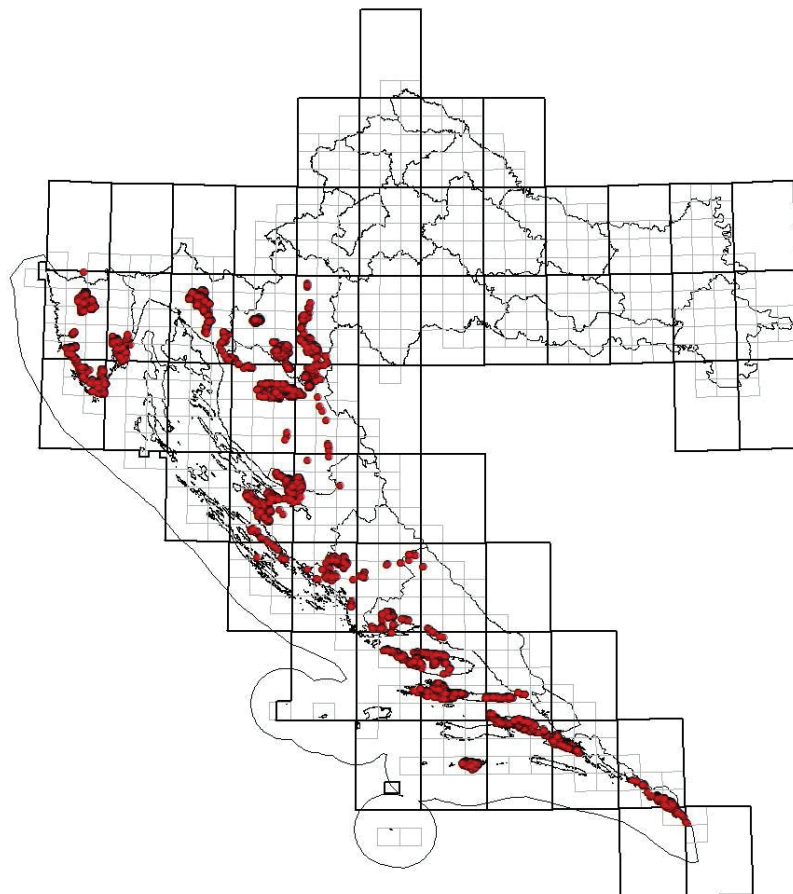


Figure 1. Spatial distribution of orchid observations in the period 2014-2019. The wider grid of topographical maps (TK) and the finer MTB-grid are shown.

Notes per species

Observations in “new” TK-sheets are presented in this format: TK map sheet number, MTB gridcell number on TK map sheet, county, year(s) of observation. I also mention species which have not been registered before in FCD on certain islands or Pelješac Peninsula. Furthermore, I present observations and clusters of local observations as large occurrences, if the total number of (estimated) specimens of a locality or in a cluster of localities was at least 5,000. Individual observations with fewer than 500 specimens were not included in clusters of local observations. On the Central Dalmatian island Šolta I encountered several orchid species of which occurrence has not yet been recorded in the FCD for this island, but of which occurrence was reported by Golubić (2018), being *Himantoglossum robertianum*, *Neotinea tridentata*, *Ophrys fusca* subsp. *leucadica*, *Ophrys oestriifera* subsp. *rhodostephane*,

Ophrys sphegodes subsp. *atrata*, *Ophrys sphegodes* subsp. *liburnica*, *Orchis anthrophora*, *Orchis italica*, *Orchis quadripunctata* and *Serapias parviflora*. I have not included these observations in the explanation.

Anacamptis coriophora* subsp. *fragrans – two new islands: Ugljan and Pašman (Zadar County 2014).

Anacamptis laxiflora – ten thousands of specimens in vicinity of Krković (Šibenik-Knin County 2017) and thousands 2 km east of Nin in silty humid grassland near Grbe (Zadar County 2019). In North Dalmatia, roughly between Novigradsko more and Vir, some populations seem to be (largely) introgressed with *Anacamptis palustris*.

***Anacamptis morio* (including subsp. *picta*)** – about ten thousand specimens in mostly nutrient-poor grassland around Donji Babin Potok,

Rudopolje, Vrhovine and Vrhovinsko polje (Lika-Senj County 2018) and thousands on unimproved grasslands near Zalužnica (Lika-Senj County 2018), along road 5195 north and south of Udbina (Lika-Senj County 2019) and along road D1 0-5 km north of Gračac (Šibenik-Knin County 2019). One of the commonest and most numerous occurring Croatian orchid taxa.

Anacamptis papilionacea – one new TK-sheet / one new island: Brač (4316-2 (6) Split-Dalmatia County 2019). First FCD-logged observation on the island of Brač. One clump with seven spikes near the coast, about 3 km west of Milna. Thousands of specimens in nutrient-poor grasslands in municipality Zadar (2019). It is quite common around Zadar, perhaps its main stronghold in Dalmatia. Very rare in Central Dalmatia (FCD records: Dugopolje-Veliki Kabal, Hvar and Vis), extremely rare or absent in Southern Dalmatia (no FCD records, Korčula according M. Jeričević, pers. comm.).

Anacamptis pyramidalis – first FCD-logged observation in the eastern part of Hvar. Two specimens along a fieldroad through a mosaic of grassy and shrubby vegetation (Split-Dalmatia County 2017).

Cephalanthera damasonium – first FCD-logged observation on Pelješac Peninsula (Fig. 2). Four specimens in broadleaved forest and on a forest road east of Potomje (Dubrovnik-Neretva County 2016). On the adjacent islands Mljet and Korčula this taxon was first reported in 2010 (Šegota 2012) and 2014 (Jeričević 2014) respectively. On Brač it was first FCD-logged in 2012 by LJ. Borovečki-Voska. According to Šegota (2012) “the finding of the species *C. damasonium* on the island of Mljet is the first note of this species on the Dalmatian Islands” and “the occurrence of the mesophilous species *C. damasonium* in evergreen forests dominated by *Quercus ilex* in Croatia is extremely rare and occasional”.

Epipactis greuteri – one new TK-sheet: 4515-2 (15) Karlovac County 2018. One specimen in spruce forest, about 1.5 km west of Blata.



Figure 2. *Cephalanthera damasonium*. First FCD-logged observation from Pelješac (Pijavičino, 24.4.2016).

Epipactis microphylla – two new TK-sheets: 4516-1 (13) Karlovac County 2016. Three specimens in old inclined beech forest along national road D1 south of Slunj, near Broćanac, (14) Karlovac County 2016. Seven specimens in beech forest on slope, along forest path NE of Nova Kršlja (Kordunski Ljeskovac); 4514-3 (6) Istria 2017. 15 specimens in deciduous forest east of Šišan-Ušićovi Dvori (Cuf, Sarancan, Grabovići/Sv. Lovrenc).

Epipactis muelleri – one new TK-sheet: 4515-2 (13) Lika-Senj County 2018. 20 specimens under thicket at the edge of deciduous forest, between Mrzli Dol and Grabova Lokva.

Goodyera repens – one new TK-sheet: 4515-4 (1) Lika-Senj County 2018. Four specimens in damp deciduous forest with *Abies alba* Mill., south of Brinje, 30 km from nearest FCD-logged locality.

Himantoglossum adriaticum – one new TK-sheet: 4515-4 (6) Lika-Senj County 2018. 12 specimens on inclined nutrient-poor grassland near Gornji Doljani, 40 km from nearest FCD-logged locality. Mentionable other finds: 12 specimens on nutrient-poor rocky mountain meadow west of hilltop Malic (Lika-Senj County 2018), 36 km from nearest FCD-logged locality. One specimen along fieldpath through nutrient-poor grassland in municipality Rovinj, 1 km south of Kokuletošica: the most southern locality in Istria logged in FCD. In 2021 a few specimens were found up to 2.5 km further south in Istria, in municipality Svetvinčenat near Cabruniči by K. Sergio (pers. comm).

Limodorum abortivum – one new TK-sheet: 4218-2 (3) Dubrovnik-Neretva County 2017. One specimen in open broadleaved forest 0.8 km northwest of Mikulići in Konavle. One new island: Šolta (Split-Dalmatia County 2019). Four specimens under thicket at the edge of coniferous forest near church Sv. Nikola (Maslinica).

Neotinea maculata – one new TK-sheet / first observations in North Dalmatia: 4415-2 (7) Zadar County 2019. 10 specimens on nutrient-poor grassland under scattered presence of *Pinus halepensis* Mill. on plain Križine between Nin and Privlaka. (11) Zadar County 2014/2019. More than thousand specimens were observed in Musapstan Forest Park (Državna šuma) in 2014. These observations are situated 85 km from the nearest FCD-records on the Quarnero Islands and 100 km from the logged occurrences in Central Dalmatia.

Neotinea tridentata – more than ten thousand specimens in mostly nutrient-poor grassland around Donji Babin Potok, Rudopolje, Vrhovine and Vrhovinsko polje (Lika-Senj County 2018).

***Neotinea ustulata* (including var. *aestivalis*)** – one new TK-sheet: 4416-3 (5) Šibenik-Knin County 2017. Two specimens in nutrient-poor grassland with thicket vegetation on the hill Gradina, 2 km south of Čista Mala, 45 km from nearest FCD-logged locality. First FCD-logged observation on Pelješac

Peninsula. Two specimens on abandoned fields on south exposed hill Glavica, 1 km south of Donja Vručica, 34 km from nearest FCD-logged locality (Dubrovnik-Neretva County 2016).

Ophrys bombyliflora – one new TK-sheet: 4317-2 (13) Dubrovnik-Neretva County 2016. Over 100 specimens in garrigue vegetation near and north of Mirce on Pelješac.

Ophrys holosericea sensu lato – one new TK-sheet: 4516-1 (14) Karlovac County 2016. One specimen under thicket vegetation in roadside, 1 km east of Zapoljak.

Ophrys holosericea subsp. medea – one new TK-sheet: 4415-2 (8) (9) (11) Zadar County 2019. 45 specimens on six localities in three MTB-gridcells east of Ljubač (Mramor, Vučkovac, Gornje glav), southwest of Radovin (Kremenjača) and north of Brisevo (Brčac). Plants and flowers had a consistent appearance, showing little variation, a pink perianth, usually with a green vein in the sepals, (very) strong gibbositities and a hairy margin on the labellum. The habitat on most sites consisted of (humid) nutrient-poor grassland on (calcareous) loamy to rocky substrate. The plants are flowering at the same time as *Ophrys apifera*, present on five of the six localities with *Ophrys holosericea* subsp. *medea*.

Ophrys insectifera – one new TK-sheet: 4515-4 (3) Karlovac County 2018. Five specimens 1-2 km south of Lička Jesenica, mostly in open coniferous forest, near Dragiči, Kneževići and Vukelić-Poljana, (6) Lika-Senj County 2018 two specimens on inclined nutrient-poor grassland near Gornji Doljani, cemetery of Hrkalovići.

Ophrys lutea subsp. lutea – one new TK-sheet: 4318-4 (11) Dubrovnik-Neretva County 2017. One specimen in coastal terraced coniferous forest between Srebreno and Mlini (Fig. 3). R. Čičmir photographed this taxon in 2007 south of Dubrovnik (Mast de Maeght 2020). Since the occurrence of vital populations has not yet been documented, it is among the rarest orchid taxa in Croatia.



Figure 3. *Ophrys lutea* subsp. *lutea*. First FCD-logged observation in Croatia (Srebreno, Župa dubrovačka, 10.4.2017).

No photographs of this species are stored in FCD. The FCD contains three sheets of *Ophrys lutea* Cav. from Herbarium Croaticum (ZA), but these plants belong to *Ophrys lutea* subsp. *minor*.

Ophrys sphegodes* subsp. *atrata – one new TK-sheet: 4417-3 (13) Split-Dalmatia County 2015. 50 specimens in roadbank between mount Perun and mount Sridivica, south and west of Žrnovnica. Ten thousand specimens in an olive grove 1 km north-east of Poljica on Hvar (Split-Dalmatia County 2015).

Ophrys garganica – one new TK-sheet / one new island: 4317-3 (9) Lastovo, Dubrovnik-Neretva County 2019 (Fig. 4). Five to seven specimens on sandy calcareous substrate in nutrient-poor vegetation, some plants growing along thicket at the northern edge of Prgove valley. The first published observation in Croatia was done in 2005 by S. Hertel and A. Zirnsack (2006) on Korčula and Prežba. In 2007 R. Čičmir recorded this taxon from

Blace in the Neretva valley (Mast de Maeght 2020). The presence of *Ophrys garganica* has, according to Pezzetta (2020), so far been observed near Blace, Duba and Konavle and on Korčula and Prežba. *Ophrys garganica* has possibly only recently reached Croatian territory, or it might not have been recognised so far. Plants belonging to this taxon are clearly distinguishable from *Ophrys sphegodes* subsp. *sphogodes*. Therefore, this taxon deserves to become formally part of the Croatian flora and indexation in the FCD is justified. In WCSP *Ophrys garganica* is considered as a synonym of *Ophrys sphegodes* subsp. *passionis* (Sennen) Sanz & Nuet. Recent eminent orchidological publications however adopt a division into two (sub-)species: *Ophrys passionis* subsp. *garganica* and *O. passionis* subsp. *passionis* (Kreutz 2005), *Ophrys passionis* subsp. *garganica* and *O. passionis* subsp. *passionis* (Baumann et al. 2006), *Ophrys passionis* var. *garganica* and *O. passionis* (Delforge 2006), *Ophrys garganica* and *O. caloptera* (Delforge 2016). Also, Pederson & Fauerholdt (2007), who are more conservative in



Figure 4. *Ophrys garganica*. Taxon currently not listed in FCD (Lastovo, 19.4.2019).



Figure 5. *Orchis pauciflora*. First FCD-logged observation in Velebit Nature Park (Seline, 25.5.2019).

their taxonomic approach, distinguish two taxa: *Ophrys sphegodes* subsp. *sipontensis* and *Ophrys sphegodes* subsp. *passionis*. The distribution of the “*passionis*” taxon is confined to Spain, France and northern Italy, whereas the “*garganica*” taxon, named after the Gargano region, occurs in central and southern Italy. The observations in Croatia testify of a larger or perhaps enlarging distribution range of the “*garganica*” taxon. It could be introduced in the FCD under its first validly described name *Ophrys garganica* O. Danesch & E. Danesch

Ophrys tenthredinifera* subsp. *neglecta – one new TK-sheet / one new island: 4316-2 (2) Split-Dalmatia County 2019. First FCD-logged observation on island Čiovo, first found by R. Crnković (pers. comm.). The locality is situated 90 km from the nearest FCD-record on Korčula; photos of this species from Šolta in Golubić 2018 display hybrids.

Orchis italica – ten thousand specimens in an olive grove 1 km northeast of Poljica on Hvar (Split-Dalmatia County 2015).

Orchis militaris – one new TK-sheet: 4416-3 (6) Šibenik-Knin County 2017. 150 specimens in a mosaic of grassy and shrubby vegetation with *Juniperus* sp., 0.5 km south of Ždrapanj (Biljane), 45 km from the nearest FCD-logged locality.

Orchis pauciflora – one new TK-sheet: 4416-1 (4) Zadar County 2019. Seven specimens in open coniferous forest with *Pinus* sp. near the “pass” Kosica, between the “peaks” Konsjka and Okruglica, along marked trail (600 m. a.s.l.). One specimen in nutrient-poor grassland, young broad-leaved forest with *Carpinus orientalis* Mill., *Juniperus* sp. and *Pinus nigra* Aiton, Njive Lekine (700 m. a.s.l.). These are the first observations of *Orchis pauciflora* logged in FCD for Paklenica National Park and Velebit Nature Park (Fig. 5). An aquarel of a small specimen of *Orchis pauciflora* from “southern Velebit mountain range” is depicted in Landwehr (1977).

Orchis quadripunctata – thousands of specimens in an olive grove 1 km northeast of Poljica on Hvar (Split-Dalmatia County 2015).

Orchis simia – one new TK-sheet: 4218-2 (3) Dubrovnik-Neretva County 2017. 120 specimens on Vrh Sv. Ilija northeast of Poljice.

Serapias lingua – one new TK-sheet: 4219-1 (1) Dubrovnik-Neretva County 2017. 40 specimens in vicinity of low thicket vegetation, 0.2 km north of peninsula Prevlaka. This is the southernmost locality logged in FCD from the family Orchidaceae on the territory of Croatia. Ten thousands of specimens in fields west of Poljica near Zadar 2014/2019, thousands of specimens in coastal nutrient-poor grasslands near Ližnjan in Istria 2017.

Serapias neglecta* subsp. *ionica – one new TK-sheet: 4317-2 (13) Dubrovnik-Neretva County 2016. 40 specimens in garrigue vegetation north of Mirce (Kalci) on Pelješac.

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