

The orchid flora and distribution of species on the island of Vis (eastern Adriatic, Croatia)

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Floristic investigations were carried out on the island of Vis during spring 2004. Two hundred and sixty three vascular plants were recorded, including 23 taxa of Orchidaceae. The island is a new locality for the orchids *Cephalanthera longifolia*, *O.scolopax*, *Orchis purpurea* and *Spiranthes spiralis*. On the basis of our investigations and the floristic data published so far, there are 27 taxa of orchids on the island of Vis. The distribution of the observed orchids was mapped by GPS. Some nature conservation considerations complete the investigations.

Key words: Flora, Orchidaceae, conservation, island, Vis, Dalmatia, Adriatic, Croatia

Introduction

Human influence is seen as the major reason for changes in species abundance and diversity (FORUM BIODIVERSITAET SCHWEIZ 2004). The human impact is even stronger on islands because of their full or partial isolation (BROGGI 1994).

The island of Vis is comparatively rich in plant species because of its specific geomorphological characteristics. The natural vegetation of the island used to be a Mediterranean association of holm oak (*Quercus ilex*), which is still widespread on the island, but persisted in most parts only in a degraded form due to human influence. Nowadays, Aleppo pine (*Pinus halepensis*) is the dominating tree on Vis. Its most frequent form is garrigue, and more rarely maquis can be found. Vis belongs to the Eumediterranean region, where the Mediterranean floral element plays the dominating role, the eastern-mediterranean type prevailing here (DOMAC 1955).

In the mid 20th century the flora of Vis was studied in detail by DOMAC (1955), who published a list of 460 taxa of vascular plants. Contemporarily the island provides a habitat for nearly 500 taxa altogether.

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Specific research on orchids was carried out by KRANJČEV (2001) from 1998–2000. He classified 23 taxa, including 18 taxa that were new for the island of Vis. *Ophrys bertoloniiiformis*, *O. sphegodes* ssp. *mammosa* and *O. lacaitae* were recorded for the first time in Croatia and *O. lacaitae* for the first time outside Italy. The occurrence of the species *O. lacaitae* and *O. bertoloniiiformis* indicates the connection of the flora of the island of Vis with that of the neighbouring Apennine peninsula. BOGDANOVIĆ et al. (2004) recently found *Ophrys bombyliflora* on the nearby small island of Biševo, and this species was once also confirmed on the island of Vis.

Materials and methods

The island of Vis covers an area of 90.3 km², with its highest point at Hum (587 m). The island of Vis is 45–55 km from the Dalmatian coast and 147 km from the nearest point on the Italian coast. The island consists mostly of limestone and dolomite, with some volcanic silicate rocks on the north-eastern and eastern parts of Komiža Bay. A chain of karstic poljes stretches across the island. The island has a mild Mediterranean climate with dry summers.

A group of the Botanical-Zoological Society of Liechtenstein-Sargans-Werdenberg visited the island of Vis between 24th April and 6th May 2004. All the relevant habitats were examined in a large number of locations. The floral elements were recorded with their geographical distribution according to the UTM-technique on a 1 km² grid.

Results

During our floristic investigation on the island we found 23 taxa, including the new species *Cephalanthera longifolia*, *O. scolopax*, *Orchis purpurea* and *Spiranthes spiralis*. As the records of KRANJČEV (2001) led us to expect, we did not find any *Ophrys insectifera* and *O. sphegodes* ssp. *mammosa*. We could not be sure we had observed *O. fusca* s.l. because the specimen we saw was very faded. This means that the orchid flora of Vis now consists of 27 taxa, and it is rich in species with rather large populations.

The most abundant orchid species were *Anacamptis pyramidalis*, *Ophrys incubacea*, *O. sicula* and *Serapias parviflora*, which we found in large populations. *Ophrys bertolonii* and *Orchis italica* are widespread over the island, but occur only in patches with a few individuals.

We present some annotations about the observed Orchid taxa (the list of all other observed vascular plants is available from the authors):

Aceras anthropophorum (Fig. 1): not rare, but only found in the northern part of the island, on the slopes surrounding Vis. Few large populations (e.g. on Voščica), mostly in small groups or individually.

Anacamptis pyramidalis (Fig. 2): the most common orchid on the island, especially on the old, previously cultivated terraced land or on fallow ground, beside roads, in the garrigue and more rarely in the maquis. Very common in the eastern part of the island, around the town of Vis and in the southern part of the island. Populations of more than 1000 plants were found in the fallow ground between Plisko polje and Podselje.

Found east of the chapel of St. Cosmas in very shady maquis were tall specimens with strikingly small, very bright flowers with delicate stalks. The small light pink flowers have labella with hardly any or only very flat ridges and a rather short and thin spur, similar to the var. *brachystachys* described previously, except that the inflorescence is outstretched quite far. The flowers of some of these plants have a conspicuous vanilla-like smell, similar to that of *Gymnadenia conopsea*. The typically dark-red *A. pyramidalis* were always odourless.

Barlia robertiana (Fig.3): KRANJČEV (2001) noted only one place on the top of the Hum mountain, where we found only one individual plant in blossom and a few non-flowering plants at two other locations nearby. A second observation was on a mountain north of Komiža. The species *B. robertiana* is rare on the island.

Cephalanthera longifolia (Fig.4): First record on the island of Vis. BOGDANOVIĆ et al. (2004) found this species on the island of Biševo, five kilometres away. We found only one example along the road in shady maquis with *Quercus ilex* and *Pinus halepensis* near the chapel of Sveti Nikola in the west of Vis. In the vicinity we also found *Ophrys sphegodes*, *O. scolopax* and *Spiranthes spiralis*.

Neotinea maculata (Fig.5): mostly individuals or in small populations in the shade of Aleppo pine woodland or along roads in the slopes of maquis and garrigue in the south or southwest of Vis, on the hills in the southern part of the island (Camica), on Hum and in garrigue around the village of Oključina.

Ophrys apifera (Fig.6): we found two large populations around Marine Zemlje in the south of the island. One record was on very dry and rocky garrigue, and the other in a clearing of a *Pinus* forest.

Ophrys bertolonii (Fig.7): a frequent orchid on the island. Large populations were found above Komiža. As well as typical *O. bertolonii* we found plants whose flowers had a much wider stigmatic cavity than the usual form and a rather flattened outstretched lip without the saddle that is typical of *O. bertolonii*. The markings on the plants were sometimes deformed, horseshoe shaped or with a proximal extension. Such plants were not rare, especially above Vis. Their flower structure is very similar to that of *O. explanata* (Lojac.) Delforge (= *O. bertolonii* var. *explanata* Lojac.) (DELFORGE 2001), described from Sicily. Perhaps they should be regarded as *O. bertolonii* plants with, exceptionally, pink floral leaves. The bastardising influence of *Ophrys incubacea*, found everywhere on the island, is likely. We found a very typical hybrid plant *O. x lyrata* H. Fleischm. (= *O. bertolonii* x *O. incubacea*), with clear intermediate flower characteristics, near the Sv. Nikola chapel west of Vis. But there were some problems distinguishing it from the hybrid form *O. bertolonii*formis.

***Ophrys bertolonii*formis** (Fig.8): this hybridogene species was recorded for the first time on the island of Vis by KRANJČEV (2001). We found large populations in Terjum and nearby in Rogaćić north of the Bay of Vis.

Ophrys cornuta (Fig.9): typical long-horned *O. cornuta* at a few places, but not too many, on the slopes south of Vis (Sv. Kuzma, Čunkovica) and on Hum. *O. cornuta* seems to be rare on Vis.

Ophrys incubacea (Fig. 10): the most common *Ophrys* taxon on the island.

Ophrys fusca s.l. (Fig. 10): we found two sites with a few single dried up plants we thought could be *O. fusca*, but they could possibly be another taxon (*O. leucadica?*) of the *O. fusca* group.

Ophrys lacaitae (Fig. 11). Two localities for *O. lacaitae* are known, one near Zlo polje and the other in Vošćice polje (KRANJČEV 2001). We found several other places, especially in the eastern part of the island. They grow in small groups in the garrigue, mostly near *Pinus halepensis*. The species *O. lacaitae* is not rare on the island. Most striking was a group of plants near Marine Zemlje with fine pink slightly-coloured sepals and petals.

Ophrys scolopax (Fig. 12): First record on the island of Vis. We found a group of plants only in one place near the chapel of Sv. Nikola in a clearing of the maquis in the west of Vis. Most of them had begun to fade, but the blossoms on the top of the plants were still flowering. They were bigger and stronger than those of *O. cornuta*. The form of the lip led us to identify them as *O. scolopax*; whether *O. scolopax* still exists in Italy and along the Dalmatian coast is a matter of discussion. Possibly all such records will have to be associated with other taxa.

Ophrys sicula (O. lutea ssp. minor) (Fig. 13): a common *Ophrys* species, widespread in the region of Vis and on the slopes along the south coast and in the karstic fields. Not seen in the western part. The flowers were typical of *O. sicula*, and there were no signs of any crossing with the east Mediterranean species *O. phryganae*.

Ophrys sphegodes (Fig. 14): we found only ten plants at a site in the west of Vis along a forest road. Possibly we were too late to see any of this species flowering (but even on Hum we did not find any plants).

Ophrys tommasinii (Fig. 15): in full blossom on the top of Hum in a small number. After we had compared numerous illustrations of this small-flowering *Ophrys* belonging to the *O. sphegodes* group, we determined the specimen that we found on Hum as *O. tommasinii*. Flower characteristics were typical (small flowers, wide stigmatic cavity, yellow lip edges), although with much smaller sharp bumps on the lips. We did not find any similar plants anywhere else. We assume that that *O. sphegodes ssp. litigiosa* (= *O. areneola* Rchb.) listed in KRANJČEV (2001) is identical to *O. tommasinii*.

Orchis fragrans (Fig. 16): we found this taxon only at two sites near the coast in the southwest (Kupinovica-Stupišće) and in the northeast (Stončica). In the southwest corner of the island the determination of *O. fragrans* was definitely possible, but in the northeast the buds were too small to distinguish between *O. fragrans* or *O. coriophopra ssp. coriophora* according to KRANJČEV (2001).

Orchis italica (fig. 17) is very common and widespread on the island, especially in the dry garrigue. In the region of Basulinka (east of Vis) we found white specimens.

Orchis pauciflora (Fig. 18): abundant on Hum, especially near the chapel of Sv. Duh, where it was an attractive sight together with *O. quadripunctata*. KRANJČEV (2001) mentioned only this site, but we found another above Podšpilje in abandoned terraces and near Krušovica.

Orchis picta (Fig. 19): this representative of the *O. morio* group is rare on the island. We could not confirm the sighting of DOMAC (1955) in Stiniva Bay. We found a few plants

Fig. 1–23. Distribution maps of 23 orchid species on the island of Vis. Black circles indicate position of villages.

above Podšpilje together with *O. quadripunctata* and *O. pauciflora* and just a single plant east of Kunjanove in *Pinus* woodland.

Orchis purpurea (Fig. 20): First recording on the island. We found a wonderfully vital population of a dozen plants near Marine Zemlje not far from the former airstrip.

Orchis quadripunctata (Fig. 21): not rare in the rocky region in the western and south-western parts of the island near Komiža, on Hum and on the central plateau between Vis and Podselje.

Serapias parviflora (Fig. 22): astonishingly this species was the only representative of the genus *Serapias* on the island of Vis. Widespread all over the island and very common.

Spiranthes spiralis (Fig. 23): First record on the island. We found the juicy, dark green rosette of leaves blooming in the autumn near the forest road by the chapel of Sv. Nikola in the west of Vis.

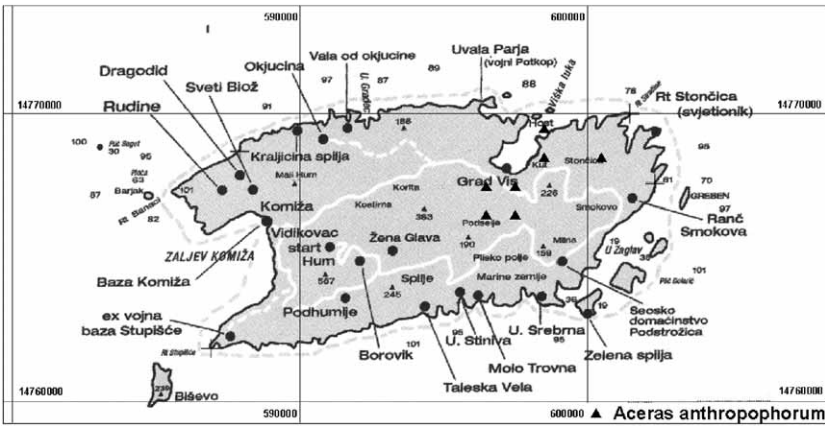


Fig. 1

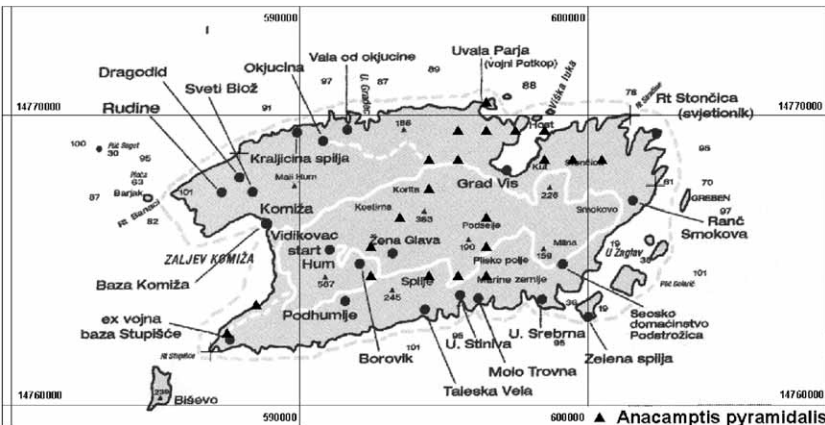


Fig. 2

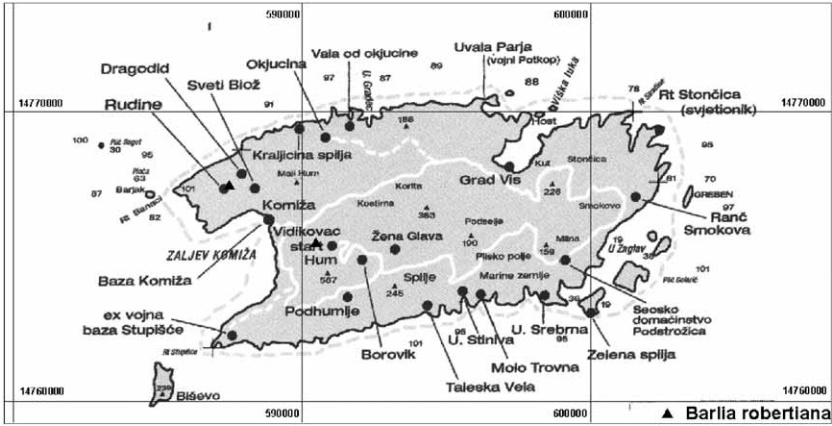


Fig. 3

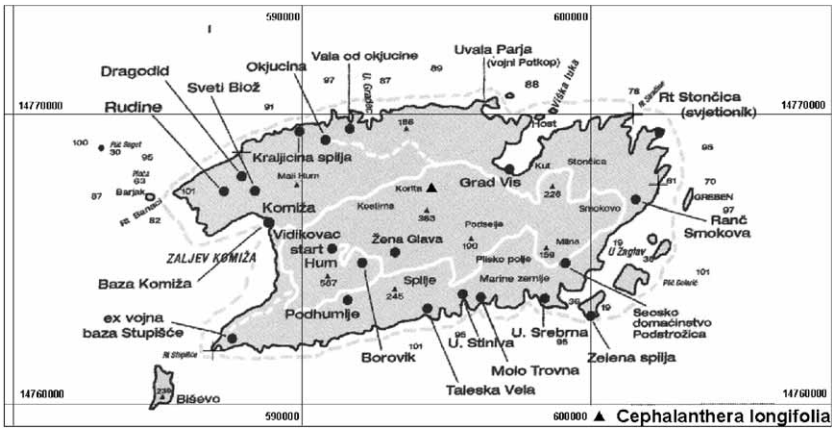


Fig. 4

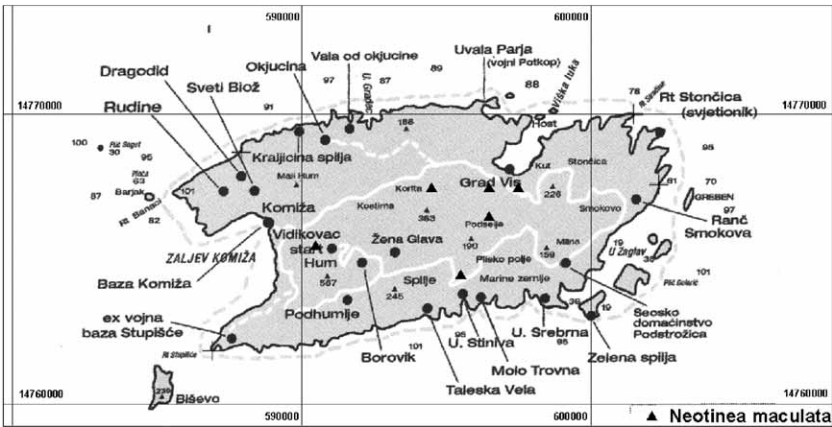


Fig. 5

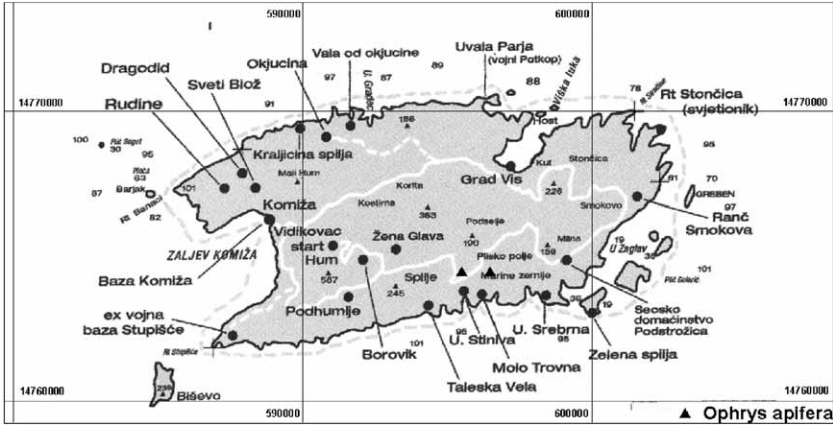


Fig. 6

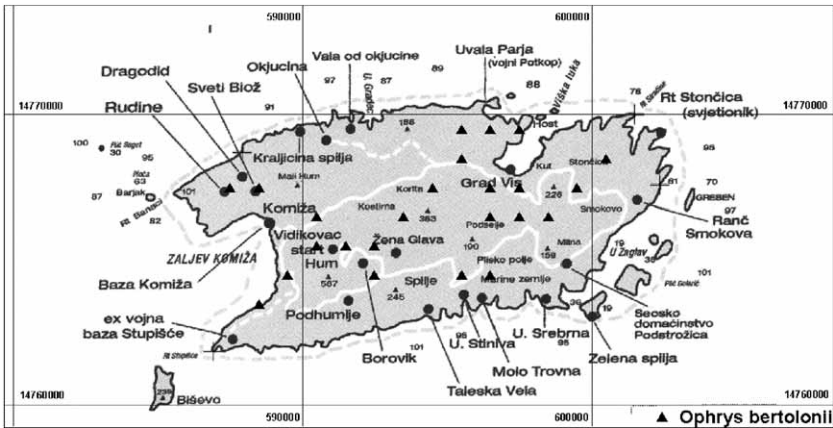


Fig. 7

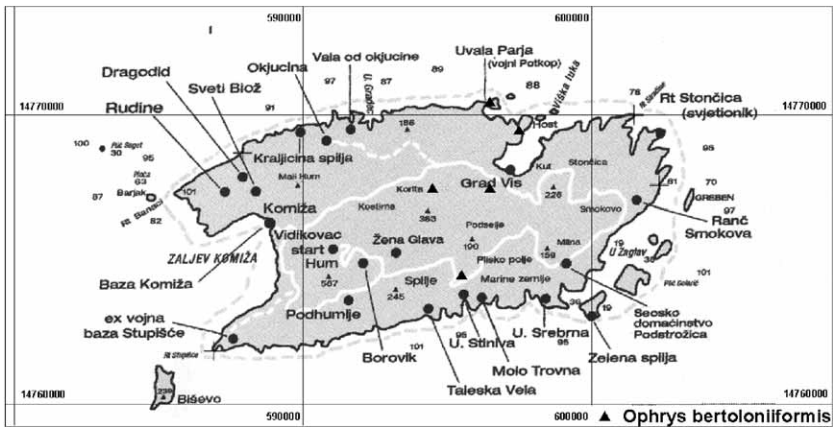


Fig. 8

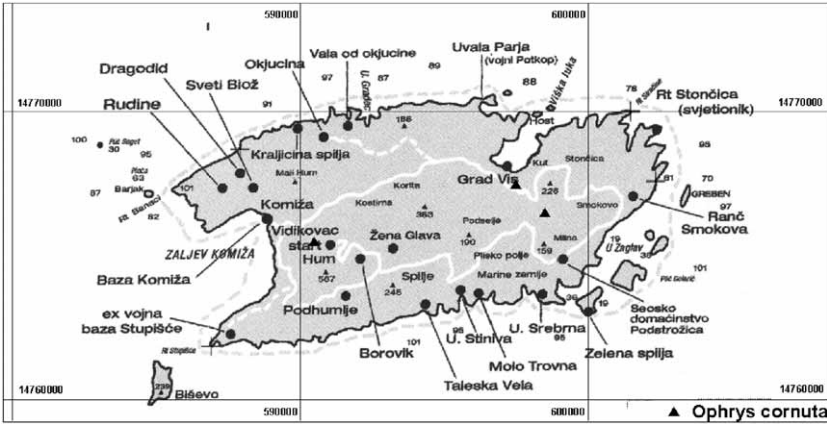


Fig. 9

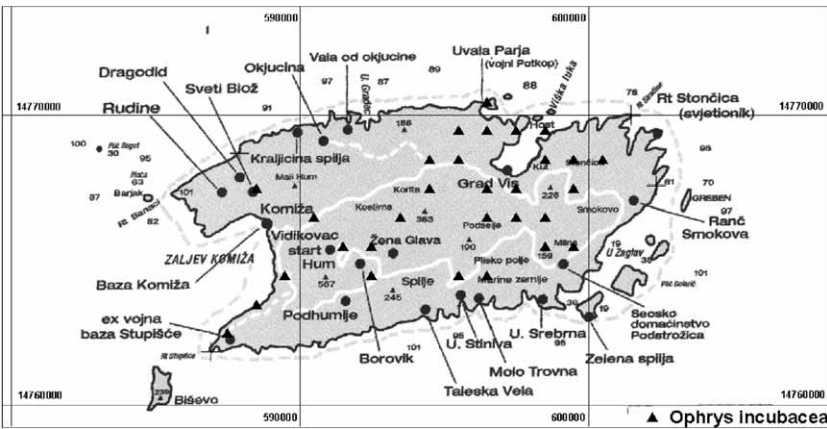


Fig. 10

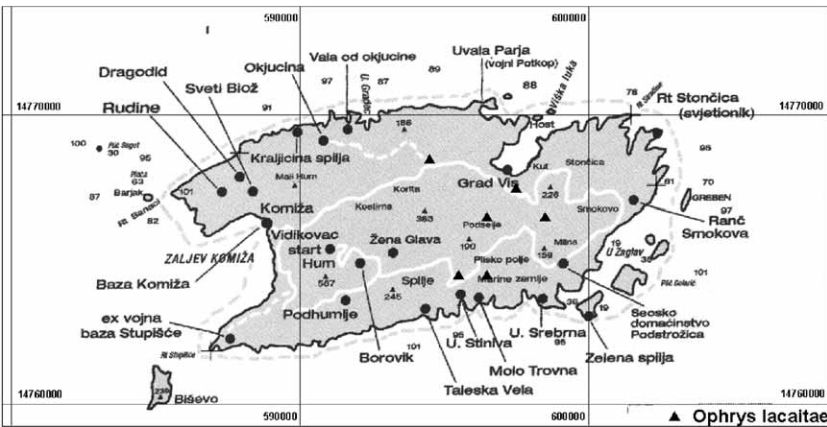


Fig. 11

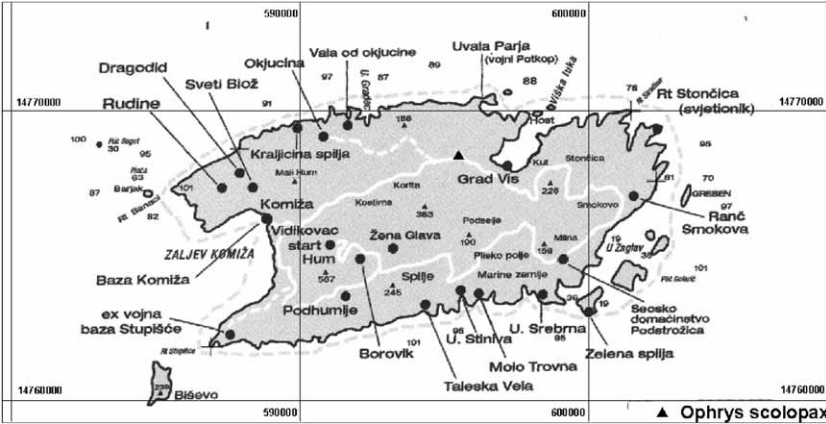


Fig. 12

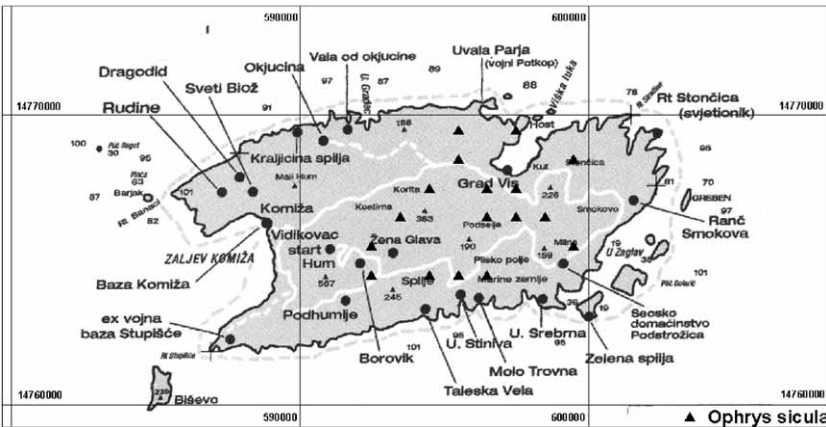


Fig. 13

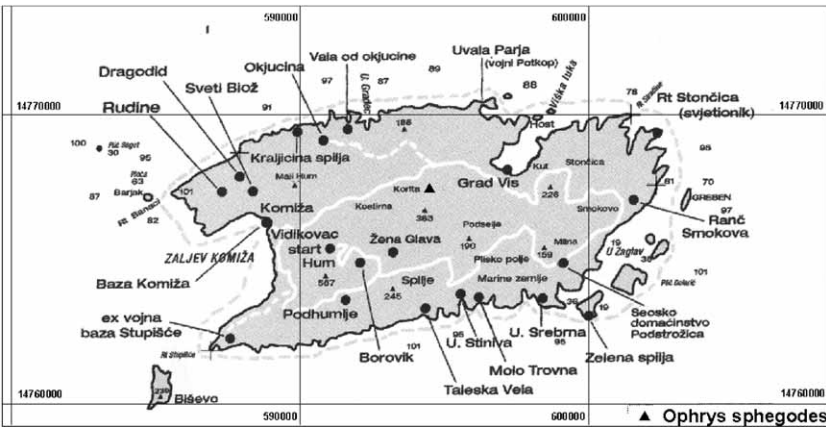


Fig. 14

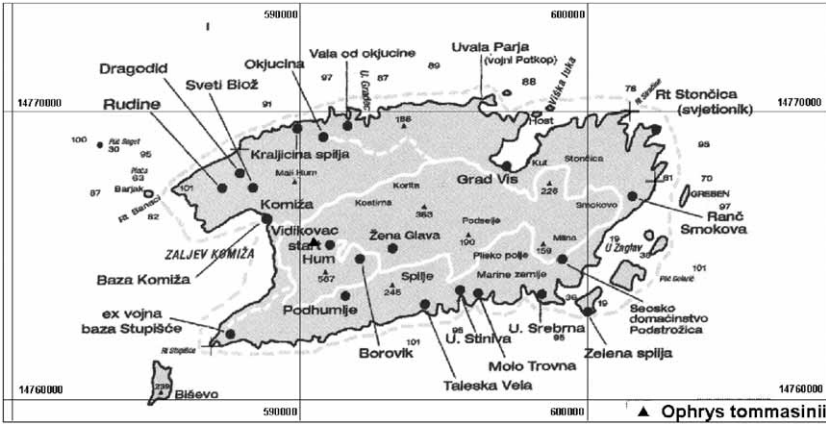


Fig. 15

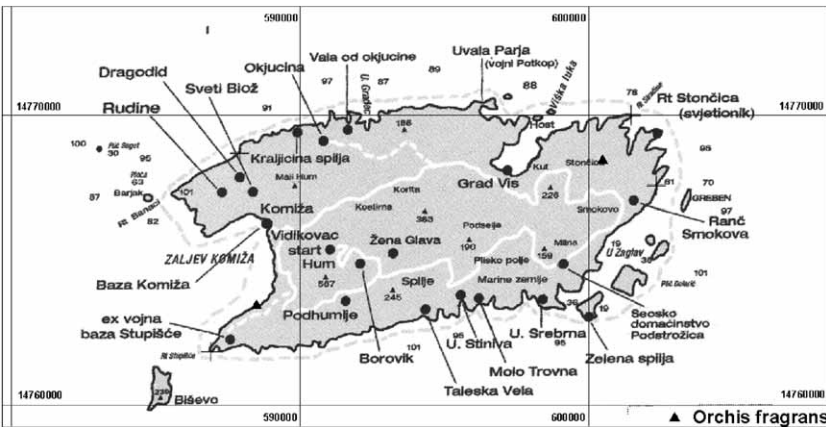


Fig. 16

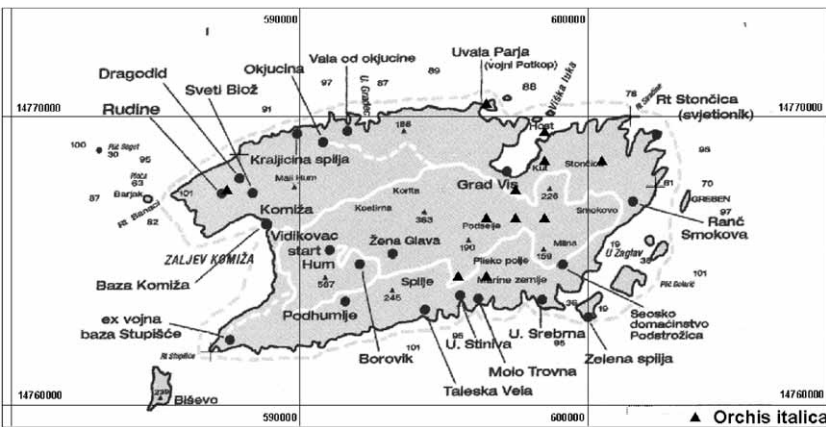


Fig. 17

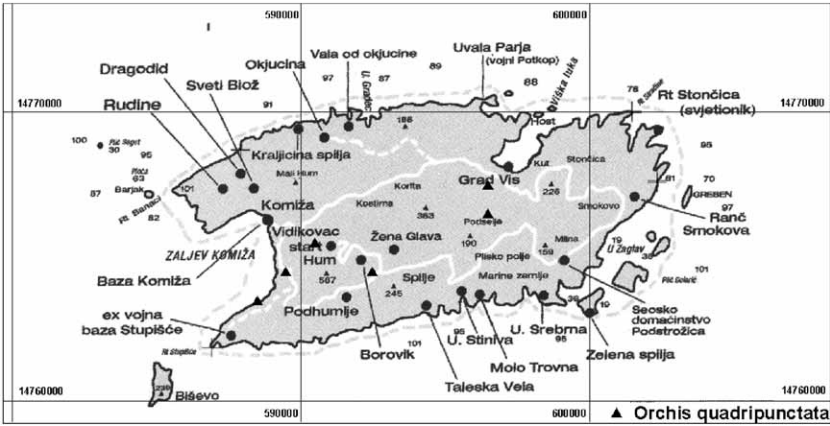


Fig. 21

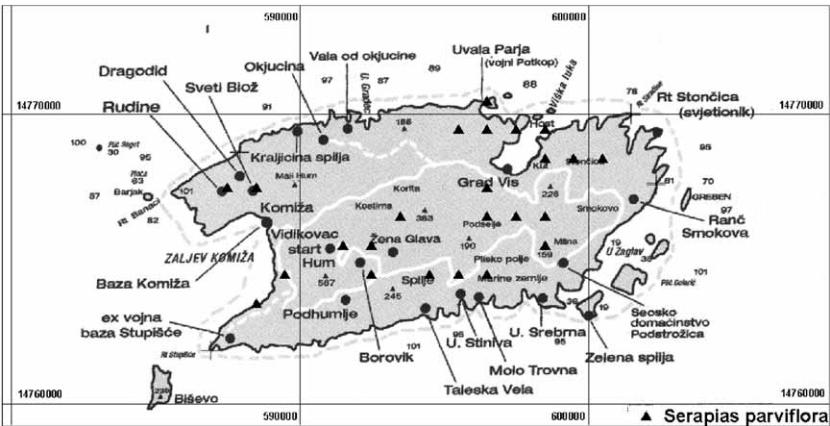


Fig. 22

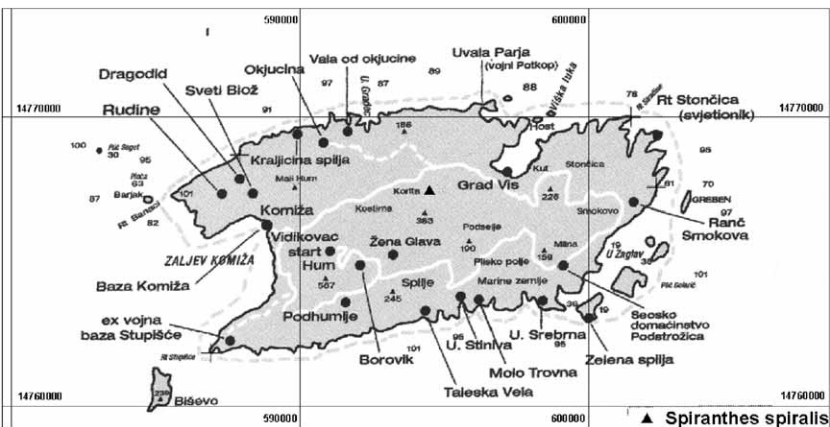


Fig. 23

Discussion

We were able to visit the island during the right season for observation. Some very early flowering orchid species had, however, already bloomed. For example, we found *Ophrys sphegodes* only in Aleppo pine maquis shade, while KRANJČEV (2001) mentioned spotting it in 13 places.

The distribution maps (Figs. 1–23) are the documentation of the status quo of the investigations in the year 2004. The distribution of the orchid species on the island confirms the common observation that bedrock of calcareous and dolomitic limestones produce richer presence than silicate rock. This is why we found fewer orchid species in the north-western and western part of the island.

The general richness of orchid taxa is probably due to the former traditional form of land use, which is today extensive without the previously intensive pasturing of sheep and goats (exceptions are the woodland orchids *Cephalanthera longifolia* and *Neotinea maculata*). But the current status of diversity richness can not be preserved without land use management. More and more, the land is becoming overgrown with shrubs and trees. As the old stone walls and piles of collected stones indicate, more land used to be cultivated in the past. For the future a new balance must be found between land cultivation and conservation aspects. Any pasturing with goats and sheep must be in a balance with the carrying capacity of the vegetation. The expansion of viticulture could in some areas be a danger for some species like *Orchis purpurea* and *Ophrys lacaitae*. A thinning of the maquis from time to time would recreate adapted habitats. The richness of natural values is a precious pillar for nature and culture tourism on this island. Sustainable development by nature conservation and suitable tourism and organic farming are a good outlook for the island of Vis. In this context it is also to consider to create nature reserves on the island, for example in the surrounding of Vis, on the plateau between Podselje and Vis (vino polje), the surroundings of Plisko polje and Marine Zemlja and on of the mountains of Hum-Sv. Duh-Orlovica.

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