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The Orchids of the Isle of Formentera

Keywords
Orchidaceae; Aceras anthropophorum, Barlia robertiana, Gennaria diphylla, Neotinea maculata, Ophrys bombyliflora, O. dyris, O. cf. fabrella, O. fusca, O. speculum, O. tenthredinifera, Orchis collina, O. fragrans, Serapias parviflora; Formentera, Pityuses, Balearic Islands; distribution; ecology; endangerment; protection.

Summary
Klahr, B. (2005): The orchids of Formentera.- Jour. Eur. Orch. 37 (4): 501 XXX. A short review of history and geography of Formentera is given; aspects of flora and fauna of a south mediterranean Island, survival of plants in a half-arid zone without any wells or fresh ground water. As the most southern Island of the Pityuses, Formentera belongs climatically more to Africa than to Europe. It is a very rocky eroded Island after having had a long period without agriculture. Endemic species in flora and fauna are mentioned. Wild Orchids are growing on this small Island mainly in the higher regions of the plateau *La Mola* and *Cap de Barbaria.* There is not as much pastureland as in other mediterranean countries. *Ophrys* and *Orchis* predominate.. Most areas of Formentera were explored during the whole year, also difficult to reach regions like “Torrentes” (Canyons). The period of my observation is 2002 - 2005. The Orchids are endangered as a result of the reinforced agriculture and chemical fertilizing, subsidized by the EU, and by increasing building activities. Centuries fallow agricultural land that makes very interesting biotopes will be destroyed. The orchids of Formentera are bibliographically quoted; the results are to be supplemented with four new found species and new sites.

Zusammenfassung
Klahr, B. (2005): Die Orchideen der Insel Formentera.- Jour. Eur. Orch. 37 (4): Die Insel Formentera wird bezüglich Geschichte und Geographischer Lage vorgestellt. Als südlichste der Pytiusen-Inseln, ist sie klimatisch eher zu Afrika gehörig. Die Insel besitzt keine Quellen oder Grundwasservorkommen. Regenwasser ist das einzige Süßwasser. Vorkommen vieler endemischer Formen in Flora und Fauna. Hier wird über die Ergebnisse der in den Jahren 2002 bis 2005 durchgeführten Beobachtungen der Wildorchideen berichtet. Weite Areale der Insel, ebenfalls schwer zugängliche Bereiche wurden untersucht. Stark zunehmende großflächige Bebauung, sowie subventionierte landwirtschaftliche Aktivitäten, die zunehmend chemische Düngung mit sich bringen, stören die seit Jahrhunderten nicht berührten Biotope und gefährden die heimischen Orchideen dieser kleinen Insel. Die Literatur-Kenntnisse über die Orchideen von Formentera werden ergänzt durch vier Erstnachweise und weitere, bisher ungenannte Fundorte bereits hier bekannter Arten.

Resumen
Klahr, B (2005): Las Orquídeas de la Isla Formentera.- Jour. Eur. Orch. 37 (4): Se ha estudiado la familia Orquidaceae en la isla de Formentera (Islas Baleares, España). Se ha comprobado la presencia de al menos 14 especies diferentes, a las que habría que sumar una más (Spiranthes spiralis) citada en la bibliografía y que no ha sido hallada. Se citan cuatro especies nuevas para la flora de la isla: *Barlia robertiana, Neotinea maculata, Ophrys* cf. *fabrella-fusca* y *Aceras anthropophorum.* Por otra parte se cuestiona la presencia en la isla de *Ophrys vernixia* y de *Orchis coriophora* subsp. *martrinii,* citadas por otros autores, ya que consideramos que se tratan en realidad de *Ophrys speculum* y a *Orchis coriophora* subsp. *fragans.* Se han encontrado poblaciones del grupo de *Ophrys fusca*, pero con flores más pequeñas y una línea amarilla que bordea el labelo parecido a *Ophrys fabrella*, el tallo frecuentemente llega hasta 60 cm de altura. Specimen de esa planta son investigados de momento en la Universidad Ulm, Alemania. Es necesario un estudio más preciso para conocer de forma definitiva su posición taxonómica. Se presenta también un estudio de la distribución de todas estas especies en la isla sobre una cuadrícula UTM de 5 x 5 km de lado. Se ha ampliado notablemente la distribución conocida de la mayoría de las especies. Se puede destacar que *Gennaria diphylla* es más frecuente de lo que se pensaba en un principio, y por el contrario *Ophrys bombyliflora* y *Ophrys speculum* aparentemente han reducido su área de distribución respecto de las citas conocidas en la bibliografía. Se ofrece igualmente información sobre los periodos de floración de todas las especies sobre observaciones que han durado tres años consecutivos.

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1. INTRODUCTION

The wealth of endemic plants and animals of the small island of Formentera will make people interested in botany and biology curious to know more. Especially the Orchids and their hitherto incomplete mapping induced me to look into this matter more closely, to discover new locations and to start a photodocumentation.

In the year 1972 I discovered a green-yellow orchid whose name nobody seemed to know, until I found out from my photographs that I had come across
Gennaria diphylla.

Unfortunately I have not yet succeeded in finding anyone on Formentera as a companion for this interesting work. However, I looked for and found patient experts who answered my questions. I asked my way “through botany”, as it were, and found advice and many useful hints in the internet.

Both the universities of Palma and Alicante as well as the "Gobern Balear" need data from Formentera, they will use them after publishing. For this reason, Prof. Dr. Joan L. Rita Larrucea of the botanical faculty of the University de las Islas Baleares de Palma de Mallorca advised me to publish my findings. When I discovered varieties that had not been described here, I understood that I should make, at least, a report about them. I cannot offer a scientific documentation but a pathway into places where orchids can be found, that have not yet been fully investigated.

Fig. 1 General map of Formentera

1.1 Mapping bases and mapping procedure, nomenclature

Reports and Mapping of the Pityuses are, in part, older than 20 years. In 2001, Llorenç GIL VIVES and LLEONARD LLORENS GARCIA published a special report on Formentera. In this report, however, I found discrepancies which might be traced back to false designations (Tab. 6) made by mistake. During the winter of 2002, I began mapping the island and observed the places where the orchids were found. My observations were based on the following maps: Mapa Topográfico of the Institute Geográfico Nacional de España: 824-II; 824-IV; 849-II; and 825-III plus 850-I; scale 1: 25 000 (Unfortunately, the small island is distributed over four charts.) I used the grid based on the UTM-coordinates by GIL VIVES (2001). There, the area of the island is subdivided into squares of 10 x 10 km. It contains the squares: UTM 31 S; CC 57; CC 58; CC 67; CC 68; CC 69; CC77 and CC 78. In order to reduce the 10 x 10 km grids, the quadrants GIL VIVES used were further subdivided, so that squares of 5 x 5 km (A, B, C, D,) originated .

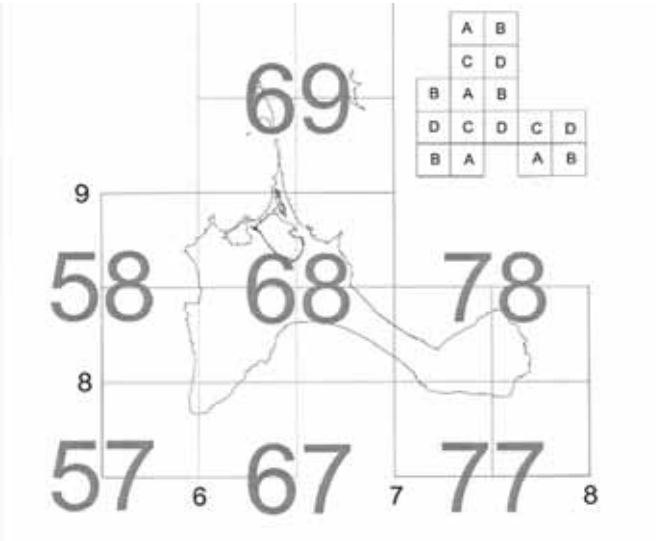

Fig. 2

Up to now, the island of Espalmador was not included in the study. Nomenclature followes DELFORGE (2001)

2. Geographical situation

The island is situated east of the Spanish mainland about 100 km from the Cabo de la Nao (near Denia) and about 235 km north of the African coast. The strait of "Es Freus", which is 4 km wide, separates the island of Ibiza from the island of Espalmador, which historically belongs to Formentera. Together with the small

surrounding islands, Formentera covers about 82 square kilometres with a maximum North-South length (from Espalmador to the Cap de Barbaria) of 17,5 km and a West-East extension (Punta Rasa - Cap de la Mola) of 17,8 km. The predominantly rocky parts of the shores are up to 100 m high. Lacking here are the small sandy beaches, embedded in the rocky shores which are typical of the other Balearic Islands. A long rocky, sandy beach is extending for 7 km from La Mola, the plateau in the East, to the Cap de Barbaria in the Southwest. A dune belt behind the beach is covered with a sparse growth of pines for some hundred yards. Beyond this sand wall, the land was farmed even in Roman days and perfected under the rule of the Arabs. Irrigation systems, which unfortunately are being destroyed at present, ran through the plain between Es Caló and San Ferran. Relics from this period are still to be found: "Norias" and "Aljubs" (wells) can be detected by those who have a good look at the island.

The island, which is relatively flat, has two plateaus: La Mola with its highest elevation Sa Talaiassa (195 m) and the Cap de Barbaria in the Southwest with the Puig Guillem (108 m). A further elevation is the Punta Prima (with the Cala en Baster) in the Northeast of the island. On these plateaus, there are pinewoods. Deciduous forests are completely lacking on the island. In addition, large areas on La Mola are being used for agricultural purposes, where grain, vegetables, fruit and vines are cultivated, quite close to the Faro de la Mola. In the meantime, the Cap de Barbaria is being used more and more agriculturally and has been used more intensively as agrarian land even further south. In the southernmost third, the ´Cap` is grown with a few juniper trees (Juniperus phoenicea, Juniperus oxycedrus) and Aleppo pines (Pinus halapensis). Behind the old stonewall, which two kilometres inland of the light tower separates the "Pla del Rey" (King’s Land) from the rest of the Island, the ´Cap` gradually becomes a stony desert. Here wild goats live almost undisturbed and, among other birds, Burhinus oedicnemus, the Stone-Curlew.

Two lagoons are situated to the north. The smaller one is the Estany des Peix which comprises about 80 hectares (about 193 acres) and has a natural channel to the Mediterranean where small boats can pass, and the much larger Estany Pudent (the stinking one) which measures about 400 hectares (about 988 acres), which is connected to the sea by an artificial canal. This canal serves to flood the lagoon, which was the first area of seawater evaporation for the process of winning salt from the salinas beyond it. It is called Estany Pudent, because the extremely shallow water evaporates during the summer and millions of small organisms die in the process. A bad odour then rises above the region.

The Salinas form an interesting biotope for special plants and animals. Unfortunately they are no longer being used, because they are not economic; thus they fall dry and the biotope loses many valuable species.

3. Geology

According to FELLMANN (1996), the Balearic Islands show a common development and form a continuation of the Betic Cordilleras. The genesis of the Balearic Islands covers a period of 300 million years from the ´carbon` (the hard coal period) to the deserts of the new red sandstone era and the high seas of the Mesozoic up to the tertiary salt deserts and the following torrential rains of the latest history of the earth. The origin of the morph tectonic structure of the Balearic Islands corresponds to that of an alpine region. The Balearic Islands are the fragment of a circummediterranean alpine fold-mountain system, which, originating in the Betic Cordilleras of southern Spain reaches - as an extensive mountain range - far into the Mediterranean. During the late Myocene, the first elevations were formed by lime deposits, which mostly consisted of fossils (La Mola, Cap de Barbaria, Cala en Baster). Above these deposits there are, in part, deposits of reddish mud and soft sands with fossilized inclusions (Mares stones) from the Pliocene. The island has many caverns and caves. Stalactites, fossils and crystals I found only, where these treasures were being destroyed in quarries.

4. History

The little Island was not spared the historic fate of the Balearic Islands. Various invasions, which covered a period of over 2000 years, did not pass the island without leaving their trace. Finally, at about 1500, Formentera was depopulated for almost 200 years, but has now about 7000 inhabitants (In the year 2005). Precise historical developments cannot be described with certainty, because the available documents show too many gaps. The following table 1 therefore contains data which cannot be reliably verified.

Century	Tribe	Period
700-654 BC	Griegos / Greek	46 Years
654-200 BC	Carthagenos /Carthaginians	454 Years
200-426 AD	Romanos / Romans	626 Years
426-535	Vandalos / Vandalen	109 Years
535-700	Byzanthinos / Byzantines	165 Years
700-1235	Árabes / Arabs	535 Years
1235-1500	Catalanes / Catalanes	265 Years
1500-1697	Sin población/not populated	197 Years
around 1700	Hesitant new settlement	

Table 1: Settlement of Formentera

5 NATURE OF FORMENTERA

5.1 The Animal World

Arthropods

Together with the first red-brown muddy Sahara rains, swarms of "Painted Ladies" (Cynthia Cardui) will sometimes cross the sea. It is a joy to observe these beautiful butterflies on the flowering wild plants. Other butterflies too can be seen here; many moths and neuropters like the Ant lion (Euroleon Nostras). The various ant species fascinate me as well as the Egyptian Migratory Locust (Anacridium aegypticum), the Praying Mantis (Mantis Religiosa), cicadas, crickets, solitary bees, dragonflies and spiders. A spider of the Theriids group, which is not normally indigenous in Europe, builds its net in the nets of the big Argiope bruennichii and Argiope lobata.

REPTILES

Here I want to mention one endemic species, which - blue-green like the sea - can be found in many parts of the island: the Pityuse Lizard (Podarcis pityusensis) with its many variants. In certain regions only a few of this kind can be found. I noticed that in the most northern part of the island none of these blue-green lizards were to be seen, but brownish variants instead. A reptile that is active at night is the gecko Hemidactylus turcicus. Up to the middle of the sixties, turtles frequented the Cala Mitjorn to deposit their eggs. Unfortunately they no longer come here to lay.

BIRDS

During the winter months, up to June, many migratory birds come to Formentera. I saw here the red-headed shrike (*Lanius senator)* and the much rarer red-backed shrike (*Lanius collurio*). Many other species of small birds like the Sardinian Warbler *Sylvia melanocephala* and Marmora's Warbler (*Sylvia sarda)*, the Spotted Flycatcher (*Muscicapa striata)*, the Blue Rock thrush (*Monticula solitarius)*, the Wren (*Troglodytes troglodytes*), the Robin (*Erythacus rubecula*) and the Stonechat (*Saxicola torquata)*, the Redstart (*Phoenicurus phoenicurus)*, the Swift (*Apus apus)* and many others. The group of the aquatic birds is quite numerous as well. Beside the indigenous birds, many migratory birds come to Formentera. Even rare species are to be seen like *Eudromias morinellus* and *Chlidonias leucopterus*. Under special protection is *Puffinus mauretanicus*, which breed in the cliffs and feeds its young ones at night. Whoever finds it worthwhile to go to the lighthouse of La Mola in the breeding season will be rewarded with the acoustic hubbub of these rare birds.

Unfortunately there is no denying the fact that the number of kestrels (*Falco tinnunculus*), the Hoopoes (*Upupa epops)* of *Burhinus oedicnemus and the Goat Suckers – European Nightjar* -(*Caprimulgus europaeus*) has decreased significantly within the last thirty years. In my region I have been observing the breeding efforts of these birds for many years. Breeding places on fallow properties between holiday homes are readily sought out, as the houses are vacant almost all the year round and are very quiet. When the breeding season starts, the first tourists arrive and disturb the breeding process, which leads to great losses. Happily hunting the birds has become rarer in the meantime. Especially worth mentioning among the birds of prey is the very rare *Falco eleonorae.*

MAMMALS

The old ´Corales`, stables built of natural stone, covered with beams and seaweed, are a home for bats. In the age-old demarcation walls „Eliomys *quercinus*" raise their young ones; rats and mice are romping about even in the poorest cliff regions.

The number of wild rabbits "Oryctolagus Cuniculus" has been diminished by hunting.

Hedgehogs "*Erinaceus algirus*" are decimated every year on the roads of Formentera.

The wild goats of the "Pla del Rey", the "King's Land" of Cap de Barbaria run about without tethers. It is a joy to observe the natural gait of these animals, if one has seen

these animals crippled by tethering in the fields of southern countries. One should not forget, however, that the wild plants in this almost barren country are very much endangered by the goats.

5.2 General plant life

Formentera may be counted among the half-arid zones. Very often, the semiarid years (See precipitation table 2) together with the merciless sun in summer will erode the sparse soil that covers the rocks. Frequent storms will additionally erode the dried-out land and level down the soil, unless it is covered with greenery. Agriculture, which for some years has been subsidized by the EU, counters this effect to some extent, but destroys many biotopes, which have been lying fallow for centuries, by artificial fertilizing. In view of the insignificant thickness of the topsoil, over-fertilization could occur within a short period of time. The "Lluvias irregulares" - the irregular rainfalls - are the main reason why the grain frequently does not get moisture in time and bears no fruit. The farmers will then lead their cattle, as well as goats and sheep to graze in the fields, in order to gain what little use they can get from the crop.

Rainwater is a precious commodity which has been collected for centuries in underground cisterns ("aljub") and has been the only freshwater reserve for the inhabitants. The island has no springs, therefore the rain was the only source of natural freshwater. There is no groundwater, apart from the so-called "Possos".
This tectonic feature, which comprises depressions and hollow spaces within the rock, allows rainwater to collect in them, so that it can be pumped out. For watering the fields, deep wells were dug into the flat regions of the island (today they are drilled), which contain more or less brackish seawater which has passed from the sea through sand and stone. In the meantime, the large hotels have seawater-desalination plants at their disposal, and for the communities there is also a plant available. This, however, is not enough to satisfy the water requirements of the tourists during the summer months. In the villages the water will then be rationed by turning it off for some hours. During the hot and dry summer months, the vegetation is reduced to a minimum. Very noticeable is the heavy shedding of needles in pine trees, and especially in juniper trees. The danger if fire rises extremely. In spite of the dryness, plants and animals survive, for there is surprisingly much dew. The humidity frequently rises to 90% in summer, at temperatures of 30° - 36° in the shade. The plants collect the humidity via their leaves and shallow roots. Birds drink the dew drops from the twigs and take their bath. In September, at the latest, the first rains fall and then this barren island begins to turn green and to blossom.

Precipitation in the Region C'an Parra, Formentera Barbara Klahr																	
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
Jan	0	19	20	18	38	84	37	70	34	1	53	0	7	116	42	18	52
Feb	17	18	11	51	0	9	23	0	31	0	26	9,5	38	74	22	18	2
Mar	0	16	10	42	1	11	10	22	0	40	12	39	60	2	31	8	53
Apr	70	18	0	14	49	6	6	2	16,5	55	69	38	19	14	55	0	55
May	0	7	4	15	0	47	14	7	30,5	76	46	94	0	32	9	108	12
June	0	7	6	18	52	0	0	0	0	16	0	1,5	1	0	5	30	0
July	4	0	0	0	1	0	0	0	95	23	0	0	0	0	0	13	0
Aug	0	0	82	125	3	17	0	0	0	103	0	0	2	21	23	0	
Sept	25	130	34	96	24	6	33	101	73	13	69	14	151	45	7	43	
Oct	102	62	6	115	30	31	36	126	2	20	88	41	31	12	234	41	
Nov	170	21	20	54	75	39	81	32	146	60	87	34	96	110	63	136	
Dec	17	9	57	60	53	96	38	15	68	40	31	270	26	75	61	98	
total	405	307	250	608	326	346	278	375	496	447	481	541	431	501	552	513	

Table 2: Precipitation Formentera, Region C'an Parra, in Liters/m²

During the summer, when nature is resting, the underwater-flora and -fauna is interesting for the nature lover. Swarms of young fish are then a special event for the snorkler and diver, unless the biological balance is threatened by the increasing number of ferries, yachts, motor boats and luxury liners as well as the hundreds of sewage systems that contaminate the sea, so that the snorkler/diver literally cannot see their hands before their eyes. Even Dredging sand from the sea and depositing on beaches, the clouding of the seawater is increased; the seaweed meadows are partially buried under the sand, so that the sunlight cannot reach the plants any longer. In the meantime, the dunes on Formentera have been put under protection, which was very expensive. The masses of tourists in summer, however, destroy much of the protected biotope. Ever larger car-ferries transport an ever larger number of cars. In the protected dunes, barriers are pulled down, and the cars are parked near the beaches. In addition - although this is strictly forbidden - there is extended camping in the dunes. The freshly planted grass and halophytes are trampled down and the remainders are fertilized with faeces. The island of Formentera offers a few special features. The mediterranean plant life has produced many endemic forms. Alone on Formentera 27 different kinds of Taxa were found. Among them the wild Larkspur *Delphinium pentagynum subspecies Formenteranum* (N. TORRES) or *Limonium Formenterae* (LL LLORENS), *Limonium Wiedmannii* (ERBEN) and *Chaenorrhinum Formenterae* (GAND) a plant from the genus *Scrophulariaceae*.

Within the old walls of natural stone, which are built in a different way on each Balearic island, there are fields which have not been cultivated for centuries. These fields are grown with wild grass and herbs, where ancient fig- and almond trees grow that have not been pruned for years. Next to the walls, there are areas, which, in the meantime, are loosely grown with *Juniperus phoenicea* and *Juniperus oxycedrus.* There one can find *Orchis collina, Orchis coriophora subspecies fragrans* (Pollini) SUDRE, which I in the following pages call *Orchis fragrans;* one can find furthermore *Gennaria diphylla* and *Ophrys fusca.* Further areas are grown with sparse pine tree woods. The undergrowth consists of shrubs like: *Pistacia lentiscus,* the high *Erica multiflora, Juniperus oxycedrus*, *Rosmarinus officinalis, Asphodelus aestivus,* and *Asphodelus fistulosus.* Protected by this vegetation various mushrooms and, besides many other plants, orchids are growing. The island has a very large number of species. In spring, the fields are multi-coloured. Dark-red poppies (Papaver *roehas*) between a variety of fragrant clovers and their leguminous plants, the white *Ammi majus,* Anacyclus *clavatus,* and the splendid *Bellardia trixago.* The *Boraginaceae* and *Echium species* are brightly blue. The large group of the *Euphorbiae* is represented here by at least ten varieties like e.g. *Euphorbia exigua, Euphorbia falcata, Euphorbia helioscopia, Euphorbia medicaginea, Euphorbia paralias,* - and there is an astounding number of grass plants. It is impossible for me to name all the plants of this colourful spring parade.

5.3. The Orchids

5.3.1 General Remarks

The sterile and rocky island is very much subject to erosion. Fertile soil rarely reaches a thickness of 1 m above the rocky ground. The erosion of the last centuries is gradually counterbalanced by agricultural activities. This, however, has diminished the natural orchid biotopes.

Orchids grow here, above all, in sparse pine forests and on barren grass, at the borders of paths and roads and near natural stonewalls. The barren grass on which I found *Ophrys fusca, Gennaria diphylla, Orchis collina* and *Ophrys fragrans* are not pastured or cultivated. In comparison to other mediterranean regions, there are only a few pastured areas here. During the last few years not only the agriculture has been intensified but also the cattle breeding, so that it might pay to look at sheep- and goat pastures in order to find further orchids. To me it seems remarkable that varieties like e.g. *Gennaria diphylla* have been considered rarities on Formentera up to now, although they are encountered rather frequently. On a roadside I found along a distance of about 100 m *Ophrys fusca, O. dyris, O. tenthredinifera, Neotinea maculata, Serapias parviflora, Anacamptis pyramidalis, Orchis fragrans* and, of

course, *Gennaria diphylla.* Between the Cap de Berberia and La Mola, the two plateaus, extends a long bay, which opens toward the South. Alongside this bay, there is a belt of dunes grown with pine trees. There are only a few *Ophrys fusca* and *Ophrys tenthredinifera.* At the feet of both plateaus are growing *Ophrys fragrans, and* occasionally also *O. fusca* and *Serapias parviflora.* These regions, in which all varieties occur simultaneously, I have observed with special intensity. The undergrowth consists of *Juniperus phoenicea, J. oxycedrus, Pistacia lentiscus, Erica multiflora, Rosmarinus officinalis, Cistus albidus, Cistus, monspeliensis, Cistus salviifolius* and *Cistus clusii.* The ground is covered by moss and lichen in autumn - clearings are strewn with *Merendera filifolia,* a delicate violet flower that is similar to the meadow saffron, as well as *Narcissus serotinus.* In the beginning of December you can detect there *Ophrys* rosettes, but unfortunately I did not find *Spiranthes spiralis (L).* CHEVALIER, which is said to exist on Formentera. During the investigations, it became apparent, that orchids occur more frequently and in a greater variety of species in the higher regions of the island. The plateaus are thus richer in orchids than the plains. To complete the present investigations will take a lot of time.

5.3.2 First finds on Formentera

Within the scope of the mapping, the following taxa were newly detected on Formentera: *Aceras anthropophorum, Barlia robertiana, Neotinea maculata, and Ophrys cf. Fabrella.*

Aceras anthropophorum

In April 2005 I found in the West of the island the hitherto undetected species *Aceras anthropophorum*. There were merely five specimen of which four were in bloom.

Barlia robertiana When I happened to look over a stone wall I saw a single splendid *Barlia robertiana* in full bloom at the edge of a field not reached by the plough. Among the many leaves of *Urginea maritima,* I would not have detected the flower if it had not been in bloom. That was in the year 2003; is flowered again in 2004 and 2005 but there are no further plants in the surrounding area. The rosette of a non-flowering *Barlia robertiana* was encountered in 2004 and 2005 on La Mola. In January 2005, I discovered in a remote spot on the West coast 125 specimen of every age in a dense pine forest. Although these orchids grow on a very remote place, there are apparently "collectors" who cut off these flowers systematically. One plant has disappeared completely.

Neotinea maculata

A further new discovery was *Neotinea maculata*, likewise unknown on the island, which I found in a dense, rather dark pine forest with little undergrowth. In this place there were growing many relatively small plants, which I observed until they were in bloom. The leaves are, without exception, dark green with dark-violet to dark russet spots. In this region, I found I found no specimen without spots. The plants remained small and there were relatively few blossoms. The plants found in brighter regions were considerably bigger (up to 32 cm high) and the blossoms were appropriately well developed. There I also found unspotted specimen with lighter leaves. The time for blossoming is the middle of March to the middle of April.

Ophrys cf. Fabrella

In February 2004, on an open northern slope, I discovered the 60 cm high stem of an *Ophrys* with a relatively compact juvenile blossom. I could not classify this plant from the literature at hand, but found the description of *Ophrys fabrella-fusca*, H. F. Paulus nom. prov. with DELFORGE (2002), which seemed to fit my new find best. In the meantime, DELFORGE has described it as a new species, *Ophrys fabrella*, H.F. Paulus and Ayasse ex Delforge (2004). As it is not certain, whether this might be a variant of *O. fabrella*, Prof Ayasse of the University of Ulm offered to look into the matter and to classify the evidence I sent him in April 2004 and March 2005. The results of the gene- and scent tests are not available yet. Until I have definite information, I shall call this variety *Ophrys cf. fabrella*. For possibilities of comparison with the description published in 2004 by DELFORGE, I shall now describe the local plants:

Ophrys cf. Fabrella

Habitus

Conspicuously tall plant with slender yellow-green stem; up to 60 cm high and 1-8 relatively small flowers.
Aspect of the Labium:

Juvenile labium, rather six-sided, 8-10x8 –10 mm later 8-11x10-12 mm (width x length) when extended. In the young plant the labium and the side lobes are extended, and in the older blossom it is turning downward at the edge. The labium is notched in front. A regular narrow, yellow edge borders the labium and the side lobes.

Colour:

Labium and side lobes are reddish brown to dark reddish-brown, and are often marbled yellow-brown.

Marks:

The upper tips are usually orange-russet and run down to differing colours below. The marks very often have an unsteady centre and terminate in a silvery white V. Variants are numerous. Very often the marks are completely bluish silvery and reach to the yellow rim of the lobes, showing no difference in colour worth mentioning; - others are marbled. The marks are clearly separated by a narrow furrow.

Hairs:

The relatively short hairs in the juvenile blossom often appear rough and coarse in the fully matured blossom.

Sepals:

Yellow-green and not fully opened.

Petals:

Relatively short, green petals, which do not open very much. Occasionally lined with a very fine dark rim.

Time of flowering:

During the last three years, the time of flowering varied. From the middle of February in 2003 and 2004, and from the beginning of March in 2005, i.e. 8-10 days later. The relative time of flowering is from the middle of February to the middle of April. In all places where these plants were found, which grow, without exception, free-standing in sparse pinewood forests or on clearings, they were incomparably higher than described in the available literature (DELFORGE 2004: up to 25 cm high) and appeared very gracile. In the year 2005, the time of blossoming was about 8 days later, but did not last longer than the middle of April. A striking fact I noted in the course of three years: nearly all the flowers in the regions known to me remained without seed capsules. During the blossoming time, the rosemary was in full bloom and was frequently visited by bees; the blossoming of the pines also occurred during this period.

5.3.3 Ophrys

The other Ophrys varieties indigenous to Formentera, like *O. fusca*, *O. tenthredinifera*, *O. dyris* and *O. bombyliflora* are most frequently found on the plateau of La Mola. They can also be encountered on the plateau of the Cap de Berberia.

Ophrys speculum

I found *O. speculum* in March 2002 and 2003. Two flowering plants were growing in a small clearing, where otherwise only *O. fragrans* was to be found. In 2004 the blossoms were destroyed by the driver of a Rover, which parked there. In 2005, both plants were blooming together with a third one. The stems were about 20 cm high and supported 6 blossoms each; the smaller young plant had three flowers. In 2005, I found a single blooming plant on La Mola, but no signs of further plants. All four plants remained unpollinated. Where have the plants disappeared to which Llorenc Gil Vives et al. (sub O.vernixia) encountered so often?

Ophrys fusca

O. fusca flowers for a long time between December and the beginning of April, then it is joined by *Anacamptis pyramidalis*

I could not find any of the late blooming species. The variants of *O. fusca*, however, are truly bewildering. The tables and distribution charts show therefore the great spectrum of the local *O. fusca* varieties, among which also *O. lupercalis* can be found. For the complete Fusca aggregate, further studies are necessary.

Ophrys dyris

O. dyris with its dark-brown-violet, velvety lips and long greenish to russetreddish petals shows a peculiarity in the juvenile blossom: the lips are turned upward like a spoon. The hairs seem nearly white. Later the lips curve downwards and fork off in a 90° angle; the mark which is surrounded by a bluish to white "W“, is without hairs and shining, the middle notch is lacking.
The most striking variant to the dark-brown violet nearly black seeming *O. dyris* appears like being painted red, the red colour covers the lip, the "W" and the marks.

Ophrys tenthredinifera

O. tenthredinifera is also incredibly different in colour and pattern. A blue, especially gracile high-growing species I encountered on the Cap de Berberia and on La Mola. A difference in blooming time could not be ascertained. This Ophrys is most often encounted here.

Ophrys bombyliflora

O. bombyliflora fascinated me by its wonderful rosettes. I first found it in the quadrant 78 D on the 3rd of February 2004. The perfectly formed, bright yellowgreen big rosettes with 5-9 elongated lanceolate leaves irritated me when I tried to classify it. There were no Flower-buds as yet and so, on the 16th of February 2004, I went the difficult way again to the place where I discovered it and found many blossoms which I was unable to classify. On the 8th of March 2004, I went to this difficult to reach region again and the 5-hours trip was rewarded. *O. bombyliflora* was in bloom. There are many small areas there of which only an area of 5 m² is filled with about 500 plants, standing on moss-covered ground. A further 2 x 2m spot in 78C (situated in a small hollow) houses about 200 plants. In 2005, I found two other small areas, which were again densely occupied; here too, in an area of about 4 x 3m about 500 plants were growing. The place in 58D is the only one, on which but a few plants (16) were standing.

5.3.4 Orchis

Orchis collina

Although *Orchis collina* is known on Formentera, it had not been mapped. The 5-20 cm high plant can be found in open, meagre grass plots, where it grows loosely distributed in most cases. When taking a walk round the Lagoon Estany Pudent or the Estany des Peix, one encounters *Orchis collina* here and there, even growing to within 5 m of the salt lake. There they stand in small groups of up to 30 plants and more. *Ophrys collina* is not rare on Formentera.

Orchis fragrans

O. fragrans, the most numerous species, does not avoid the nearness of the coast and is found on meagre grass plots as well as in open pine forests. Colour variants

between dark red to whitish green can be found. It grows even in stony regions and gives off a delicate and beautiful scent. Therefore, it cannot be *O. coriophora subsp. Martrinii.*

5.3.5 Serapias

Of the genus *Serapias* I found only *Serapias parviflora* on Formentera. It is quite numerous and fortunately spread over nearly all the quadrants.

5.3.6 Spiranthes spiralis

Spiranthes spiralis could not be found by me up to now. Two sites were named by LL. GIL VIVES (2001) which I have yet to discover.

5.3.7 Gennaria diphylla

Gennaria diphylla was found on the Balearic Island of Menorca by Delforge. He describes it as rare. I cannot confirm the description; on Formentera at least it is encountered frequently. It seems to be content with nearly every soil and light conditions. Both on street shoulders as well as in woods, or in the deepest shady areas of the Torrentes grow hundreds of these bright, light-green plants. Not in all regions, but where they are to be found, there are many of them. *Gennaria diphylla* grows on street shoulders as well as in woods or in the Macchia. I found it under *Juniperus phoenicea,* which settled on meagre grass plots, as well as under *Rosmarinus officinalis, which* grew there. Content with nearly all locations it can be found in tiny earth-filled holes in rocky ground. The buds develop relatively slowly to the completely open flower. Beginning with the buds in January, the abundant seed capsules emerge in the second half of April.

5.3.8 Anacamptis pyramidalis

Within urbanization in 68 B, *Anacamptis pyramidalis* is growing. It is a very rocky and stony plot grown with *Juniperus phoenicea subsp. Turbinata, Juniperus oxycedrus, Rosmarinus officinalis* and thyme bushes. Within the appropriate season, one also encounters *O. fusca, O. tenthredinifera, O. dyris, Serapias parviflora, O. fragrans* and an astounding number of colour- and formvariants of *Anacamptis pyramidalis.* Within an area of 30 x 30 x 30 m I counted about 350 flowering plants each year, in the years 2003, 2004 and 2005. It seems that the blossoms grow smaller in the course of the years. The surrounding "Garrigue" grows over the plants. The

different colours and lipforms irritated me at first. I found no indication for a so -called late-blooming Anacamptis. Further places, where I encountered the plants are in 68A, 58D (with about 100 plants) and 78C with about 120 plants in two spots, which are approximately 100 m distant from each other.

5.3.9 Aceras anthropophorum

Another pleasing rediscovery in April 2005 was *Aceras anthropophorum.* At first, I stumbled over a rosette that was unknown to me; a little later I noticed a single blossom, which had not yet fully opened. In this area there were three further specimen in bloom within a radius of 50 m. The plants were standing in the NE of an open, relatively young group of pine trees beside *Rosemary* on non-pastured poor grassland, where also single *Ophrys bombyliflora* as well as *Ophrys cf. Fabrella* could be seen. *Orchis fragrans* and *Serapias parviflora* were encountered as well.

6. Species

6.1 List of Orchid Species found.

	Species	Number of habitats (related to a 5 X 5 km grid)
1	*Aceras anthropophorum*	1
2	*Anacamptis pyramidalis*	4
3	*Barlia robertiana*	2
4	*Neotinea maculata*	1
5	*Serapias parviflora*	9
6	*Gennaria diphylla*	7
7	*Ophrys bombyliflora*	3
8	*Ophrys* cf. *fabrella*	4
9	*Ophrys fusca*	9
10	*Ophrys dyris*	5
11	*Ophrys speculum*	2
12	*Ophrys tenthredinifera*	8
13	*Orchis collina*	6
14	*Orchis fragrans*	10

Tab. 3: List of Orchid Species, found on Formentera

6.2 Table of Habitats

Orquídeas de la Isla Formentera

	UTM 31 S	57B	58D	58B	67A	68A	68B	68C	68D	77A	77B	78C	78D
1	*Anacamptis pyramidalis*		N		X	Nq	Nq					X V	
2	*Barlia robertiana*		N					N				N	
3	*Neotinea maculata*											N	
4	*Serapias parviflora*		Nq		Nq	XV	XV	XV	X	X		XV	XV
5	*Gennaria diphylla*	Nq	Nq		Nq			X V		X V		X V	X V
6	*Ophrys bombiliflora*		Nq			X		X	X	X		Nq	XV
7	*Ophrys fabrella-fusca*		N					N				N	N
8	*Ophrys fusca*	Nq	X V			X V	Nq	X V	Nq	Nq		X V	Nq
9	*Ophrys dyris*		Nq					X V				X V	Nq
10	*Ophrys speculum* *					X		XV	X	X		XV	
11	*Ophrys tenthredinifera*		Nq		Nq	X V	X V	X V	X	Nq		Nq	Nq
12	*Orchis collina*		Nq			Nq	Nq	Nq				Nq	Nq
13	*Orchis fragrans* *		N		N	XV	XV	XV	Nq	XV	XV	XV	XV
14	*Aceras anthropophorum*		N										
	Spiranthes spiralis									X		X	

Legend / Leyenda / Legende

X bibliograficaly quoted / citada en bibliografía / zitiert in Bibliografie
XV Veryfied / verificada / verifiziert
N New Species / Nueva Especie / Neue Spezies
Nq New quadrant / nuevo cuadrante / Neuer Quadrant

* **Two formerly described Species seems to be wrong named by error**
Ophrys vernixia Brot
Orchis coriophora subsp. martrinii

Tab. 4: Table of habitats

6.3 Blooming Period of Orchids

Flowering period / Período florescente / Blühperiode

UTM-Grid 31S	**December**	**January**	**February**	**March**	**April**	**May**
Aceras anthropophorum						
Anacamptis pyramidalis						
Barlia robertiana						
Neotinea maculata						
Ophrys bombyliflora						
Ophrys dyris						
Ophrys cf. fabrella						
Ophrys fusca						
Ophrys speculum						
Ophrys tenthredinifera						
Orchis collina						
Orchis fragrans						
Serapias parviflora						
Gennaria diphylla						

6.4 Hybrids

Up to now, I have not found any hybrids of the various species. I suspect that many `bastards` came into being through human ´help`.

7. Rendering of Thanks

I wish to thank Mr. Helmut Presser for his unflagging support and the many hours, which he spent for me in front of the PC, especially for his suggestions and the critical perusal of my manuscript. A great help was, furthermore, Prof. Juan Rita Larrucea, Botanical Faculty of the University of Palma de Mallorca, also as regards problems of the Spanish Conservation of Nature. Without the friendly company of my Scottish companion Bill Balharry in the spring of 2004, I would not have ventured into the Torrentes and I want to thank him heartily.

8. LITERATURE

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Pict. 1: *Ophrys* cf. *fabrella*, Isle of Formentera, Highland La Mola 150m, 04.03.2004. (Foto B. Klahr)

Pict. 2: *Ophrys* cf. *fabrella*, Isle of Formentera, Highland La Mola 150m 24.03.2005; different stages of age. (Foto B. Klahr)

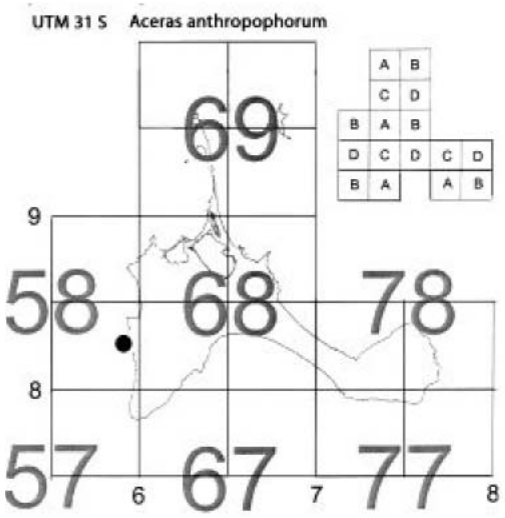
Pict. 3: *Ophrys* cf. *fabrella*, Isle of Formentera,Highland La Mola 130m, 12.04.2005 (Foto B. Klahr)

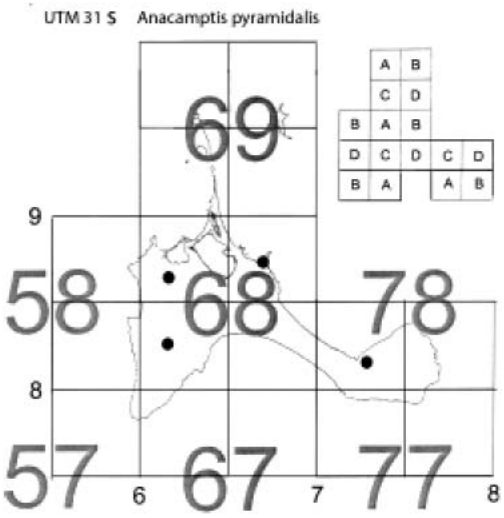
Pict. 4: *Ophrys* cf. *fabrella,*Isleof Formentera, Highland la Mola 150m 17.03.2004. (Foto B. Klahr)

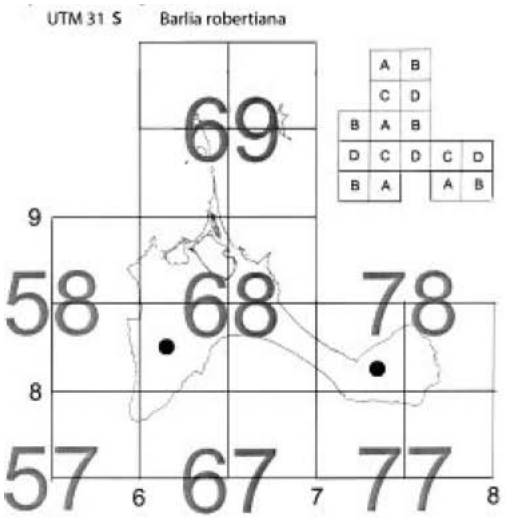
Pict. 5: *Ophrys* cf. *fabrella*, Isle of Formentera, La Mola 150m, La Mola; 26.02.2004; (Foto: B. Klahr)

Pict. 6: *Ophrys* cf. *fabrella*, Isle of Formentera, La Mola 150m, La Mola; 26.02.2004; (Foto: B. Klahr)

Annex: Distribution maps



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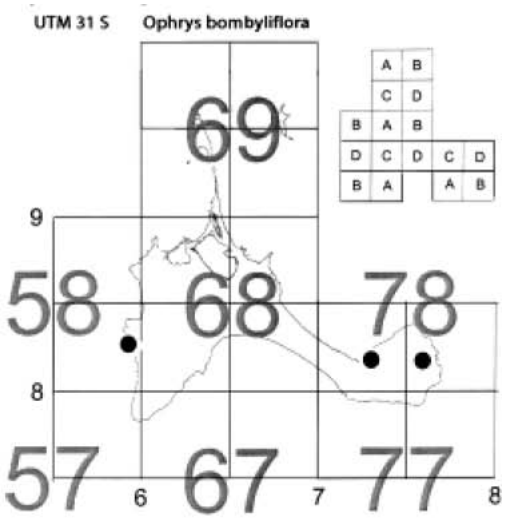
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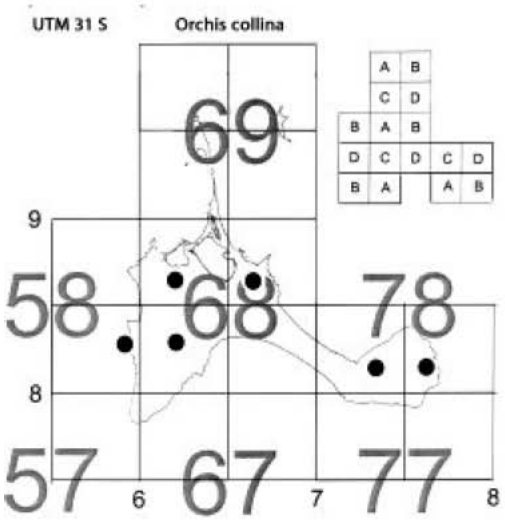
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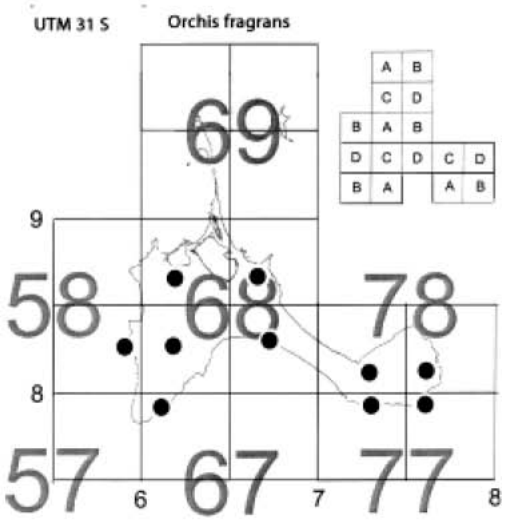
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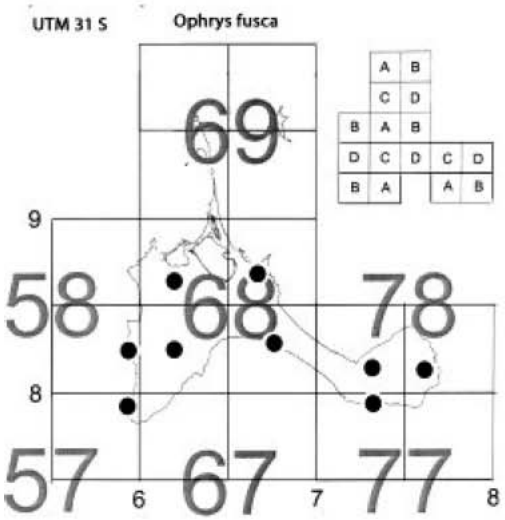
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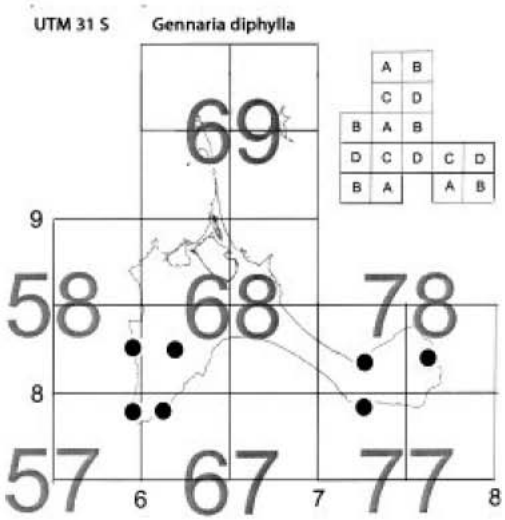
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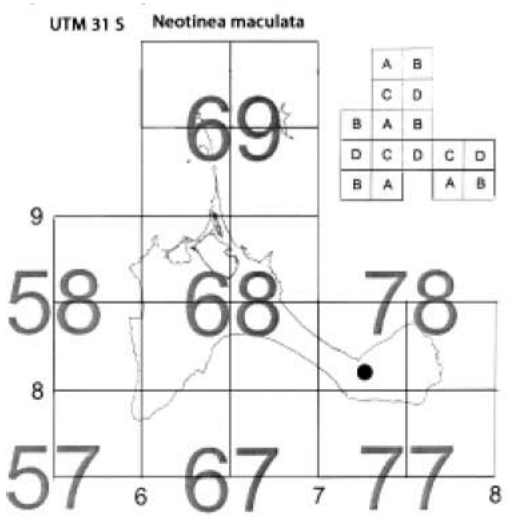
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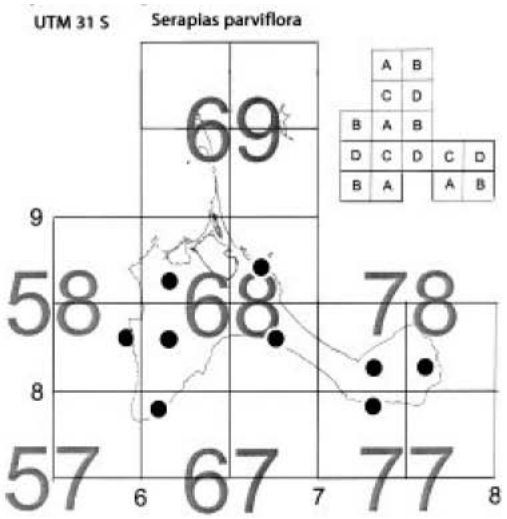
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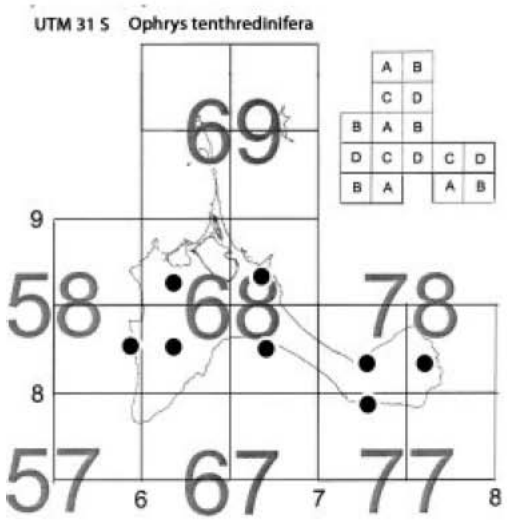
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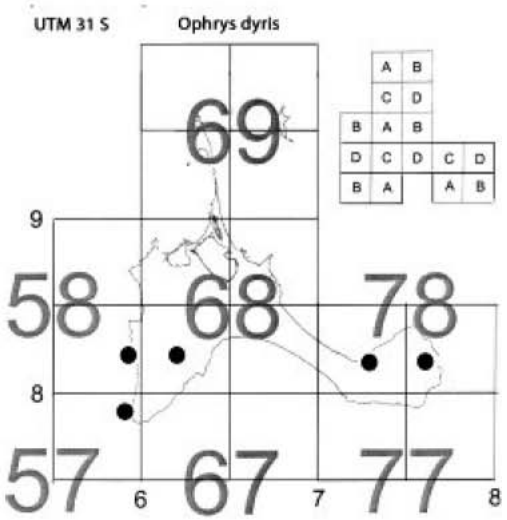
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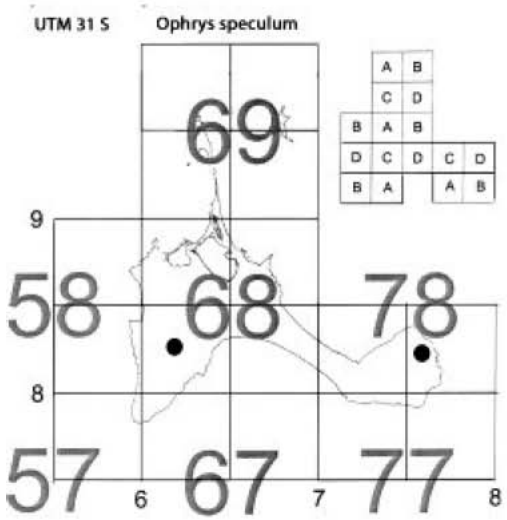
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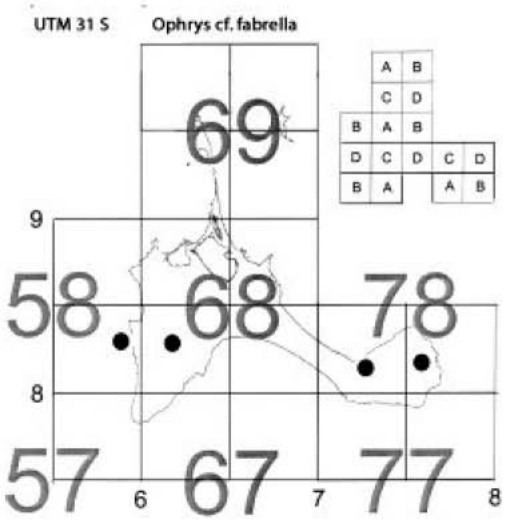
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