

There are 143 species of dragonflies and damselflies in Europe and 39 of these are presently found on Corfu, giving the island one of the highest numbers of species in the Greek archipelago. New species have been added to the fauna quite recently, the Dainty Bluet (*Coenagrion scitulum*) and the Blue-eye (*Erythromma lindenii*) were reported for the first time in 2012. In addition, the Black Pennant (*Selysiothemis nigra*) was reported in 2007 and the Bladetail (*Lindenia tetraphylla*) in 2014, both most likely being recent arrivals to the island. Corfu also holds populations of the “Critically Endangered” Greek Red Damsel (*Pyrrhosoma elisabethae*) and the “Near Threatened” Eastern Spectre (*Caliaeschna microstigma*).

The high precipitation and the rich presence of waterways, both permanent and temporary, have created a range of suitable habitats and are factors that can explain the rich dragonfly fauna. However, the increase in the resident population and the growth in tourism, with close to two million visitors every year, have led to habitat loss, especially of coastal wetlands due to the development of hotels and other tourist venues. The increase in water consumption and the increase in the pollution of the island waters are factors that pose serious threats to the fauna in general and to the amphibious one in particular.

The aim of this book is to raise the awareness of and the understanding for the dragonfly fauna, and to give a first idea of its status and need for protection. Information on identification, distribution and habitat for all the 43 reported species from Corfu is also presented.

The International Dragonfly Fund (IDF) is a scientific society founded in 1996 for the improvement of odonatological knowledge and the protection of species. It supports projects dedicated to the exploration and protection of the dragonflies of our world and their habitats.

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Figure 1. The Ioanian Islands: The Diapontia Islands (1-3), Corfu (4), Paxos and Antipaxos (5-6), Lefkada (7), Ithaka (8), Kefallonia (9) and Zakynthos (10).



Figure 2. Female *Erythromma lindenii*.

Introduction

Delicate and elegant, but also forceful and robust. Colourful, sometimes garish, but on occasion very sombre. A master flyer and navigator, or a slow and casual flutterer. An ephemeral and mysterious creature and a very effective and precise predator. These are all attributes that can be ascribed to the remarkable dragonfly, an insect that can be mistaken for no other.

Dragonflies have roamed the earth for about three and a half million years, but they have changed very little in their basic appearance during this period. They are insects with interesting, in some respects unique, biology that spend most of their life in the water and only a short period on land and in the air. Dragonflies are important indicators of water status as they are dependent on good, unpolluted breeding waters for their survival. However, the decrease or disappearance of dragonflies from a certain body of water may not solely be caused by poor water quality but could also be due to disturbance of the surrounding terrestrial habitat. Adult dragonflies use, and are dependent on, specific terrestrial micro-habitats for hunting, resting and courtship and severe disturbances, such as clearing vegetation from the banks or cutting down trees in areas close to the water, may prove very destructive.

The climate on Corfu is typical Mediterranean with mild and rainy winters and warm, dry summers, but even if the summers are hot several of the island's rivers and small lakes or ponds remains more or less permanent throughout the year.

Corfu has a rich dragonfly fauna and the number of recorded species has steadily risen from 23 in 1983 to 43 in 2017 and some species are quite recent additions. However, there are also species that have not been recorded since the beginning of the 20th century, and these may well have been lost to the island. Corfu has gone through a tremendous change during the past 50 years and there has been a huge increase in tourism as well as in population growth. Large areas have been developed for housing and hotels, small temporary waters have been infilled and the water out-take from rivers and ground water supplies has increased rapidly. These are all factors that have a negative influence not only on dragonflies but on all amphibious and aquatic fauna on the island.

As mentioned above, dragonflies are good indicators of water quality and waters with breeding dragonflies are indicative of water of good quality, free from serious pollution, while their disappearance from a particular water body consequently suggests the opposite.

The interest in dragonflies has increased in recent years and "dragonfly watching" is a common phenomenon today that could, like bird watching, be used to promote ecotourism in places like Corfu.

This book can be used as a field guide to the island's dragonflies, but it is also an attempt to a first draft of their current distribution and description of their habitats on Corfu.



Figure 3. Red-veined Darter *Sympetrum fonscolombii*.

Corfu island

Corfu, also known as Kerkyra or Corcyra, is the northernmost of the Ionian Islands, positioned just where the Adriatic meets the Ionian Sea, not far from the Albanian and Greek mainland. The Ionian Islands are, geologically speaking, relatively young and Corfu did not emerge from the sea until about five million years ago (Ma) during the late Miocene or early Pliocene epoch when the African plate collided with the Eurasian causing the Pindos uplift. Today Corfu is separated from the European continent by the narrow Kerkyra or Corfu Strait, but 21 500 years before present (YBP), during the maximum of the latest large glacial, it was connected to the European mainland. The sea level in the Ionian Sea was at its lowest during this period, -120 m. Around 11,500 YBP the sea level had risen to -60 m and at this time Corfu was connected to the mainland by a land bridge in the north, and what today is the Corfu channel formed a lake and the landbridge in the south may have had a narrow outlet. It was also during this period that the effect of the melting ice-caps in Europe began to have a real impact on the landscape. The fast moving rivers of meltwater brought with them a substantial amount of loose alluvial materials such as clay, silt and gravel, which were deposited when the surge of the rivers slowed down. Valleys, gorges and lagoons, previously open to the sea, were filled with mineral-rich sediments containing very fine-grained materials. The composition of these Holocene deposits is what makes it possible for water to stay on the surface of the ground for a prolonged period after the soil has become saturated. This, together with the high precipitation during winter and early spring, causes Corfu's alluvial plains to flood and form shallow, seasonal ponds, ideal breeding grounds for much of the island's amphibious fauna.

Corfu's climate is Mediterranean with warm and dry summers caused by the domination of subtropical high-pressure systems, while the winters are mild with moderate temperatures and high but variable precipitation due to the polar front (Csa in the Köppen-Geiger classification). The high annual precipitation and mild climate make Corfu green and lush during large parts of the year. The island is rich in wetlands, rivers, streams, ponds and small lakes and the geology with permeable limestone rock that allows water to be stored underground is a factor that has made it possible to irrigate and cultivate the mineral rich soil for centuries, even during parts of the dry season. This richness of water may have caused the misconception that water is an unlimited resource that could be wasted freely, but as the population has been steadily growing, tourism increasing and the climate changing, this is an attitude that is no longer justifiable and a practice that is not sustainable.

Precipitation

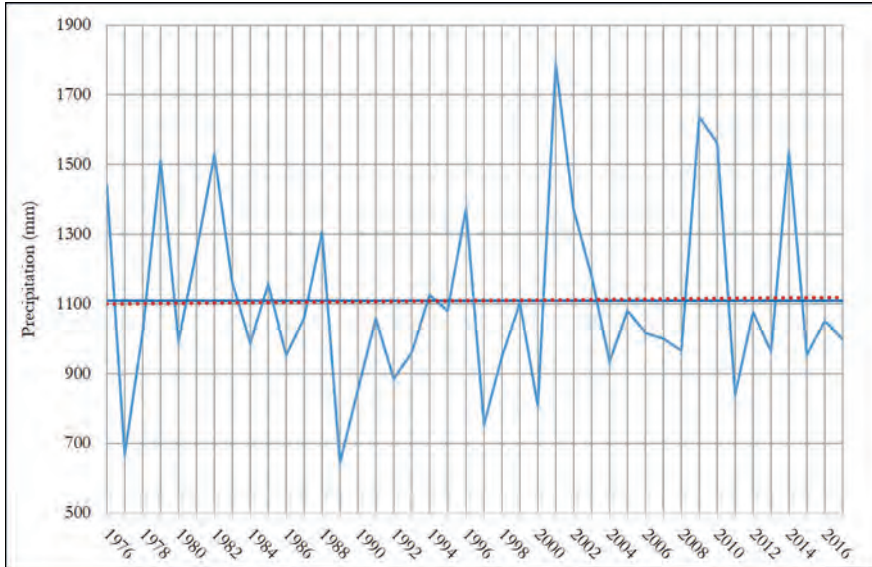


Figure 4. Yearly total precipitation for Corfu 1976-2017 (straight blue line=average over period; red dotted line=change over period).

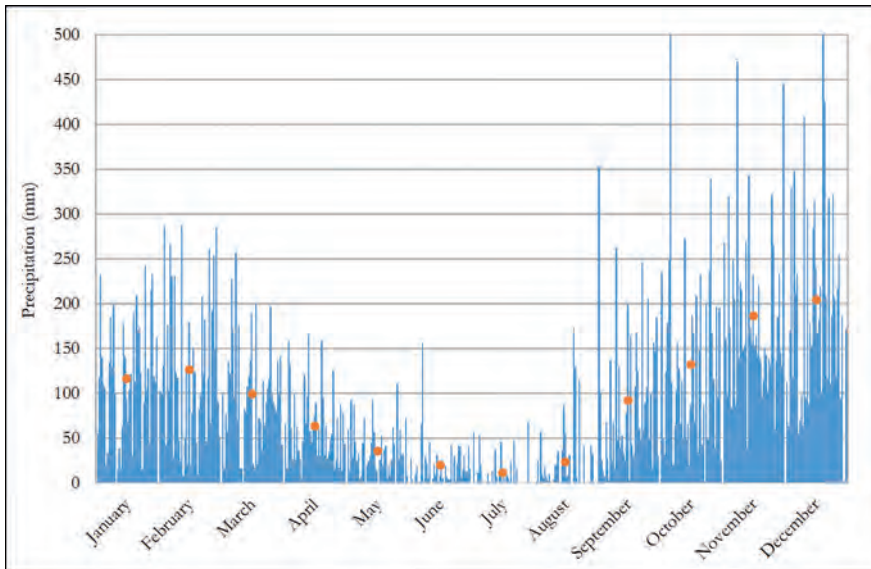


Figure 5. Monthly variation and average (red dots) of precipitation on Corfu 1976-2017.

The precipitation in Corfu is among the heaviest in Greece with an annual mean of 1.110 mm (42 years, 1976-2017), and November and December are the two wettest months with an average rainfall of 181 mm and 209 mm, respectively. However, in 2015 and 2016 the rainfall in December was extremely low, only 3 mm for both years (Fig. 4 & 5, p. 10). Furthermore, the mean annual temperature on Corfu has increased by an estimated 1.5 °C over the 42 year period, and the temperature during the summers of 2016-17 has during long periods been higher still (Fig. 6 & 7, p. 12). This combination of extremely low precipitation during December and hot weather during summer, increasing evaporation from unshaded ponds and lakes, led to that many waters generally considered permanent dried out completely.

Large olive groves are found all over Corfu, but grapes, citrus-fruits and vegetables are also grown, and large areas have been drained for cultivation, creating a landscape mainly shaped by agriculture. However, remnants of oak- and cypress forests are scattered around the island and there are areas covered with dense marquis and phrygana vegetation.

Variables such as altitude, temperature and soil type gradually influence the composition and association of plants in an area. However, the shift in vegetation can be abrupt, creating distinct zones with the same type of vegetation. These so-called vegetation zones are used to describe the vegetation in a certain area.

There are two main vegetation zones on Corfu, the Lowland Zone (Thermo-Mediterranean vegetation zone, *Quercetalia ilicis*) and the Montane Forest Zone (Para-Mediterranean coniferous forests, *Fagetalia*). The main vegetation zones can be further divided into subzones, and these in turn to plant communities. The Lowland Zone is divided into two subzones, the *Ceratonio-Pistacion* and the *Quercion ilicis* subzone. The vegetation on Corfu mainly belongs to the the former. This subzone is divided into seven plant communities covering the lowland and hills (- 700 m a.s.l.). 1 - Mediterranean evergreen forest; 2 - Maquis; 3 - Phrygana; 4 - Mediterranean mixed deciduous forest; 5 - Herbaceous vegetation of stony ground, or pseudo-steppe; 6 - Vegetation of rock-walls and gorges, or chasmophyte community; 7 - Coastal terrestrial vegetation.

The Montane Forest Zone (700 - 1700 m.a.s.l) is the area of the coniferous forest, but at this elevation on Corfu (900 m.a.s.l) the predominant tree species are oaks such as Valonia Oak (*Quercus ithaburensis* ssp. *macrolepis*) and Kermes Oak (*Q. coccifera*).

Corfu has two mountain ranges, the Pantokrator in the north and the Agioi Deka in the central part, which divide the island into three areas. The Pantokrator range with the island's highest peak (906 m.a.s.l.) stretches from Cape Agios Stefanos in the northeast to Cape Agios Angelos in the northwest.

Temperature

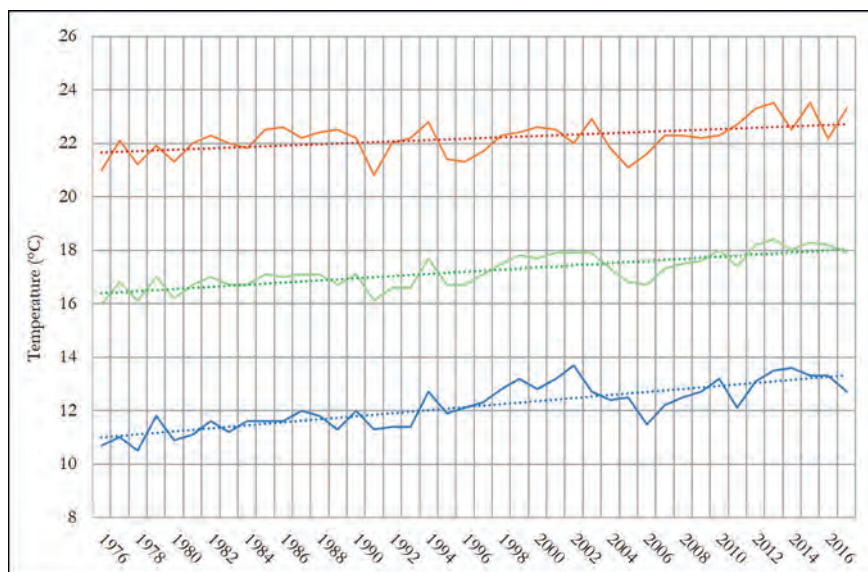


Figure 6. Year average temperature for Corfu 1976-2017 (red=high, green=mean, blue=low) . The increases (dotted lines) are statistically significant.

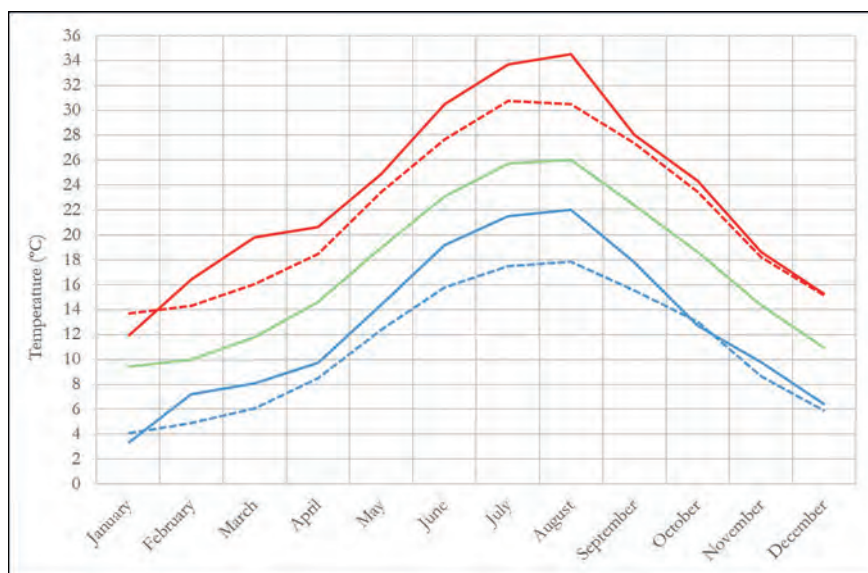


Figure 7. Month average temperature for Corfu (dotted blue line=low 1976; solid blue line=low 2017; dotted red line=high 1976; solid red line=high 2017; solid green line=average 1976-2017).

The Agioi Deka (highest peak 573 m.a.s.l.) forms a crescent-shaped range that stretches from the central part of the island to the village of Stavros in the southeast and Gardiki in the southwest. Several alluvial plains are found in the low parts of the island, and there are three lagoons and several other wetlands of variable size along its coasts. Many areas on Corfu used to be swampy and infested by mosquitoes, and malaria was common on the island before the valleys and plains were drained from water and used for agriculture. Several of the island's rivers and streams flow through mountain areas as well as lowland plains, changing their nature on the way and creating diverse habitats for dragonflies.

Habitats

Some dragonflies have very specific habitat requirements while others are generalists that tolerate brackish or even saline environments. As habitat requirements can vary even between populations of a single species, it is difficult to give a complete habitat description for every species. However, factors such as flowing or standing water, pH, bottom substrate, water turbidity, vegetation and if the water is permanent or seasonal all affect habitat choice. The choice between flowing and standing waters is determined already at the family level and most species within Platycnemididae (Featherlegs) and Gomphidae (Clubtails) are found in habitats with flowing waters, while members of Coenagrionidae (Pond Damsels) and Libellulidae (Common Skimmers) tend to use standing waters.

Intolerance to desiccation or changes in temperature is common in many species, but some have adapted to such conditions by developing drought resistant eggs and rapidly growing larvae. Species in the genus *Lestes* (Spreadwings) and *Sympetrum* (Darters) are examples of dragonflies that breed in temporary waters.

Even if the aquatic habitat is crucial for dragonflies, the surrounding terrestrial habitat also plays a very important role as adult dragonflies seek out specific terrestrial micro-habitats for hunting, resting and courtship. Small changes, such as logging or clearing of vegetation near breeding waters, can have an effect on dragonfly populations even if the water itself is left undisturbed. Consequently, it is crucial to protect and manage not only the aquatic habitat but also important terrestrial areas in such a way that they can sustain populations over time.

Corfu is rich in rivers, small lakes and ponds and precipitation is high, making the island an ideal place for dragonflies (Fig. 4 & 5, p. 10). In 2012, the Greek chapter of the WWF made an initial inventory of the wetlands on the Greek islands and recognised 56, both terrestrial and coastal, on Corfu (see chapter on Legislation and Appendix III). In addition to these there are

countless brooks, small streams, storm-drains, artificial ponds, wells, ditches and temporarily flooded areas that function as habitats for dragonflies. Unfortunately, there seems to be no sustainable management plan for any type of waterways or water assemblages on Corfu, at least none that is publicly accessible, and infilling, garbage dumping and pollution occur in many places.

Rivers and streams

Many of Corfu's rivers hold water during a large part of the year and can support both early and late breeding species as well as two generations for some of them. The nature of a river or stream generally changes considerably along its course, providing habitats suitable for many different species of dragonflies. Also, longer rivers often have small tributaries or larger storm drains that empty into them, adding to the diversity of habitats and consequently the possible occurrence of different dragonfly species. Floating vegetation that accumulates in the estuary, sandy bottoms in glades or other sunny areas, shady or partly shaded areas with aquatic vegetation and heavily vegetated banks, areas with rapid flowing water and deeper pools or very slow-moving water are a few examples of the vastly different conditions that can occur along a river.

The Fonissa River, in the Giru region in the northwestern part of Corfu, is an example of a river with several tributaries, which provides habitats for many of Corfu's dragonflies. Species like the Broad Scarlet (*Crocothemis erythraea*), the Violet Dropwing (*Trithemis annulata*) and the Blue-eye (*Erythromma lindenii*) are found close to the river estuary, the Banded Demoiselle (*Calypteryx splendens*) and the Greek Red Damselfly (*Pyrrhosoma elisabethae*) fly in glades with dappled shade and the Small Pincertail (*Onychogomphus forcipatus*) frequents small open areas around the river with sandy or gravelly bottom. Large sections of the river hold water the year round, which is used for irrigation during summer. Mature trees such as Small-leaved Elm (*Ulmus minor*) and White Poplar (*Populus alba*) shade the river in many areas and the, often steep, banks are heavily vegetated. Common Reed (*Phragmites australis*) and Giant Reed (*Arundo donax*) grow along the banks at the estuary in Sidari, where floating vegetation usually accumulates at the surface. Both the reed and the floating vegetation are used by for example the Blue-eye (*Erythromma lindenii*) for perching and oviposition, but the area has recently been cleared of vegetation and this species is presently not found here. However, the vegetation is rapidly recovering and other species such as the Common Bluetail (*Ischnura elegans*), the Black-tailed Skimmer (*Orthretrum cancellatum*) and the Broad Scarlet (*Crocothemis erythraea*) have recolonised the area and hopefully this will also become the case for the Blue-eye (*E. lindenii*). The Fonissa River is part of a larger river system sometimes referred to as the Melissoudi, a group of rivers,

streams and torrents that appear north of the Pantokrator mountain range and travel through parts of the so-called Karousades Basin towards the sea in the north. The water at the river source is oligotrophic and cool but becomes increasingly eutrophic as it travels through the alluvial plains, agricultural land and developed areas towards the sea.

The Kyprianades (Lagades) River, a small river also part of the Melissoudi river system, has its source near Klimatia and empties into the Fonissa. The water from this river and the nearby springs has been used for irrigation and human consumption for a long time and there are many artificial irrigation canals in the area. Several natural springs are also found here. The river is oligotrophic with cool, clean water and it is shaded along stretches of its course. Butterbur (*Petasites hybridus*) and Bracken (*Pteridium aquilinum* ssp. *aquilinum*) grow along its banks and large Oriental Planes (*Platanus orientalis*) are scattered along parts of its course. The Beautiful Demoiselle (*Calypteryx virgo*) and the

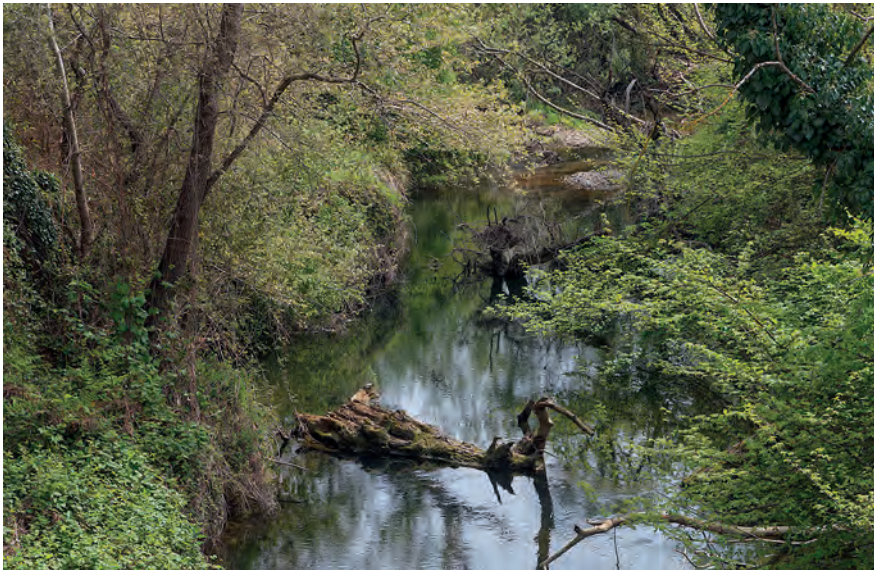


Figure 8. Fonissa River springs from the Pantokrator mountains and travels through large parts of northern Corfu. It is home to many of the island's dragonfly species.

Blue Featherleg (*Platynemis pennipes*) are very common here. The Small Pincertail (*Onychogomphus forcipatus*) and the Turkish Clubtail (*Gomphus schneiderii*) also fly in the area and the Balkan Emerald (*Somatochora meridionalis*) is frequently seen patrolling along dirt tracks and trails close to the river. This small river holds at least some water even during summer.

Platonas River is another small stream that originates somewhere in the mountains between the villages of Omali and Strinilas and exits close to Agnos at the north coast. Some stretches of the river are shaded by White Poplar (*Populus alba*) and Small-leaved Elm (*Ulmus minor*), Butterbur (*Petasites hybridus*) and Pendulous Sedge (*Carex pendula*) grow beneath them in areas along the banks. Some areas around the river can become flooded in winter and in one place there is a small, deep pond where species such as the Blue Chaser (*Libellula fulva*) and the Blue Featherleg (*Platynemis pennipes*) breed. The river is cool and clear in areas where it passes through the mountains and hills, at the waterfall at Nymphes, but gets more eutrophic as it passes through the lowlands and the coastal plain. Stinging Nettles (*Urtica dioica*) grow along the



Figure 9. Kyprianades River, habitat for the Small Pincertail (*Onychogomphus forcipatus*) and the Banded Demoiselle (*Calypteryx virgo*).

riverbanks in some areas, indicating a high level of nitrogen. This region is quite heavily developed and the last stretch of the river is difficult to reach and survey. Dragonflies such as the Beautiful Demoiselle (*Calypteryx virgo*), the Blue Featherleg (*Platynemis pennipes*), the Balkan Emerald (*Somatoclora meridionalis*) and the rare Greek Red Damsel (*Pyrrhosoma elisabethae*) are found in shaded areas at the first stretch of the river. Platonas river often dries out in large parts during summer, but when there is water it is used for irrigation.

The Stravopotamos, located on the east coast below the Pantokrator massif in the Mesi region, is a large, and in places deep, storm drain that only

holds water during short periods of the year in most of its course. However, the Eastern Spectre (*Caliaeschna microstigma*) reproduces in deep shady areas that hold water for longer periods and where their larvae live in submerged moss or leaf litter. The river empties into the sea in Krevatsoula Bay close to Dafnili on the east-coast. Unfortunately, the water at the estuary has become quite polluted and few dragonflies are found there today.

The Ropa River, which transverses the Ropa Valley in the Mesi region, is in part an artificial canal dug to drain the valley for cultivation. The river is eutrophic with rich aquatic vegetation and Common Reeds (*Phragmites australis*) and Southern Bulrush (*Typha domingensis*) grow on the banks in some areas. Ropa Valley is a 10 km² alluvial plain and during heavy winter rains the



Figure 10. Some meadows along the Platonas River are excellent hunting grounds for dragonflies.

river carries a lot of sediments and debris that build up nutrient-rich banks and block the flow of water in some areas. Clearing and dredging work are performed sporadically to permit a free flow of water towards the sea and to prevent flooding at the golf course and nearby roads, but unfortunately the riverbanks and the vegetation close to the water edge often get damaged in the process. Although regular maintenance is necessary to avoid flooding, disturbance of the vegetation close to the water edge should be minimised, and silt and undesirable vegetation dug up from the banks should be removed to prevent it from sliding back into the water when the autumn rains start. The

area around the river, the ditches throughout the valley, and the golf course ponds sustain many dragonfly species. The Blue-eyed Hawker (*Aeshna affinis*), the Green-eyed Hawker (*A. isoeles*), the Blue Emperor (*Anax imperator*) and the Hairy Hawker (*Brachytron pratense*) are common and so are several darter (*Sympetrum*) species. The Blue Chaser (*Libellula fulva*), the Keeled Skimmer (*Orthetrum coerulescens*), the Small Redeye (*Erythromma viridulum*) and the Common Bluetail (*Ischnura elegans*) are also present. The Balkan Emerald (*Somatochlora meridionalis*) and the Yellow-spotted Emerald (*S. flavomaculata*) are both found in the area, but these species differ with respect to habitat preference. Also, one of the small ditches close to the golf-course is habitat for the rare Greek Red Damsel (*Pyrrhosoma elisabethae*).

Potamos River has its source west of the village of Afra and enters the sea below the village of Potamos just north of Corfu town. This river is quite wide and holds water year-round in part of its course, but it also becomes polluted as it travels through urban areas and few dragonflies are found along this part. However, the area around the upper stretch of the river is less developed and the Balkan Emerald (*Somatochlora meridionalis*) is one species found here. This part is shaded by Downy Oak (*Quercus pubescens*) and Small-leaved elm (*Ulmus minor*) and even if it often dries out in summer it generally keeps water long enough for some dragonflies to breed here.



Figure 11. Dredging work at Ropa River.

The Paniperi flows through the Kalafationes Forest, a small fertile forest remnant in the central part of the Mesi region. Downy Oak (*Quercus pubescens*), Sweet Chestnut (*Castanea sativa*), Walnut (*Juglans regia*), Umbrella Pines (*Pinus pinea*) and White Poplars (*Populus alba*) are some of the tree species growing here. The forest is in parts overgrown with Ivy (*Hedera helix*) and Bramble (*Rubus sanctus*) and many previously open fields and meadows have formed dense thicket. However, there are still small, open areas and some land has recently been cleared and is again used for small scale cultivation. The Paniperi is a shady river that dries out in summer, but the Balkan Emerald (*Somatochlora meridionalis*) and the Blue Featherleg (*Platynemis pennipes*) are species that reproduce here.

The Messongi River, one of Corfu's larger rivers, flows through the Messongi Valley in the Lefkimmi region in southern Corfu. It originates somewhere in the region of Kato Pavliana in the north and is joined by many smaller stormdrains from the Agioi Decca mountain range before it enters the valley and flows towards the sea and the village of Messongi on the east coast. In the north, the river forms a small torrent that dries out in the summer, while it is quite broad and holds water all year round in its southwestern stretch. Small ditches and brooks cross the valley and empty into the Messongi River. Many of these waters are breeding grounds for dragonflies such as



Figure 12. A small ditch or tributary emptying into the Messongi River is breeding ground for the Banded Demoiselle (*Calopteryx splendens*).

the Beautiful Demoiselle (*Calopteryx virgo*) and occasionally the Banded Demoiselle (*C. splendens*). The river estuary possibly supports a few dragonflies, but, as with the other larger rivers of the island, both saltwater intrusion and pollution make the estuary less suitable for dragonflies.

Lefkimmi River, the second of the large rivers in the south, flows through the village of Lefkimmi and enters the sea near Bouka Beach. The Bouka Marsh with its salt meadows is also situated here and dragonflies can be found



Figure 13. The Fonissa Estuary at Sidari in northern Corfu.

hunting in the area and along the coast all the way to the Alykes Saltpans a few kilometres to the northeast. The river has its origin close to the village of Paliochori and like in the other large rivers on the island few, if any, dragonflies can be found at its estuary. The species that use this river fly in the narrower stretches where the banks have lush vegetation. The rivers, brooks and stormdrains mentioned here are only a few of those present on the island.

Lagoons

Corfu has three large lagoons, Antiniotissa in the north, Chalikiopoulou close to Corfu Town and Korission in the southwest, all of them saline. However, their salinity levels differ and there are fluctuations over seasons, but the water never becomes fresh and no dragonflies breed in the actual lagoons. Still, all three are surrounded by reed-belts where dragonflies hunt, and reproduction takes place in freshwater-bodies such as wells, small streams, dune

pools and temporary pools found in their vicinity. The Antiniotissa Lagoon in the north-eastern corner of Corfu at Cape Agia Ekaterini near the village of Acharavi is one of Corfu's four Natura 2000 sites. The site covers a wetland area of 1.9 km², including parts of the Almyros Marsh. The lagoon and the surrounding wetland are fed by freshwater both from the mountains and from precipitation. The lagoon is open towards the sea, allowing sea water to enter, and the lagoon is saline (>18 psu (practical salinity units); >1.8%). In the areas around the marsh there are parts that become flooded during spring, several freshwater ditches, an artificial pond and finally natural dune pools that all serve as breeding grounds for dragonflies. Common Reed (*Phragmites australis*), Tamarix (*Tamarix hampeana* and *T. tetrandra*) Sharp Rush (*Juncus acutus*), Jointleaf Rush (*J. articulatus*), Soft Rush (*J. effusus*), Cotton Weed (*Otanthus maritimus*), Sea Spurge (*Euphorbia paralias*), Mastic (*Pistacia lentiscus*) and Sea Daffodil (*Pancratium maritimum*) are characteristic plants of this area. Several skinner (*Orthetrum*) and darter (*Sympetrum*) species breed here and the Blue Emperor (*Anax imperator*) and the Lesser Emperor (*Anax partenope*) hawk in the reed-belt. The Greek Red Damselfly (*Pyrrhosoma elisabethae*) is found in one area along the coast. The Chalikiopoulou Lagoon, near the Ioannis Kapodistrias Airport and very close to Corfu town, is situated in a heavily developed area including suburbs such as Katakalous and Chrisiida. The water in the lagoon and along the coast down to the Messongi village is a Natura 2000-site, protected because of its rich beds of Neptune Grass (*Posidonia oceanica*). It is a purely marine site covering an area of 8.88 km². The lagoon is open towards the sea and the salinity level is about the same as in sea-water. However, the adjacent marshland is fed by freshwater from the area around Gastouri and the surrounding hills and from precipitation, and freshwater is collected in artificial pools in the surrounding area.

When the airport was built part of the lagoon was filled to create the runway and in the process a small pond was formed at its eastern side. The salinity in this area is probably lower than in the lagoon as there is an inlet of "fresh water" from Kanoni and the town, but the small canal connecting it to the lagoon also allows saltwater in, creating a brackish environment. The vegetation in the area is typical for brackish and saline marshes and includes species such as Common Reed (*Phragmites australis*), Sea Purslane (*Halimione portulacoides*), Shrubby Glasswort (*Arthrocnemum macrostachyum*), Samphire (*Sarcocornia fruticosa*) and White Willow (*Salix alba*). The Common Bluetail (*Ischnura elegans*) is common, as are several of the island's darter (*Sympetrum*) and skimmer (*Orthetrum*) species. Most of these are found in the reed belt and in small freshwater assemblies, but a few can be found hunting among the Glasswort very close to the edge of the lagoon.

The Korission Lagoon, with its sand dunes, juniper stands, tall maquis and surrounding meadows, is definitely one of the most unique natural areas on Corfu. The lagoon with its surrounding wetland is a Natura 2000 site that covers an area of 22 km² on the southwest coast of Corfu, between Gardiki Point in the northwest and the beginning of Agios Georgios beach in the south. The lagoon is 5.3 km long and 1.5 km wide and very shallow, less than 1.5 m deep. It is situated just 200 m from the sea to which it is connected by a narrow artificial canal. The salinity in the lagoon varies with season and is very high (>45 psu) during the summer, a value that exceeds the salinity of the sea. This is due to the influx of sea water through the canal in combination with high evaporation. In the winter, the salinity drops to about 20 psu due to precipitation and ground water recharge. The water in the lagoon never becomes fresh as seawater can enter both via the canal and through underground intrusion.



Figure 14. A drainage canal at the Antiniotissa Lagoon is habitat for species such as the Keeled Skimmer (*Orthetrum coerulescens*), the Common Darter (*Sympetrum striolatum*) and the Common Bluetail (*Ischnura elegans*).

The areas north and east of the lagoon are used for cultivation of olives, small scale wine production and cultivation of vegetables and ornamental plants. Coastal Prickly Pine (*Juniperus oxycedrus* ssp. *macrocarpa*) is the predominant woody species growing on the sanddunes, but Phoenician Juniper (*Juniperus phoenicia*), Holm Oak (*Quercus coccifera*), Common Myrtle (*Myrtus communis*) and



Figure 15. Korission Lagoon.

Mastic (*Masticus lentiscus*) are other character species here. Temporary dune pools are formed between the sand-dunes and moisture loving species such as Ravenna Grass (*Saccharum ravenna*), Sharp Rush (*Juncus acutus*), Jointleaf Rush (*J. articulatus*), Dwarf Rush (*J. capitatus*), Sand Galingale (*Cyperus capitatus*), Brown Galingale (*C. fuscus*), Galingale (*C. longus*) and Black Bogrush (*Schoenus nigricans*) thrive here. The Small Spreadwing (*Lestes virens*), the Common Blue-tail (*Ischnura elegans*), the Blue Emperor (*Anax imperator*) and the Blue-eyed Hawker (*Aeshna affinis*) are a few of the dragonflies breeding in the area and the migratory Vagrant Emperor (*Anax ephippiger*) is an occasional visitor. At the southern end of the lagoon, at Issos, there is one deep, more or less permanent, pond where the Eastern Willow Spreadwing (*Chalcolestes parvidens*) breeds.

There are several wells in the area and a few old specimens of Willow (*Salix* sp.) are growing at the wetland southeast of the lagoon. At the northern part, at Halikounas, there is a small riparian glade of White Poplar (*Populus alba*) and dragonflies such as the Blue Emperor (*Anax imperator*) together with several of the island's darter (*Sympetrum*) species fly and hunt in the reed belt and in the riparian meadows surrounding the glade. The Yellow-winged Darter (*Sympetrum flaveolum*) was reported from the area in 1912, but has not been seen since, and it may have been lost to the island for reasons unknown. However, it is a migratory species and as such it may return even after many years of absence. East of the lagoon there is a remnant of a small lake or pond, probably of seasonal nature, that has now been drained but that previously may have been of importance to the dragonfly fauna in the area. Other parts east of the lagoon are still flooded during winter and spring, and there is a deeper pond or pit that usually keeps water for most of the year. However, for some reason canals have recently been opened to drain the area, which may have a negative impact on the local freshwater fauna.

Lakes and ponds

There are many small natural lakes and ponds on Corfu, the majority located in the Onofrious Valley in the Mesi region in central Corfu. Some are seasonal, but several are permanent and provide breeding habitats for many dragonfly species. Most are eutrophic and surrounded by large reed belts or impenetrable thickets and can be very difficult to survey. The water level fluctuates significantly over the year in all of them and some may dry out in large parts during high summer. Trees, such as Small-leaved Elm (*Ulmus minor*), Wild Pear (*Pyrus spinosa*), Kermes Oak (*Quercus coccifera*), Sloe (*Prunus spinosa*), Chaste Tree (*Vitex agnus-castus*), Christ's Thorn (*Paliurus spina-christi*) and Hawthorn (*Crataegus monogyna*) grow near or very close to several of the lakes, while others are surrounded by reeds. The latter is the case for Lake Gaider-



Figure 16. The reed belt and freshwater marshes northeast of Korission Lagoon are habitats for many dragonflies.

ana and the close by Fundana Marsh where the reed belt is very dense. There is a small stand of White Poplar (*Populus alba*) in one corner of this lake, but the regeneration of trees seems to be rather low and several of the older specimens have died. All of the island's darter (*Sympetrum*) species reproduce and hunt in the area. The Green-eyed Hawker (*Aeshna isoteles*), the Blue-eyed Hawker (*A. affinis*) and the Blue Emperor (*Anax imperator*) are common as is the Keeled Skimmer (*Orthetrum coerulescens*). At Gavrolimni, the largest and probably deepest of the lakes, Chaste Trees (*Vitex agnus-castus*) grow right down to the edge of the water, but there is a rather extensive reed belt in one area where the Yellow-spotted Emerald (*Somatchlora flavomaculata*) patrols, and we have also observed the Common Winter Damsel (*Sympecma fusca*) here, a species not reported since 1939 when it was found in the south of the island. In this area, which is usually covered by water in spring, the Chaste Trees are used as perches and look-out points by many dragonfly species.

Lake Bertanou, close to the village of Temploni and just below the garbage landfill at Poulades, and Lake Skoteini, close to the village of Danilia, are two other lakes in the area. The latter is surrounded by reeds and the former by Chaste Trees. Bertanou Lake is enclosed by rather steep hills and private properties making it difficult to survey. We have observed dragonflies flying over the lake using binoculars, but proper identification was impossible since the insects were too far away. The Makri Pond, situated just north of Gaiderana, is surrounded by very dense vegetation and therefore difficult to reach,



Figure 17. Lake Gaiderana.

but the Yellow-spotted Emerald (*Somatoclora flavomaculata*) has been observed here. The Kounoupina Pond, the northernmost of the small ponds and lakes in the Mesi region, situated approximately 2 km from the village of Gardelades, is a mesotrophic to eutrophic pond surrounded by reeds and bulrush. Small-leaved Elm and Chaste Tree are also growing close by and olive-groves and a vegetable farm are found in the vicinity. This is a permanent pond and the dragonfly species flying here are the same as those at Gaiderana.

In the Oros-region, at the Eremites headland in the north-eastern part of Corfu, there are three coastal ponds of varying importance for the island's dragonflies. Vromolimni, the southernmost of the three, is separated from the sea by a narrow strip of land and water spills over into the lake, creating a brackish environment. The pond, which is surrounded by a saltmarsh, covers an area of approximately 1.5 ha. Akoli, the central of the three ponds, is of the same size as Vromolimni and the water is also brackish. The northernmost lake, Savoura, is also located close to, but well separated from, the sea. This is a fresh-water lake and it is the most important one of the three for the freshwater fauna. It covers an area of 2.5 ha and is encircled by a thick reed belt and protected from the wind from the sea by an impenetrable thicket of bramble and bushes. Some areas close to the lake have recently been cleared and replanted with olive trees. The Eremites headland used to be public land, but has recently been sold, and parts of it are currently being developed.



Figure 18. Lake Gaiderana, habitat for *Coenagrion scitulum*.



Figure 19. Bertanou Lake is a small eutrophic lake in central Corfu.



Figure 20. Kounoupina Pond.

The Katapinos Pond (3.75 ha) is a seasonal pond situated west of the village of Spartillas on the Katapinos Plateau. This pond used to be much larger, but the area has been drained for cultivation as the soil here is very fertile. It is fed by water rising from cavities in the mountains, and prior to the drainage water and soil mixed and a “red lake” formed during the winter. Large areas around the pond are fenced in, making it difficult to survey.

There are no natural lakes or ponds in the Lefkimmi region in the south, but the Moschopoulou Reservoir is located here. The 2.9 ha large reservoir was constructed in 2001, but except for limited local irrigation it has never been used as water supply for human purposes as intended. The pond is open with a thin belt of Common Reed (*Phragmites australis*), a few stands of Giant Reed (*Arundo donax*) and a thicket of Bramble (*Rubus sanctus*) growing around it. This pond is home to two of the latest additions to Corfu’s dragonfly fauna, the Black Pennant (*Selysiothemis nigra*) and the Bladetail (*Lindenia tetraphylla*), first reported 2009 and 2014, respectively. The Blue-eye (*Erythromma lindenii*), the Small Redeye (*E. viridulum*), the Lesser Emperor (*Anax parthenope*), the Black-tailed Skimmer (*Orthetrum cancellatum*), the Broad Scarlet (*Crocothemis erythraea*) and Violet Dropwing (*Trithemis annulata*) are examples of other species found here.

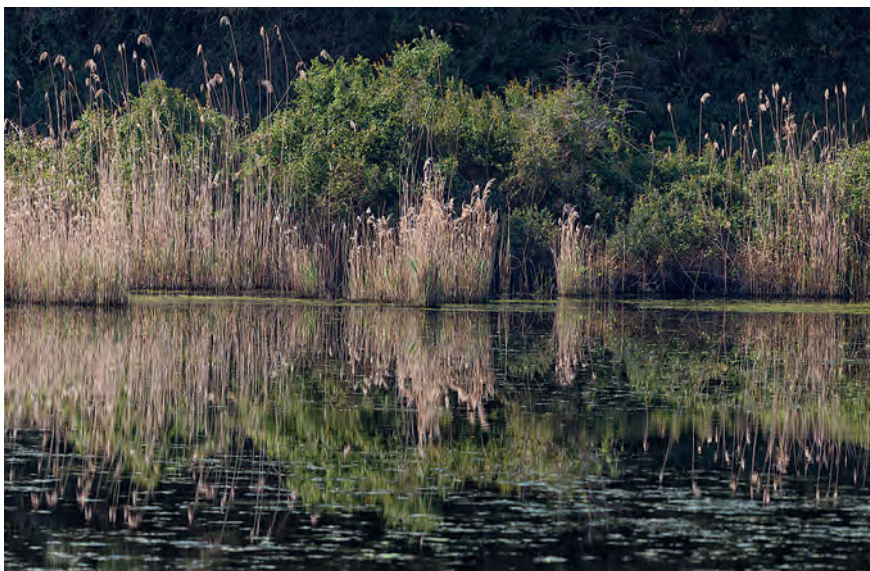


Figure 21. Savoura Lake, habitat for many Darters (*Sympetrum* spp.).



Figure 22. The Moschopoulou Reservoir, locality for the Black Pennant (*Sehysiothemis nigra*) and the Bladetail (*Lindenia tetraphylla*).

Small water assemblies and springs

Small ponds, ditches, seepages, and seasonally flooded fields, both natural and artificial, are important habitats for many dragonfly species as well as for other aquatic animals, birds and plants. These types of habitats are becoming increasingly rare all over Europe since drainage of large areas of wetland for agricultural purposes and other developments has been going on for decades. The old way of draining by using open canals was abandoned a long time ago in most parts of Europe, but is still in practise in some parts of Corfu. This practise generally has a positive effect on biodiversity, as has the seasonal flooding of small meadows and fields. Open ditches and canals are found



Figure 23. Vatos Pond is an important seasonal pond for dragonflies.

in many parts of Corfu, but many of them are not kept open as cultivation no longer is carried out in some areas. Temporary dune pools can be found on some of the beaches on the north coast and in the south of the island, especially around Issos and the Korission Lagoon. These dune pools are very important for dragonfly species such as the Small Spreadwing (*Lestes virens*) and the Migrant Spreadwing (*L. barbarus*), but also for many other dragonfly species as well as amphibious species in general. Artificial pools dug for sheep and cattle, small open water cisterns and other types of water reservoirs are also used for breeding by many dragonflies.

The natural spring of Xanthates, situated in north Corfu about 5 km SSW of Roda, carries clear, cold water from the Pantokrator Mountains. The Greek Red Damsel (*Pyrrhosoma elisabethae*) breeds in the slowly running water in the small artificial canal near by. Several other species, such as the Keeled Skimmer (*Orthetrum coerulescens*), the Blue Featherleg (*Platynemis pennipes*) and the Common Darter (*Sympetrum striolatum*) also breed in the canal and in the nearby concrete reservoir and small natural runlet. Unfortunately, the artificial canal often gets overgrown by giant reed and bramble, and when clearing work is done a lot of the vegetation is left in the water, blocking the flow of the water. During other occasions the area around the canal and runlet has been more or less stripped bare, leaving none or very little vegetation for the dragonflies to perch on.

Conservation and legislation

There is a general consensus among the world's odonatologists that the best way to protect the dragonfly fauna is to conserve and manage their habitats, and that this should be prioritized rather than to focus on the protection of single species, rare and endemic species being the exception. Studies have shown that it is not only the aquatic breeding habitat that needs to be protected, but also the surrounding terrestrial area as it is used as hunting ground by the dragonflies. Consequently, the area that needs protection may in some cases be much larger than previously thought as many species can fly quite a distance from their breeding waters in search for prey.

There are several global, European and national regulations and legislations that protect, or could be used to protect, dragonflies and their habitats, including recent Greek national legislations protecting many island wetlands.

The Convention on Wetlands of International Importance (Ramsar Convention)

This is a global treaty for the protection of the world's wetlands, and even if it is a very important tool that could be used to enforce the protection of the dragonfly fauna, it unfortunately seldom is. The convention is the only global treaty set up to protect a specific habitat, and it provides a framework for how wetlands should be managed, conserved and wisely used through local, national and international cooperation. Wetlands are highly diverse and productive ecosystems and the convention's definition of wetlands is very broad, including all lakes and rivers, underground aquifers, swamps and marshes, wet grasslands, peatlands, oases, estuaries, deltas, tidal flats, mangroves and other coastal areas, coral reefs and all artificial sites such as fish ponds, rice paddies, reservoirs and salt pans.

The 160 countries (contracting partners) work together in an international cooperation towards the wise use of all wetlands and also designate suitable wetlands for the list of Wetlands of International Importance (the “Ramsar List”) and ensure their effective management. A wetland should be considered internationally important if it supports species classified as Vulnerable, Endangered or Critically Endangered in the IUCN Red Lists (see IUCN), or if it supports species important to a region’s biodiversity, or if it supports 1% of the individuals in a population of one species or subspecies that is dependent on a wetland habitat, excluding birds. In the case of Greece and Corfu, the Ramsar Convention could be implemented for the protection of the Greek Red Damsel (*Pyrrhosoma elisabethae*), listed as Critically Endangered in the European and EU27 Red Lists and as Endangered in the Mediterranean one. Unfortunately, no island wetlands in Greece are listed on the Ramsar list, making it difficult to protect the above mentioned species. Furthermore, Greece has not honoured its commitment to the Ramsar Convention and according to the 2015 annual review issued by WWF Greece the country failed yet again to submit its regular report on the status of its ten Ramsar wetlands. Seven of these wetlands are still listed in the Montreux record, a register of wetlands of international importance where changes in their ecological nature have occurred, are presently occurring or are likely to occur in the near future.

The Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention)

The Bern Convention is a binding international legal tool to be used for the protection of Europe’s natural heritage, but it also includes some African states. The legislation was approved by the Council of the European Communities in 1982, and all EU member states are bound by the Convention’s requirements. The aim of the convention is to conserve the wild flora and fauna and their natural habitats and to promote European co-operation to reach this goal. There are three Bern Convention appendices, Appendix I “Strictly Protected Flora Species”, Appendix II “Strictly Protected Fauna Species” and Appendix III “Protected Fauna Species”. Appendix II lists species that may not be disturbed, captured, killed or traded. Appendix III lists species that are in need of protection, but under exceptional circumstances may be hunted or otherwise exploited.

16 dragonfly species are mentioned in the Bern convention and three of these have been reported from Corfu, the Greek Red Damsel (*Pyrrhosoma elisabethae*), the Bladetail (*Lindenia tetraphylla*) and the Turkish Red Damsel (*Cerriagrion georgifreyi*), but the last species has not been observed on the island since 1971.

The International Union for Conservation of Nature (IUCN)

IUCN, founded in 1948, is the largest global authority on the status of nature. It is a union with members of both governments and civil organizations, and 1 300 organizations and around 16 000 experts are attached to it. The aim of the IUCN is to provide the knowledge and tools needed to safeguard the natural world in a way that is both ecologically and economically sustainable. Several publications and reports are produced, including the IUCN Red Lists of Threatened Species.

The IUCN Red List of Threatened Species

This inventory of the global conservation status of species was first issued in 1964. It provides information on taxonomy, conservation status and distribution for plants, fungi and animals that have been globally evaluated using the IUCN Red List categories and criteria in order to determine the relative risk of extinction. The main purpose of the list is to evaluate, categorize and catalogue plants and animals with a high risk of global extinction. The main categories are Critically Endangered (CR), Endangered (EN), Near Threatened (NT), Vulnerable (VU) and Least Concern (LC), where the latter refers to those that would be threatened if they were not protected by ongoing specific conservation programs. The list also covers taxa that are categorized as Extinct (EX) or Extinct in the Wild (EW), those that cannot be evaluated because of insufficient information are categorized as Data Deficient (DD) and finally taxa that are Not Evaluated (NE). With respect to the area discussed here there are several relevant Red Lists, a European (Europe Geographic), an EU27 (European Union), a Mediterranean and a Greek one and they may differ in the categorization of species status.

The European Red List for dragonflies was published in 2010 and 137 of the 143 dragonfly species indigenous to Europe were assessed and their status categorized. 15% of the European dragonfly fauna was categorized as Threatened and 11% as Near Threatened. In 24% of the species the number of populations were decreasing while they were increasing in 10 % and stable in 50%. The most threatened species were confined to countries in Southern Europe and one of these species, the Greek Red Damsel (*Pyrrhosoma elisabethae*), is present on Corfu.

The Habitats Directive – On the Conservation of Natural Habitats and of Wild Fauna and Flora (Council Directive 92/43/EEC)

The directive was adopted in 1992 as an EU response to the Bern Convention, while the similar Birds Directive (79/409/EEC) was adopted as ear-

ly as 1979. These directives are the most important legislative tools present for implementing conservation within the European Union and ensuring the protection of both habitats and species. The directive contains four annexes, modelled after the appendices in the Bern Convention. Annex I covers habitats and Annex II covers species of community interest whose conservation needs the designation of special areas of conservation, so-called Natura 2000 sites. The core parts, called Sites of Community Importance, must be protected under the Natura 2000 Network and the sites managed in accordance with the ecological requirements of the species. Annex III defines criteria for selecting sites of community importance that can be designated as special areas for conservation. Annex IV covers species and subspecies of community interest in need of strict protection, many also listed in Annex II. A strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites. Annex V covers species and subspecies of community interest that may require management measures due to collecting and exploitation. Member states shall take measures to ensure that the exploitation of the taxa is compatible with maintaining them at a favourable conservation status.

16 European dragonflies are listed in either Annex II or IV or in both and one species recently reported from Corfu, the Bladetail (*Lindenia tetraphylla*), is one of them. Unfortunately, the listing is based on data from the 1970s and 1980s and dragonflies from states that were not members of the European Union at that time are not included in the list. In addition, some species included have recovered since the list was first issued, while others may have become threatened. Consequently, an update of the list is urgently needed.

The EU Water Framework Directive (WFD, 2000/60/EG)

The purpose of the WFD is to create a common framework for a water policy in Europe and to establish collaboration between the EU states. The aim is to protect all European waters, i.e. rivers, lakes, ground waters and coastal and marine waters up to one nautical mile from the shore. The object of the directive, which came into force in 2000, is to achieve good ecological and chemical status for all waters. This should be done by improving environmental work related to water and by creating a common water legislation for all EU member states. Sustainable water use, decreasing pollution and improvement of existing aquatic ecosystems and reducing the effects of flooding and drought are the main objectives of the treaty. Participation by the public is a key part of the WFD and the role of citizens, citizens' groups and independent organisations is stated as crucial in the effort to achieve clean water. The reason for this participation is that transparency will provide opportunity for these groups to influence issues where there may be a conflict of interest.

The WFD, considered to be the most substantial and ambitious European environmental legislation so far, has been severely criticised. There have been delays and difficulties with implementations and understanding of the core objectives by several countries. The first stage of the legislation, to reach good status for all surface water in Europe, should have been completed by 2015, but 47% of these waters have not yet reached this status. As for Corfu, there are few, if any, signs of active water management, and dumping of garbage in rivers and streams and in-filling of wetlands are common all over the island. Information from authorities to the public on this matter is scarce or lacking, and no coordinated clean-ups of waterways seem to be undertaken. However, local clean-up initiatives are carried out now and again, but these initiatives are by far not enough to reach the goals of the WFD. A sustainable water management plan has to be initiated by the authorities and information



Figure 24. A meadow close to a small glade along the river serves as hunting-ground for the Small Pincertail (*Onychogomphus forcipatus*).

needs to be provided to the public in order to change the attitude towards water management and protection as well as towards waste disposal. Also, regular, coordinated clean-up initiatives undertaken by organizations and private citizens should be encouraged and drop-off points for the collected waste should be created.

Natura 2000

The Natura 2000 network was established in 1993 under the Habitats Directive and the Birds Directive to protect Europe's most threatened habitats and species and to save the latter from extinction. Natura 2000 areas can sometimes be strict nature reserves where all human activity is prohibited, but they can also be privately owned land or land with ongoing human activities. In the latter cases, the aim is to ensure that human activities are both ecologically and economically sustainable. Following the two directives mentioned above, Greece as well as all the other EU-member states have selected areas that they consider worthy of protection. A total of some 170 habitats and 900 plant and animal species are listed in the two European directives. Four Natura 2000 sites have been designated on Corfu.

The Korission Lagoon, also known as Lake Korission (Limnothalassa Korission (GR2230002), is a 22 km² area located on the southwestern coast of Corfu. The area is interesting and complex and the dune system is considered to be the only more or less unaltered ecosystem found on the island. The site includes the Korission Lagoon, the sand-dunes and the surrounding wetlands as well as the sandy strip of land between the lagoon and the sea that stretches from Gardiki Point in the north to the beginning of Agios Georgios beach in the south. The area is included both in the Birds Directive and the Habitats Directive and the wetlands are of great importance for many migrating as well as resident birds. It is considered to have both biological and aesthetic values due to its long sandy beaches and petrified sand-dunes. The Phoenician juniper (*Juniperus phoenicea*) population in the area is a remnant of the last continuous stand of this species on Corfu and is regarded as unique. The vegetation on the sand dunes is rich and varied and Dyer's Alkanet (*Alkanna tinctoria*), Sea Bindweed (*Calystegia soldanella*), Sea Medick (*Medicago marina*), Upright Yellow Flax (*Linum spicatum*), Small Carrot (*Pseudoorlaya pumila* (syn. *Daucus pumilus*), Purple Spurge (*Euphorbia peplis*), Sea Daffodil (*Pancratium maritimum*) and Sea Crosswort (*Crucianella maritima*) are a few examples of plants growing on the sanddunes. The Coastal Prickly Juniper (*J. oxycedrus* ssp. *macrocarpa*), the second juniper species in the area, is found scattered throughout the sand dunes and serves both as protection against sand drift and as shady refuges for plants, fungi and animals. The Eastern Willow Spreadwing (*Chalcolestes parvidens*), the Small Spreadwing (*Lestes virens*), the Common Bluetail (*Ischnura elegans*), the Blue-eyed Hawker (*Aeshna affinis*), the Vagrant Emperor (*Anax ephippiger*), the Keeled Skimmer (*Orthetrum coerulescens*) and the Southern Darter (*Sympetrum meridionale*) are examples of dragonflies that occur in the area (for details see map for the individual species and "Lagoons").

The east coast marine belt from the Kanoni Peninsula to the Messongi village (Parakitia thalassia zoni apo Kanoni eos Messongi, GR2230005)

is protected because of the rich beds of Neptune Grass (*Posidonia oceanica*) found here. This species, which is endemic to the Mediterranean Sea, forms large underwater meadows and is part of ecosystems important to many marine species. The presence of *Posidonia* beds is an indication of clear and unpolluted water. This Natura 2000 site covers an area of 8.88 km² and it is a purely marine site. Aliki Lefkimmis (GR2230003) is a 2.5 km² large area of saltmarshes that was operating as a salt work from the 16th century until it was closed down in 1988. The salt meadows and saltmarshes located along the southeastern tip of this sedimentary coast are important bird areas, but they are also important for amphibians and reptiles. They are characterized by halotypic flora containing species such as Glaucous Glasswort (*Arthrocnemum macrostachyum* (syn. *A. glaucum*)), Jointed Glasswort (*Halocnemum strobilaceum*), Common Glass Wort or Samphire (*Salicornia europaea*), European Marram Grass (*Ammophila arenaria*) and European Sea Rocket (*Cakile maritima*). The Broad Scarlet (*Crocothemis erythraea*), The Broad-bodied Chaser (*Libellula depressa*), The Red-veined Darter (*Sympetrum fonscolombii*) and the Common Darter (*S. striolatum*) are some of the dragonflies encountered here (for details see maps for the individual species).

The Antiniotissa Lagoon (Limnothalassa Antinioti, GR2230001), located in the north-eastern corner of Corfu, is a 1.9 km² area of wetlands, and the lagoon and surrounding reed belt are important for several bird species, but



Figure 25. Rivers shaded by trees are important habitats for species such as the Turkish Clubtail (*Gomphus schneiderii*).

also for dragonflies. The Migrant Spreadwing (*Lestes barbarus*), the Blue Featherleg (*Platynemis pennipes*), the Broad Scarlet (*Crocothemis erythraea*), the Blue Chaser (*Libellula fulva*), the Southern Skimmer (*Orthetrum brunneum*), the Black-tailed Skimmer (*Orthetrum cancellatum*), the Common Bluetail (*Ischnura elegans*) and the Blue Emperor (*Anax imperator*) are some of the species that occur in the area. However, the majority breed in an artificial pond west of the lagoon and in the artificial canal dug to drain some areas of the wetland.

National legislation

The Habitats Directive (HD) is considered the most important legislation for the protection of species, but many European countries have additional national regulations. These vary from country to country, some have stricter rules and protect more or different species, while others have very little or no protection at all. In some European countries it is prohibited to kill, catch or collect dragonflies, but the overall opinion of the scientific world is that this has little or no effect on species conservation, especially since large parts of dragonfly habitats are regularly destroyed when required for human development, or by pollution. Only one species present on Corfu, the Bladetail (*Limnadenia tetraphylla*), is listed in the Habitats Directive, but this is a newcomer that inhabits an artificial reservoir and that may not yet have established a stable population on the island. Neither the Turkish Red Damsel (*Ceriagrion georgi-freyi*) nor the Greek Red Damsel (*Pyrrosoma elisabethae*), both in the Red Lists, have any habitat protection as they are not listed in the Habitats Directive.

In 2012 a Presidential Decree regarding island wetlands in Greece were signed ("Approval of the list of small wetlands in islands and definition of boundaries and limitations with regards to the protection and promotion of small coastal wetlands" (229/2012)). This legislation aims at protecting wetlands smaller than 80 ha and does not include wetland areas on the mainland. This means that 28 of the 56 wetlands on Corfu originally listed by WWF Greece now have legal protection (see Appendix III). This is a long awaited and much welcomed legislation that, if enforced, could prove vital for the island's aquatic fauna and flora. However, there are still dragonfly species, like e.g. the above mentioned Greek Red Damsel (*P. elisabethae*), that breed in small ditches or brooks and those benefit neither from this new legislation, nor from the Habitats Directive. Also, some wetlands such as the Gaiderana and Fundana marshes and wetland areas in Ropa Valley, all important breeding grounds for the island's dragonflies, are not included in this or any other legislation. Despite the fact that wetland legislation has been in force since 2012 little has been done to enforce it, and infilling still occurs in some wetlands, as for example at the Apraos Bay Marsh at Kalamaki on the east coast.

Odonata – Dragonflies

Insects are old creatures on Earth, originating from crustacean ancestors during the Palaeozoic era in the Ordovician period around 480 Ma (million years ago), i.e. at approximately the same time as the appearance of the first terrestrial plants. The winged insects, or Pterygota, appeared somewhat later in the early Devonian approximately 406 Ma, and they began to radiate around 345 Ma. Fossil records suggest that modern dragonflies (Odonata) were present during the Triassic and that true dragonflies (Anisoptera) appeared no later than in the Jurassic. However, recent genomic data indicates that modern Odonata arose much earlier and existed already in the early Carboniferous period, as did its closest relatives, the mayflies (Ephemeroptera). The extinct griffinflies, the insect mastodons of the “Amphibian Era” belonging to the insect order Meganisoptera (former Protodonata), roamed the skies sometime between late Carboniferous and late Permian. These dragonfly-like insects, distant relatives of the modern Odonata, are considered to be the largest insects that have ever existed. Species such as *Meganeura monyi* and *Meganeuropsis permiana* had a wingspan exceeding 70 cm, while others such as *Tupus gracilis* and *Arctotypus sinuatus* were considerably smaller with a wingspan of only 14.5 and 12.0 cm, respectively, and many were not larger than modern day species.

The modern dragonflies, or more appropriate odonates, belong to the insect order Odonata, which is considered a monophyletic group, i.e. the members in the group have evolved from a common ancestor and form a so-called clade. The order is traditionally divided into three suborders, the damselflies (Zygoptera), the true dragonflies (Anisoptera) and the small suborder Anisozygoptera, containing four Asian species. However, some authors recognise only two suborders, Zygoptera and Epiprocta, the latter comprising two infraorders, Anisoptera and Anisozygoptera.

Odonates share characteristic features such as a highly modified labium (mouth part) in the larva, indirect insemination and delayed fertilisation. Using the copulation organ, positioned at the base of the abdomen, the male transfers sperm to the secondary genitalia on the front of the abdomen. From this the male then transfers sperm to the female during copulation when they form a so-called mating wheel (see section on Reproduction).

Zygoptera – Damselflies

The adult damselfly, or imago (name of the last and final stage of an insect developing through metamorphosis, also called imaginal stage), has a characteristic, broad head, widely separated eyes and a slender abdomen. Fore- and hindwings have a similar shape and most species rest with their wings closed. The larva has three, sometimes two, external gills positioned near the poste-

rior part of the body, so-called caudal gills (Fig. 32, p. 52). The gills are not only used for breathing, but also function as flippers when swimming. At present there are 27, mostly tropical, recognised families in the suborder and five of these are found in Europe. 14 genera can so far not be placed in the hierarchical system with any certainty and are considered *incertae sedis* (i.e. have an “uncertain seat” or taxonomic position).

Family Lestidae – Spreadwings or Emerald Damselflies

This family contains three genera, *Chalcolestes*, *Lestes* and *Sympecma*, all of which have representatives on Corfu. They differ from other damselflies by having mainly pentagonal wing cells and long, dark pterostigmata. The colour is metallic green, with pruinosity in parts of the body in most species, but a few are brownish-beige with a bronze-metallic lustre.

The genus *Chalcolestes* KENNEDY, 1920 – Willow Spreadwings
(Syn. *Lestes*)

This is a small genus containing only two species, *C. parvidens* and *C. viridis*, both previously assigned to the genus *Lestes* to which they are closely related. However, recent studies using both morphometric (quantitative analysis of form and shape) and molecular traits support the splitting of the genus into *Lestes* and *Chalcolestes*. Only one species, *C. parvidens*, has been recorded from Corfu.

The genus *Lestes* LEACH, 1815 – Spreadwings

Members of this genus are rather robust for damselflies and are characterised by their green metallic body colour and the behaviour of resting with their wings spread open. Part of the body can be pruinose and the wings have cells that are pentagonal in shape and there are only two cross-veins between the wing-base and the node. The pterostigma is long and dark. Many species in this genus lay eggs that are both cold and drought resistant and the larvae are often developing fast.

The genus *Sympecma* BURMEISTER, 1839 – Winter Damsels

This is a small genus containing three Palearctic species of which one, *S. fusca*, is found on Corfu. The species are rather inconspicuous light brown damselflies with bronze markings. The markings on the back of the abdomen are torpedo-shaped and cover S3-S6 (S = segments of the abdomen). The pale brown pterostigma is long and positioned closer to the wingtip on the forewings than on the hindwings. This feature is clearly visible when the damselfly

rests with its wings closed. *Sympetma* species are rather cryptic, both in colour and behaviour and generally rest with their wings closed and often press their body against the perch to hide. The member of this genus are the only dragonflies that overwintering as imagos (fully developed insects).

Family Calopterygidae – Broad-winged Damselflies

The members of this family are recognised by their broad, dark tinted wings with a large number of wing veins. The wings lack true pterostigmata and the pseudo-pterostigmata of the forewings of the female are divided by cross-veins. The body colour is often metallic and the eyes are uniformly dark, but lighter in females than in males. The flight is fluttering like that of butterflies and the courtship display is sometimes very distinct and elaborate.

The genus *Calopteryx* LEACH, 1815 – Demoiselles or Jewelwings

The Demoiselles are elegant, conspicuous damselflies with broad, often dark tinted, wings and bodies with a metallic sheen. These features, together with the lack of a true pterostigma, separate them from other genera. The males are usually blue with dark wings while females, in most cases, are green with either clear or light brown wings. Males lack false pterostigmata. Females sometimes develop male coloration (become andromorph or androchrome) and andromorph females are common in *C. virgo* on Corfu. There are few structural differences between species (male appendages are almost identical in all of them) within this genus, but behaviour, wing-shape, body colouration and colour of the underside of the abdomen tip make it quite easy to distinguish the males (Fig. 77, p. 84). Females of different species can be more difficult to separate, but they rarely fly far from the males and can be identified through them. The Demoiselles rest with their abdomen raised and wings closed, males defend their territory fervently, and they display an elaborate courtship dance to attract females. There are around 30 *Calopteryx* species in the world, four in Europe (two by some considered to be subspecies) and two of these are found on Corfu.

Family Platycnemididae – Featherlegs or White-legged Damselflies

This is an Old World family recognized by the flattened, whitish tibia and quadrilateral cells on the wings. The head is broad with a continuous pale postocular line (Fig 87, p. 89). Both sexes usually have extended feather-like tibiae (the fourth segment of the leg of an insect) on the middle and hind legs.

The genus *Platynemis* BURMEISTER, 1839 – Featherlegs

Members of this genus are characterised by a broad head, legs with long bristles and tibiae that are widened, whitish and feather-like, especially in the males. The body colour is rather pale and non-metallic. The quadrilateral cells on the wings are almost rectangular in shape and usually separated from the subnode by two cells. There are five species in Europe and one on Corfu.

Family Coenagrionidae – Pond Damsels

This is the largest damselfly family with a cosmopolitan distribution and eight genera represented in Europe and seven on Corfu (eight including *Enallagma cyathigerum*, but this species has not been reported since 1939). The males in this family are brightly coloured with blue or red markings and narrow, stalked and usually clear wings. The wingcells are mainly rectangular and the wings have two antenodal crossveins. Mature individuals often aggregate in the vegetation, close to water, in large numbers.

The genus *Ceriagrion* SELYS, 1876 – Small Red Damsels

This genus is represented all over the world, but only two species occur in Europe and one of these has been reported from Corfu. *Ceriagrion* species are small, delicate damselflies with red or partly red abdomen. The black areas on the thorax have a metallic sheen and the yellow antehumeral stripes are either very thin or absent. The eyes are widely separated and the insect lacks postocular spots.

The genus *Coenagrion* KIRBY, 1850 – Bluets or Eurasian Bluets

This is a genus of small and variable dragonflies. The males are usually blue with black markings, while the females often are darker and green or brown rather than blue. The pterostigma on the forewing is dark, the postocular spots elliptical, ovoid or triangular in shape, the antehumeral stripes are thinner than the black area below them and there are two fine black lines on each side of the thorax. At first glance, the members of this genus can be confused with other small, blue-coloured genera such as *Enallagma*, *Erythromma*, or *Ischnura*. However, the antehumeral stripes in *Enallagma* are usually broader than the black area below it and there is only one thin black line on the side of the thorax. *Erythromma* species are darker, lack or have reduced postocular spots and the males either have all red or vividly blue eyes. Females of both *Ischnura* and *Erythromma* species have a vulvar spine.

Coenagrion species fly in the vegetation close to the ground and rarely far from water. Oviposition occurs in tandem on floating vegetation with the

male in an upright position and the female, on occasion, submerged in the water. The three *Coenagrion* species present on Corfu are all common throughout Europe and listed as a Least Concern species with stable populations. However, on Corfu they are all found in only a few localities and even if abundant in some of them they may be threatened by habitat loss on the island.

The genus *Enallagma* CHARPENTIER, 1840 – ‘American’ Bluets

This is a large genus with worldwide distribution, but only one species is found in Europe and this species has also been reported from Corfu, but not since 1939. The males in this genus are blue with black markings, but the females can be either blue or brown with torpedo-like markings on the abdomen on S3-S7. The vulvar spine is small but prominent.

The genus *Erythromma* CHARPENTIER, 1840 – Brighteyes

The completely bright red or vividly blue eyes and blue-marked bodies of the males distinguish *Erythromma* from all other genera in the family. The abdomen is bronze-black on the dorsal side, except on S9-S10 where it is bright blue. The postocular spots are either reduced to narrow stripes or absent. The upper appendages in males are much longer than the lower ones. The absence of a vulvar spine distinguishes *Erythromma* females from *Enallagma* and *Ischnura* females. The flight is direct, linear and rather quick and males prefer to perch on floating vegetation or on vegetation emerging from the water some distance from the shore. Three species occur in Europe and two of these are present on Corfu.

The genus *Ischnura* CHARPENTIER, 1840 – Bluetails

This is a genus of small and delicate damselflies with dark abdomen and a characteristic vibrant blue “tail-light” in males and andromorph females. The underside of the abdomen is yellow on S3-S6 and the males have a bicoloured pterostigma that is dark grey and white. The pterostigma is diagnostic and distinguishes this genus from all other similar sized and coloured genera. Females in this genus are often polymorphic. This is a cosmopolitan genus with seven species occurring in Europe, but only one is present on Corfu.

The genus *Pyrrosoma* CHARPENTIER, 1840 – Large Red Damsels

The species in this genus are rather large and robust damselflies. The abdomen is mainly red, the legs black, the pterostigma dark and the antehumeral stripes pronounced. There are no postocular spots and the markings on the

thorax sides are very distinctive (Fig. 132, p. 118; Fig. 134, p. 129). Two very similar species occur in Europe, but only one is present on Corfu.

Anisoptera – True dragonflies

In true dragonflies the imago is generally larger, more robust and forceful than in the damselflies. The insect's eyes, in most families, are positioned close together and generally touch at the top of the head. The hindwings are distinctly broader at the base and when the dragonflies are resting they spread their wings horizontally. The larva is quite sturdily built and lacks caudal gills. Currently there are 11 recognised families and six of these are found in Europe.

Family Aeshnidae – Aeshnids or Hawkers

This family contains the world's largest and most eye-catching dragonflies. The European representatives are usually divided into five genera of which four can be found on Corfu.

The genus *Aeshna* FABRICIUS, 1775 – Mosaic Hawkers

This is a diverse group of small to medium sized aeshnids with eleven species found in Europe and three on Corfu. Not all species in this genus are considered closely related and *A. isoeles* differs notably from the other species and has previously been assigned to the genus *Anaciaeshna*. *Brachytron* is believed to be the genus closest related to *Aeshna*. The dragonflies in this group are usually brightly coloured with a typical mosaic-like pattern on their waisted abdomen, hence the name Mosaic Hawkers. All members are strong and swift flyers.

The genus *Anax* LEACH, 1815 – Emperors

The world's largest dragonflies belong to this genus and they are a very spectacular sight, especially in flight. Five species reproduce in Europe and three on Corfu. The hindwing in males distinguishes this genus from the rest in the family as it lacks the anal triangle, the inside lobe is rounded and there is no ear-like structure, or so-called auricles, on S2 on the abdomen. Also, the thorax in the European species is not banded but uniformly coloured brown or green. The *Anax* species generally appear earlier in the year than the *Aeshna* species.

The genus *Brachytron* EVANS, 1845 – Hairy Hawkers.

This a monotypic genus and its only member appears early in the season. It is defined by its short, rather stout and very hairy body.

The genus *Caliaeschna* SELYS, 1883 – Eastern Spectres

These are small aeshnids easily recognised by the very short, dark pterostigma and the type of venation of the wings. There are cross-veins in the median space between the arculus and the base. This is a trait that is also found in the genus *Boyeria*, but these dragonflies are not found on Corfu. *Caliaeschna* is a monotypic genus.

Family Gomphidae – Clubtails

This is a group among the Anisoptera of mostly medium sized species, the large *Lindenia* being the exception. Most species are generally yellow or green with black or dark brown markings. The gomphids' eyes are separated by a gap and do not meet at the top of the head as they do in the aeshnids. This is a trait that otherwise is typical for the suborder Zygoptera or damselflies. Most gomphid species are found along shaded rivers with slow flowing water and they are often perching on the ground in patches of sand or shingle. The female oviposits in flight on her own and the larval development is generally slow, and it may take three to five years until the adult appears. Five genera of gomphids are represented in Europe and three of these are found on Corfu.

The genus *Gomphus* LEACH, 1815 – Clubtails

The species in this genus are medium-sized, rather shy dragonflies with a yellow or green body colour and black markings. The hindwings lack an anal lobe and there is often an uninterrupted yellow line running down most of the abdomen, i.e. from S1 to S7 or sometimes to S10. There is one species found on Corfu.

The genus *Lindenia* DE HAAN, 1826 – Bladetails

This is a monotypic genus comprising one large, elegant and very spectacular dragonfly.

The genus *Onychogomphus* SELYS, 1854 – Pincertails

These medium sized dragonflies are brightly coloured in yellow and black. The large, pincer-like appendage makes it easy to recognise the males, but the females can, at first glance, be confused with *Gomphus* species. The hindwings

of *Onychogomphus* have small anal lobes with one to three cells. There are seven *Gomphus* species in Europe, six of these fly in the Mediterranean, but only one in Corfu.

Family Corduliidae – Emerald Dragonflies

This is a family of medium-sized to large dragonflies with a dark, generally green body that often has a metallic sheen and sometimes yellow markings. The thorax is covered with fine pale hairs. Five European genera are included in this family, but only *Somatochlora* is present on Corfu.

The genus *Somatochlora* SELYS, 1871 – Striped Emeralds

This is a genus of mainly green dragonflies, often with a metallic lustre and primarily clear wings that usually have an amber coloured basal mark. However, old females may have a yellow tint throughout their entire wings. The frons is dark or metallic green with yellow spots on each side. The male abdomen is, in most species, bulbous in the area of S1 and S2 while S3 has a waist after which the abdomens widens and becomes broadest between S6 and S7 to finally taper off towards the tip. The colour of the abdomen varies from metallic green to almost black with small yellow marks. The male upper appendages are rather long with ventral teeth and a tip that often curves upwards. The lower appendages are triangular and have a narrow tip that also curves upwards. In females, the appendages are very long and the vulvar scale is large and prominent. In areas where *Cordulia* and *Oxygaster* occurs together with *Somatochlora* they can be distinguished from the latter by the uniformly black frons that lacks yellow markings. Furthermore, the vulvar scale in the two former is short and not very prominent.

Family Libellulidae – Common Skimmers

This is the largest dragonfly family in Europe and contains small to medium-sized species. They are often found resting on a perch, such as a twig or a stick, from where they have a good view of the surroundings and quickly can dart out to catch insects or chase away rivals. Resting individuals keep their bodies more or less horizontal while their wings are drooping forwards. Libellulides mostly, but not exclusively, occur close to small, standing waters. The males are generally more colourful than the females and they often have a pruinose body. The body stature of both sexes usually is short and broad.

The genus *Crocothemis* BRAUER, 1868 – Scarlets

Crocothemis is an Old World genus containing eleven species, but only one of

these occurs in Europe. The males are bright red and lack black markings, but can have a thin black dorsal line along the abdomen. The legs are pale and without markings and the pterostigma is large and pale.

The genus *Libellula* LINNAEUS, 1758 – Chasers

This is a genus of rather robust dragonflies with broad, hairy bodies and large, dark marks on their hindwings, which distinguish them from all other genera in the family found on Corfu. There are two easily recognizable species on the island.

The genus *Orthetrum* NEWMAN, 1833 – Skimmers

These dragonflies have males that are blue or grey and pruinose when mature. The wings are clear without black patches at the base. Females and young males could be confused with *Sympetrum* and females of *Crocothemis* species, but they can usually be distinguished from these by wing characters. *Orthetrum* species have 10-14 antenodal cross-veins on the forewings while *Sympetrum* species only have 6-7. In *Crocothemis* the hindwings have large yellow patches, also present in some of the *Sympetrum* species, but absent in *Orthetrum*. There are three *Orthetrum* species found on Corfu.

The genus *Selysiothemis* RIS, 1897 – Black Pennants

This is a monotypic genus that is characterised by having few and indistinct wing veins and there is no other dragonfly genus on Corfu that resembles it.

The genus *Sympetrum* NEWMAN, 1833 – Darters

The darters are relatively small and slender libellulids that choose prominent places to perch and from which they make short darting flights to catch insects or to chase away rivals. In most species the mature males typically have a slender abdomen coloured in some shade of red and sometimes there are black marks present. All *Sympetrum* species have bicoloured eyes and can look quite stunning when viewed at close range. The females are yellowish or sand-coloured and old specimens may develop pruinosity on the ventral side of their thorax and abdomen. There are six species of darters in Europe and four of these are presently found on Corfu.

The genus *Trithemis* BRAUER, 1868 – Dropwings

The genus comprises some 40 mainly African, but also Asian, species. One

species, *Trithemis annulata*, occurs in Europe and it has quite recently aggressively expanded its range northwards. The species in this genus most closely resemble those of *Sympetrum* and *Crocothemis*, but differ significantly in the venation of the forewing. The mature males are flamboyantly coloured, have a shiny metallic looking frons and hooked hamule (a grasping organ on the secondary genitalia).

Reproduction

Nearly all dragonflies are amphibious with larvae (nymphs or naiads) that spend their entire life in the water, while the adult insects live on land and spend most of their time in the air. The main part of the life cycle is spent as larva, a stage that varies in length from two months up to five years, depending on species and climate. In areas with colder climate, or in cold waters, the development takes longer while the scenario is the opposite in warm climates or warmer waters where sometimes there can be more than one generation per season.

The dragonfly type of mating, with indirect insemination and delayed fertilisation, is unique in the animal world. The male moves sperm from his abdomen tip, where it is produced, to the secondary genitalia located at the base of his abdomen. The sperm is transferred to the female from the secondary



Figure 26. The Common Bluetail (*Ischnura elegans*) often mates in low vegetation close to the water.



Figure 27. The Blue-eye (*Erythromma lindeni*) oviposits in tandem on floating vegetation.

genitalia during copulation and the eggs are not fertilised until they are laid. This allows males that manage to copulate with an already mated female to remove the sperm of the first male and replace it with his own. This type of fertilisation may have given rise to male behaviours such as fierce defence of breeding grounds and hovering over the female when she oviposits.

Dragonflies oviposit either in tandem or alone, and females that oviposit alone may choose to do so when the weather is less favourable to avoid interference from courting males. The female can lay hundreds of eggs and she deposits them in batches over a period of one to a couple of weeks. She either lays them directly in the water or in aquatic plants, in mud on the bottom of the preferred type of water, or in damp moss or clay. Eggs that are laid inside plants growing in or overhanging water are called endophytic, while those deposited directly in the water are referred to as exophytic. Endophytic eggs are oval and lack a protective cover, whereas exophytic eggs are round and protected by a gelatinous layer. The females of species that lay endophytic eggs have well developed ovipositors, while those that lay exophytic eggs directly into the water lack them or have rudimentary ones.

The dragonfly develops from egg through several larval stages to a fully grown insect without a pupal stage, a process called incomplete metamorphosis, and insects having this form of development are called hemimetabolous. When the egg hatches and the first larva, the prolarva, emerges it is very small



Figure 28. A male of the Small Spreadwing (*Lestes virens*) grabbing the female by the pronotum behind the head before mating.

and this stage only lasts for a few hours. The development from prolarva to fully grown insect goes through 5-14 larval stages or instars, depending on species.

The larvae of damselflies and true dragonflies differ noticeably in appearance, but they all share typical features such as six legs, wing-sheets and a hinged jaw or mask, the latter being a modification of the labium (lower lip or jaw). The labium can be thrown out very quickly and the hinge together with the modified palps, which function as movable claws, make it a very powerful tool for catching prey. The hinged labium regresses shortly before the emergence of the adult insect. Larvae of both suborders have the ability to breathe under water, but the location of the breathing organs differs between them. Both have tracheal gills, but in true dragonflies they are concealed within the abdomen, while damselflies use modified cerci and a central projection located outside the body at the end of the abdomen (Fig. 32, p. 52).

When the larvae are fully grown they leave the water, crawl up into suitable vegetation and moult for the last time on land. The skin splits open longitudinally and the emerging insect is soft. After expanding its wings and abdomen it must rest for some time (approximately 30 minutes) until its body and wings have hardened enough for it to be able to fly. The exuvia, the final moulted skin, is found on the vegetation close to the water from which the dragonfly emerged and can be used to identify the species that breed at the site, even



Figure 29. The Keeled Skimmer (*Orthetrum coerulescens*) forming a mating-wheel.



Figure 30. The Common Darter (*Sympetrum striolatum*) forming a mating-wheel before the male accompanies the female in tandem to the water where she lays her eggs.



Figure 31. A Common Darter (*Sympetrum striolatum*) pair flying in tandem during oviposition.



Figure 32. Larva of a damselfly (Zygoptera; note the caudal gills).



Figure 33. Larva of a true dragonfly (Anisoptera).



Figure 34. Newly emerged Lesser Emperor (*Anax parthenope*).



Figure 35. Exuvia of Lesser Emperor (*Anax parthenope*).

when no adults are around. The first flight is weak and short, but when the body and wings have hardened the dragonfly usually leaves the breeding water to feed and mature before returning to breed.

Territoriality

Dragonflies are territorial and males patrol and defend a certain stretch of water from rivaling males of the same species, or even from males of similar sized species. Fights often occur, but one of the combatants usually gives up fairly quickly and serious injuries are rare. In larger waters there is space enough for several males to keep territories, but in smaller ones there is often room for only one. Dragonfly territories are not as rigid as the ones in for instance birds, they may overlap with those of other males, change in size, and different species may occupy the same territory during the course of day. Territoriality in dragonflies is nearly all about securing females for mating, but some damselflies also keep hunting territories. The most territorial damselflies are found in the genus *Calypteryx*. Aggressive behaviour between females also occurs, and, as an example, egg-laying females often chase away other females that come to close. Dragonflies rarely behave aggressively when they hunt together in swarms, even when sexually mature.

Dragonflies can be either perchers or fliers. The perchers fly to an elevated position from where they can survey the surroundings and make short darting flights to chase away rivals or to catch prey. Reeds or dead twigs are often used as lookout points, and this type of perching behaviour is common among Zygoptera and in the families Libellulidae and Gomphidae in Anisoptera. Fliers seldom settle down and spend most of their time in the air, patrolling back and forth over their territories, chasing off rivals and hawking their prey. Species within the families Aeshnidae and Corduliidae mainly behave in this way.

Foraging

Both larvae and adult dragonflies are generalist predators and feed on any small animal they can catch and manage to ingest. The larvae mainly prey on small invertebrates such as insects, insect larvae and small crustaceans, but also on tadpoles, newts and small fish and fry. Immature dragonflies, or tenerals, start to feed the first or second day after emergence and spend most of their time feeding, while sexually mature individuals only spend parts of the day hunting. Species within the Zygoptera feed on a variety of small insects that are found in the vegetation, such as aphids (Aphidoidea), while Anisoptera species feed in flight and mainly prey on flies (Diptera), especially mosquitoes and midges, but also on mayflies (Ephemeroptera) and caddisflies (Trichoptera). Occasionally they also catch butterflies (Lepidoptera), bees and



Figure 36. A male Black-tailed Skimmer (*Orthetrum cancellatum*) eating a fly.

wasps (Hymenoptera), dragonflies (Odonata) and large species even small frogs and hummingbirds. The dragonfly's legs are positioned horizontally beneath the head and the claws on the insect's feet (tarsal claws) are equipped with bristles, both adaptations to optimise the catching of prey.

Vision

Dragonflies have excellent vision and their large compound eyes comprise approximately 30 000 facets or ommatidia each. The hexagonal shaped ommatidia contain the eyes' sensory cells and light sensitive proteins, so-called opsins. Each individual ommatidium only registers a small part of the surroundings, but together they create a very wide field of view. Furthermore, in most species, the eyes cover a large proportion of the head, giving dragonflies an almost perfect spherical field of view, which means that the insect can see an object even after it has flown passed it. However, the rear vision is not as good as in other directions.

Even if the vision in dragonflies is very good, the compound eye has limitations and the optical resolution is far inferior to, for example, that of the human eye. This is due to factors such as the angle between the individual ommatidia, the number of sensory cells present and the dimension of the so-called rhabdom (a translucent cylinder that is a part of the ommatidium and determines how much light can be let into the eye). The angle between the ommatidia in dragonflies is small, only 0.24° , which makes it possible for them to detect objects and movements at a distance of 20 meters or more. The number of sensory cells is low, each ommatidium only contains 7–11 sensory cells, compared to the about 170 000/mm² cones present in the

fovea (yellow spot), the most light-sensitive part of the human eye. Dragonflies have exceptional colour vision and can not only see colours and colour combinations in the red, green and blue spectrum, but they can also see ultraviolet light and detect polarised light reflected from the water surface. Recent studies have shown that the dragonfly ommatidium contains many more light-sensitive proteins than previously thought and they are now estimated to be between 11-30. The type and number of opsins present vary between species, between larvae and adults and between the upper and lower part of the eye. Dragonflies are colourful insects and the body colour is a key factor with respect to their behaviour as they need to be able to recognize and distinguish between males and females of their own species as well as individuals from competing species.

Temperature regulation

Dragonflies cannot maintain a constant body temperature and are therefore dependent on ambient temperature and behaviour to be able to function, i.e. they are ectotherms. If the ambient temperature is too low the wing-muscle metabolism decreases and the dragonfly cannot fly. They may whirr their wings or move to a sunny position to raise their inner thorax temperature, which needs to be at least 19 °C in small perching species and 27-39 °C in larger, strong flying species. Features such as hairs or internal hair-sacs serve as insulation and help maintain the thorax muscle temperature for species that emerge early in the season. Very high temperatures can also pose a problem for dragonflies by increasing the risk of overheating and this is why the ratio of perching to flying species increases in warm climates. Drooping the wings and pointing the abdomen vertically into the air are other behaviours that reduce the body area exposed to the sun and help lower the body temperature.

Longevity

As mentioned above the main part of a dragonfly's life is spent as larva in the water, but an adult dragonfly can live up to 45-50 days on land, which is quite long for an insect. However, very few individuals survive to "old age" and life expectancy varies between species and can be as short as seven days. Many individuals, independent of age, fall prey to predators. *Sympecma* species have the most long-lived adults, which emerge during summer, hibernate and lay eggs the following spring. Climate and weather also have an impact on longevity and severe weather may be detrimental to newly emerged individuals. Adults of species from warmer climate tend to have a shorter life-span than those from colder areas due to a more intense way of life that wears them out faster.

Flight and dispersal

Dragonflies, especially the true dragonflies, Anisoptera, are excellent fliers and can change speed, direction and altitude quickly and seemingly effortlessly. They can hover in the air, fly slowly backwards, only to suddenly move fast forward at a tremendous speed. Dragonflies are considered to be among the fastest fliers in the insect world and can reach speeds of up to at least 30 km/h. They can move their fore- and hindwings independently of each other. In true dragonflies the movement between them is synchronized while it is unsynchronized in damselflies.

Dragonflies are not only fast but also persistent fliers that are able to migrate over very long distances. As an example, the Wandering Glider (*Pantala*



Figure 37. Common Darters (*Sympetrum striolatum*) can fly several km away from their breeding waters to hunt.

flavescens) makes a round-trip journey of 14 000 - 18 000 km from southern India to Mozambique in Africa via the Maldives and the Seychelles. The journey follows the monsoon rains and takes several generations of dragonflies to complete. They travel 3 500 km or more over open waters on a journey surpassed by no other insect. Despite the fact that swarms of mass-migrating dragonflies are not that uncommon, and that they have been periodically reported in the literature since the late 19th century, the reason for this behaviour is still not fully understood. Even if migration occurs on all continents where dragonflies are present, only about 50 of the worlds some 5000 species are considered migratory. As dragonflies are dependent on aquatic habitats they need to be able to find new ones when the old deteriorate or when residential dragonfly populations become too dense and competition too great.

Thus, they are dependent on their ability to fly and to colonize new areas. Some species are more true colonizers than others and actively seek new breeding grounds. *Libellula depressa* is one such species that quickly will colonize for instance a small, newly dug pool.

Species from different habitats may differ in their ability to colonize new habitats in response to, for instance, over-crowding or climate change. It has been argued that dragonflies that inhabit flowing (lotic) waters do not disperse as easily as species that inhabit standing (lentic) waters such as lakes. The reason for this is that flowing waters, like rivers and streams, are more long-lived than lakes and ponds, which will fill in over time and therefore are less stable. The species living in less stable habitats will adapt to these circumstances, leading to selection for better dispersal ability, while the scenario will be the opposite for species from the more stable lotic waters. Good flying ability and stamina is not only important for migrating species but also for stationary species that in general fly quite a distance from their breeding habitat to hunt.

Predators and other natural threats

Many animals prey on dragonflies and large dragonflies often catch smaller species of their own kind, the Black-tailed Skimmer (*Orthetrum cancellatum*) is one such example as it regularly feeds on Zygoptera species. The Hornet (*Vespa crabro*), several species of fish and birds like the European Bee-eater (*Merops apiaster*), the Hobby (*Falco subbuteo*), the Red-footed Falcon (*F. vespertinus*) and the White Wagtail (*Montacilla alba*) all feed on dragonflies.

Moulting or newly moulted teneral are very vulnerable to bad weather and long periods of cold and rain can prove fatal. The soft wings of newly emerged insects sometimes stick together and therefore do not unfold properly, leading to flight problems. Immature dragonflies that plunge into the water with bodies and wings still soft often fall prey to fishes as they are unable to get out of the water.

Parasites, both internal (endoparasites) and external (ectoparasites), frequently attack dragonflies. Red mites (*Arrenurus* spp.) are common ectoparasites, often visible with the naked eye. The mite larvae attack the dragonfly larva already in the water and when the dragonfly moults for the last time the mites attach themselves to the insect's thorax, leg joints (articulations) or wing veins, depending on species, and destroy the epidermis in these areas. Heavy infestations can make it difficult for the dragonfly to fly and may weaken it considerably but are rarely fatal. Red mites often attack species in the genus *Lestes* and *Sympetrum* and some species of red mites are host specific.

The Biting Midge (*Forcipomyia* (*Pterobosca*) *paludis*, Diptera) is another ectoparasite that infests dragonflies. The female midge attaches herself to the



Figure 38. A spider preying on a Blue Featherleg (*Platynemís pennípes*).



Figure 39. A Black-tailed Skimmer (*Orthetrum cancellatum*) being attacked by a wasp.



Figure 40. Common Bluetail (*Ischnura elegans*) infested with red mites (*Arrenurus* sp.).

thorax or wings of the adult dragonfly from where she sucks haemolymph (the insect equivalent to blood). There are 61 known dragonfly host species in Europe, but the life cycle and larval habitat of this midge is unknown. It is not as easily spotted as the red mites, and the parasite has so far not been reported from Corfu.

Endoparasites such as gregarine protozoa infect the gut of adult dragonflies, destroying its lining (epithelium), exposing it to bacteria. The dragonfly larvae are unaffected by this parasite and the degree of infestation increases with the dragonfly's age.

Terminology

In the following section the 43 species of Odonata so far reported from Corfu are described with respect to distribution, characteristics, behaviour, flight season, habitat and size. As to flight observations our own observations from Corfu are given as e.g. “April-July”, followed by those reported by Lopau (2010a) for the whole of Greece in parentheses “(IV-VII)”. Additional information on flight and mating observations can be found in Appendix I. Yellow dots in the maps are from Lopau (2010a), blue dots from Brochard & van der Ploeg (2013) and red dots are our own observations. General terms of morphology can be found in Figures 41- 44, whereas more specific characters are shown in other figures as indicated in the text.



Figure 41. *Aeshna isocetes*, male:

1. Head
2. Thorax
3. Abdomen
4. Secondary genitalia

Figure 42. *Aeshna isocetes*, male:

1. Costa
2. Wing-node
3. Pterostigma
4. Wing vein
5. Wing-cell
6. Membranule
7. Upper appendage
8. Lower appendage
9. Abdomen segments S1-S10
10. Triangle
11. Frons

Figure 43. *Ischnura elegans*, female:

1. Post-ocular spot
2. Antehumeral stripe
3. Pronotum
4. Tail-light

Figure 44. *Ischnura elegans*, male:

1. Interpleural suture
2. Metapleural suture
3. Secondary genitalia

Figure 41. Male *Aeshna isocetes*.

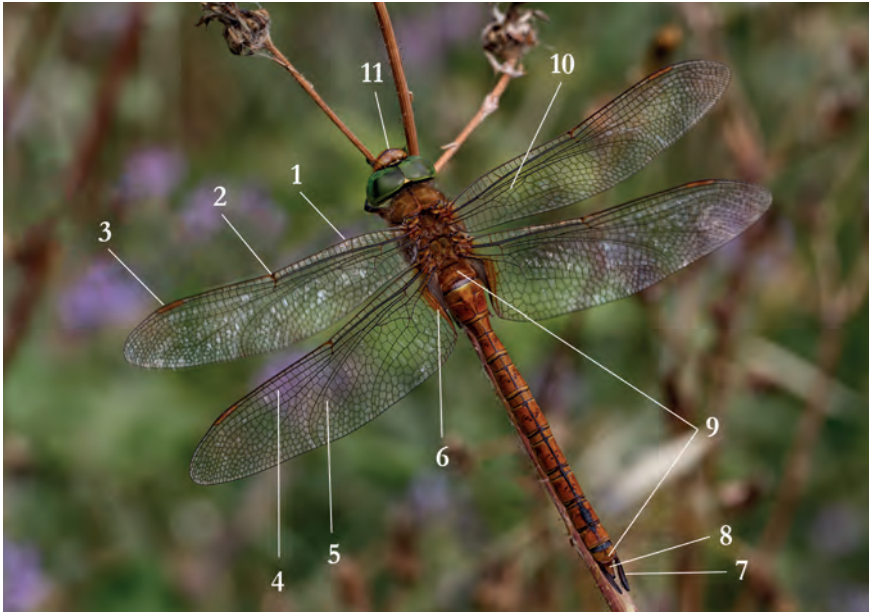


Figure 42. Male *Aeshna isoceles*.



Figure 43. Female *Ischnura elegans*.

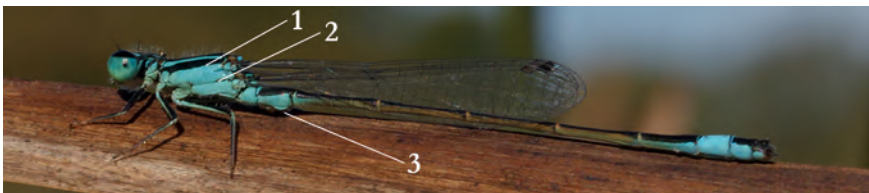


Figure 44. Male *Ischnura elegans*.

Chalcolestes parvidens (ARTOBELEVSKI, 1929) – Eastern Willow Spreadwing



Figure 45. Mature male of *Chalcolestes parvidens*.

This is a relatively robust damselfly long thought to be a subspecies of *Chalcolestes viridis*, a species considered to be confined to the Crimea. However, closer examination revealed that the two overlapped in both Italy and in the Balkans, and although hybridization does occur they are now considered separate species. *C. parvidens* is recognised by its bronze-green colouration with a metallic sheen and absence of pruinosity on the abdomen. Like *C. viridis*, a species not found on Corfu, there is a distinct spur-like mark on the side of the thorax. The pterostigma is large and almost white in teneral but turns brown with age. The male upper appendages are pure white in newly emerged individuals but often turn more yellowish or cream with age.

Key characters: The metallic green body, the uniformly dark pterostigma in mature individuals and the white or cream upper appendages in males.

Behaviour: This species is found in large numbers in tree canopies and shrubs near its breeding waters. The females oviposit in tandem and lay endophytic eggs.

Flight season: May-November (III-XII).

Habitat: This is a common species on Corfu and it can be found in standing or slow flowing waters surrounded with shrubs and trees such as Chaste Tree,

Small Leaved Elm and White Poplar. It generally appears in large groups in May and September and is especially abundant during the autumn.

Size: Total 44-50 mm, abdomen 34-39 mm, hindwing 22-26 mm.

Synonym: *Lestes parvidens*.



Figure 46. Dark bronze-coloured *Chalcolestes parvidens* female.



Figure 47. The white upper appendages in *Chalcolestes parvidens* are clearly visible with the naked eye.



Figure 48. Mature female of *Chalcolestes parvidens* (note the uniformly brown pterostigma).



Figure 49. Mating wheel of *Chalcolestes parvidens*.



Figure 50. The uniform brown pterostigma and lack of yellow on the back of the head are two diagnostic characters in *Chalcolestes parvidens*.

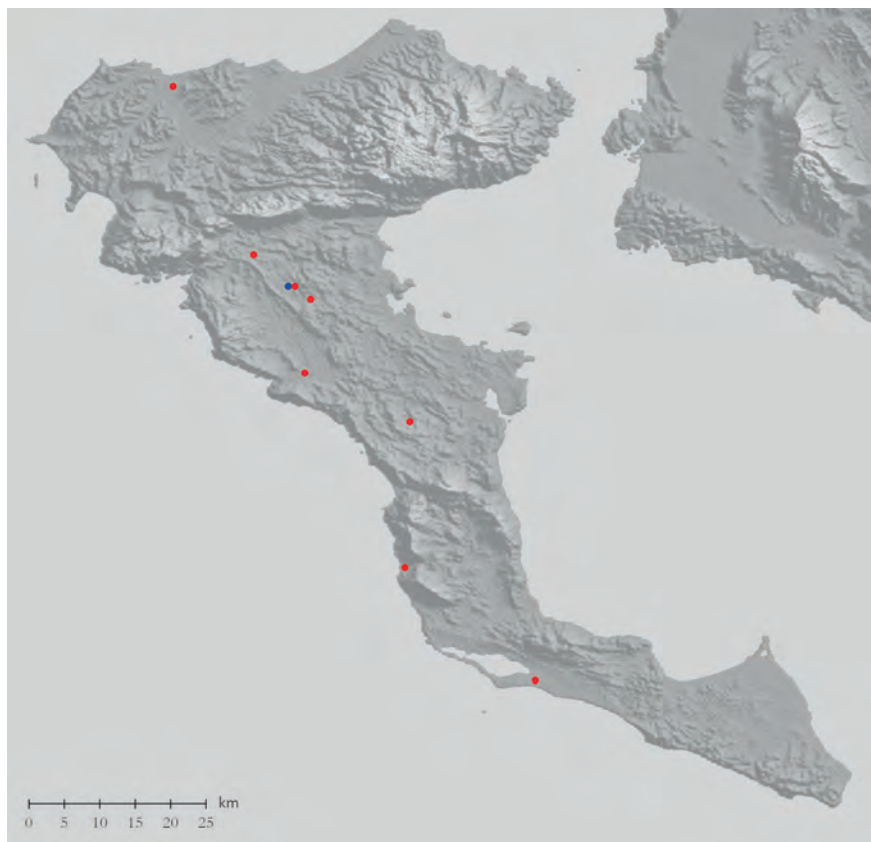


Figure 51. Localities for *Chalcolestes parvidens*.

Lestes barbarus (FABRICIUS, 1798) – Migrant Spreadwing



Figure 52. Mature male of *Lestes barbarus*.

L. barbarus is a relative large spreadwing with bright green metallic colour. The antehumeral stripe on the thorax is pale and rather broad and the pterostigma is bicoloured with the broadest and lightest part pointing towards the tip of the wing (Fig. 54, p. 68). The lower appendages in males diverge at the tip and the abdominal tip in females is pale with a rounded sheath.

Key characters: The bicoloured pterostigma and wide antehumeral stripes.

Behaviour: *L. barbarus* is a very strong wanderer that often colonizes new habitats. It can suddenly disappear from an area and stay absent for several years, only to return and stay on to produce large colonies. The species oviposits in tandem and lays endophytic eggs, often in completely dry areas.

Flight season: April-September (IV-X).

Habitat: *L. barbarus* prefers shallow, temporal waters such as dune pools or depressions that form temporary pools in meadows.

Size: Total 40-45 mm, abdomen 26-35 mm, hindwing 20-27 mm.



Figure 53. Mature female of *Lestes barbarus*.



Figure 54. The typical bicoloured pterostigma and yellow colouration at the back of the head of *Lestes barbarus* (female).



Figure 55. This teneral female of *Lestes barbarus* still has a uniformly pale pterostigma.

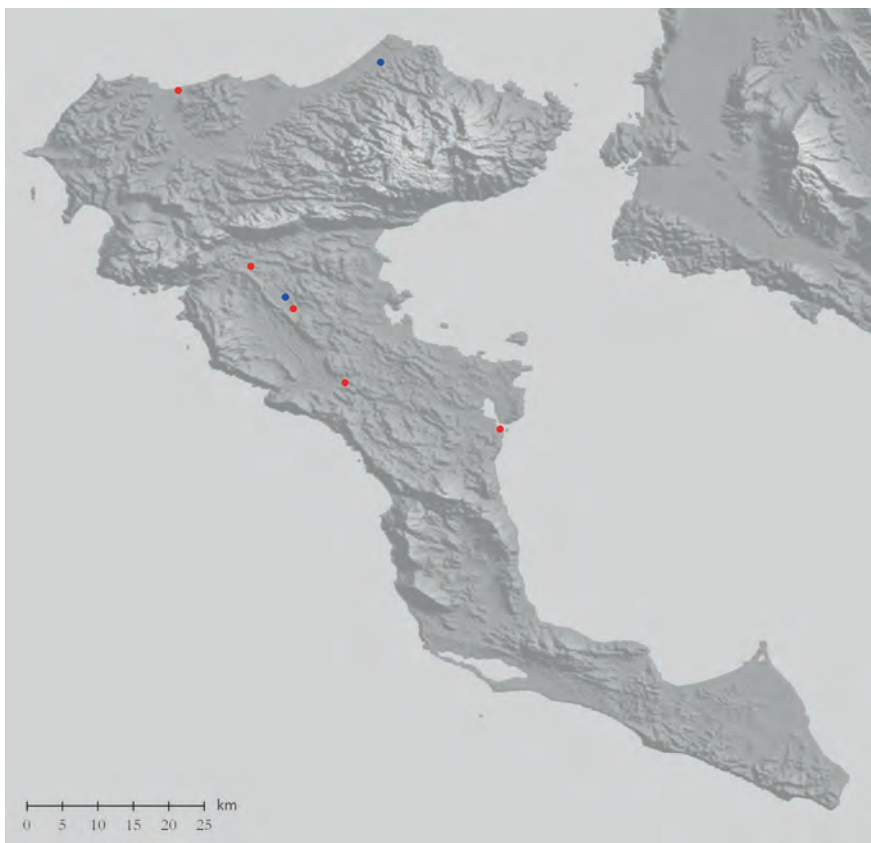


Figure 56. Localities for *Lestes barbarus*.

Lestes macrostigma (EVERSMANN, 1836) – Dark Spreadwing



Figure 57. Female *Lestes macrostigma*.

C. Brochard

This unmistakable species is very dark with bluish pruinosity on the head and thorax and the green or bronze colouration, common in all other species in this genus, only occurs on segments S3-S7. *L. macrostigma* has a rather local and patchy distribution in Europe and on the Greek mainland it is mostly found along the coast and on some of the Aegean islands. On the Ionian Islands it has been reported from Cephalonia and from Corfu, but the latest record from Corfu dates back to 1887.

Key characters: The extensive blue pruinosity on the head, thorax, S1-S2 and S8-S10 and the large dark pterostigma.

Behaviour: The females lay their eggs in the stems of rushes.

Flight season: (IV-VII).

Habitat: This is a mainly coastal species that reproduces in shallow, brackish waters with a dense vegetation of rushes, especially Sea Club-rush (*Bolboschenus maritimus*) and Sea Rush (*Juncus maritimus*). It is commonly found

around abandoned salt pans, in other saline wetlands and in dune ponds.

Size: Total 39-48 mm, abdomen 31-38 mm, hindwing 24-27 mm.

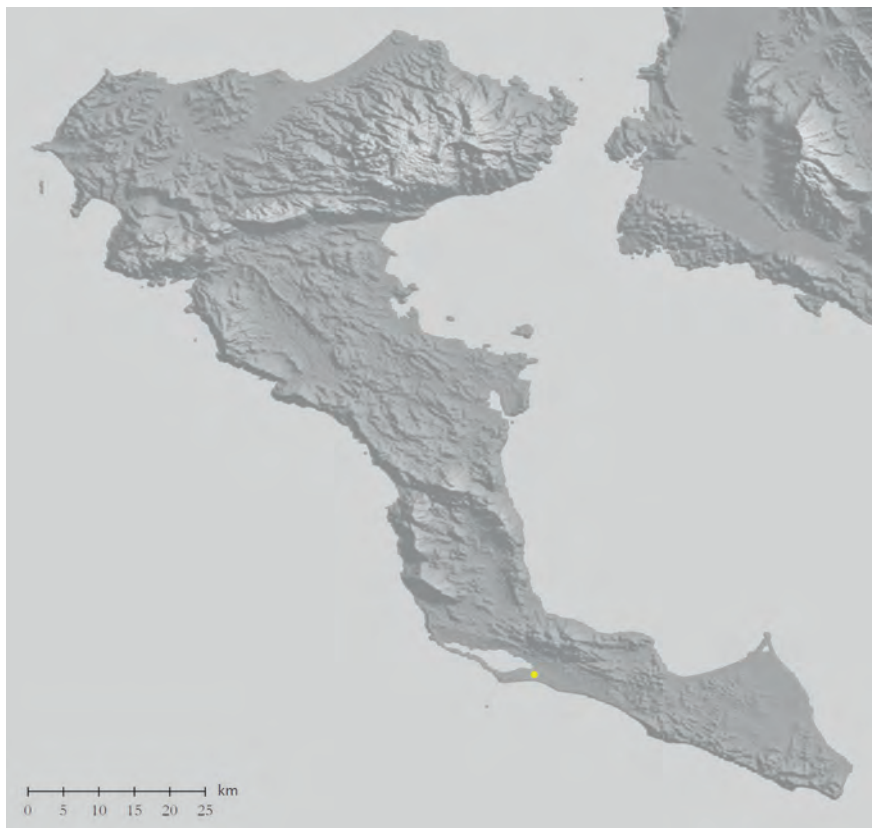


Figure 58. The only reported historic locality from Corfu for *Lestes macrostigma*.

Lestes virens (CHARPENTIER, 1825) – Small Spreadwing



Figure 59. Mature male of *Lestes virens*.

This is a small and slender dragonfly with a more delicate appearance than other *Lestes* species found on Corfu. The male is easily separated from other species in the genus by its pruinose blue tail-light confined to S9 and S10. The yellow underside at the back of the head also separates it from all other species except *L. barbarus*, but the latter is a bigger species that lacks pruinosity. The pterostigma is brownish with thin white edges and the lower appendages are short and straight in males. The females are metallic green or bronze coloured like the males, but their colouration is often duller and they lack the blue pruinosity on the abdomen tip.

Key characters: The small size and blue pruinosity on S9 and S10 in males.

Behaviour: This species flies among low trees, shrubs or other vegetation where it is protected from the wind. The females oviposit in the stems of aquatic plants or plants on land that later will become submerged, and the endophytic eggs can consequently survive both dry and wet conditions. This species has a one-year life-cycle. Oviposition can either take place in tandem or be performed by the female on her own.

Flight season: July-November (IV-XI).

Habitat: *L. virens* can be found in a variety of small, shallow temporary or

permanent waters that are more or less overgrown or surrounded by thick reed-belts. The sun must be able to reach the water surface, but the water must also be protected from wind by trees and shrubs.

Size: Total 30-39 mm, abdomen 25-32 mm, hindwing 19-23 mm.



Figure 60. Front-view of *Lestes virens* male.



Figure 61. *Lestes virens* female.



Figure 62. The small white lines bordering the pterostigma separate *Lestes virens* from other species in the genus.

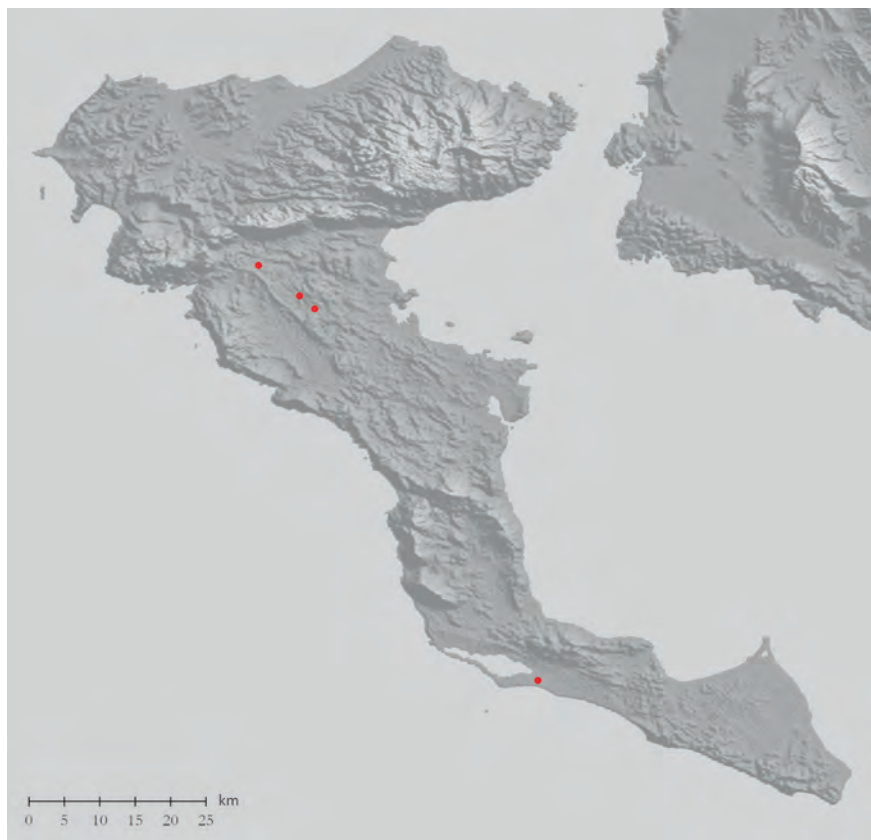


Figure 63. Localities for *Lestes virens*.

Sympecma fusca (VANDER LINDEN, 1820) – Common Winter Damselfly



Figure 64. Male *Sympecma fusca*.

A. Borkenstein

This is a common damselfly in south and central Europe but less so on mainland Greece. It was listed as present on Corfu in 1939 but there were no further reports until we found it at a single locality, Lake Gavrolimni in the Onoufrios Valley, in May-June 2017. This is a rather inconspicuous dragonfly with light brown or beige body colour and bronze markings. It cannot really be confused with any other species on Corfu, but it may easily be overlooked because of its dull colour and thin body. However, the colour is much lighter in newly emerged individuals and fresh, sexually mature specimens have a blue spot on the eyes, features that make them easier to spot.

Key characters: The light brown colour and long brown pterostigma. The straight outer margin of the dark stripe on the side of the upper thorax distinguishes it from the other *Sympecma* species, but none of these are present on Corfu.

Behaviour: Like other members of this genus *S. fusca* overwinters as adult and not as larva. During winter, it rests pressed against twigs, under bark, in leaf litter or among stalks of dry grass etc, often far from breeding waters. It is rarely seen during winter, but may appear during warm, sunny days. It oviposits in tandem on floating vegetation and lays endophytic eggs.

Flight season: May (II-X).

Habitat: This species prefers shallow, standing or slow-flowing waters with lush vegetation on the banks and floating vegetation in the water. It can be found in many different types of habitats such as bogs, lakes, ponds and marshes.

Size: Total 34-39 mm, abdomen 25-30 mm, hindwing 18-23 mm.



Figure 65. Female *Sympecma fusca*.

A. Borkenstein



Figure 66. Side-view of a male *Sympecma fusca* showing the straight lower margin of the dark stripe on the side of the upper thorax.

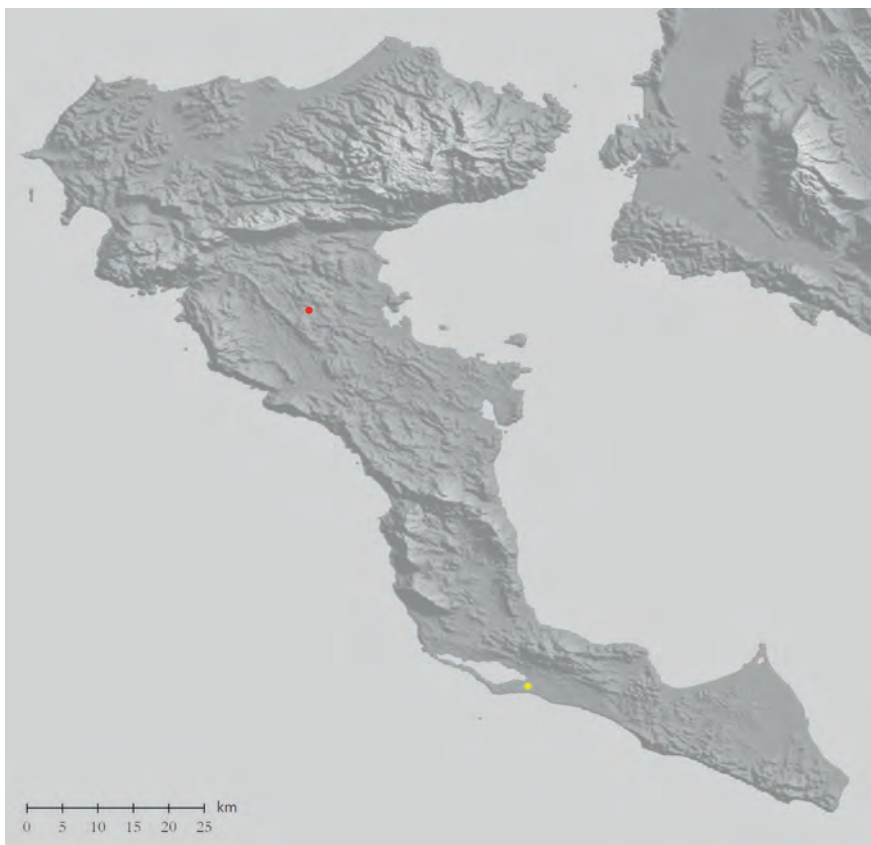


Figure 67. Localities for *Sympecma fusca*.

Calopteryx splendens (HARRIS, 1780) – Banded Demoiselle



Figure 68. Mature male of *Calopteryx splendens*.

Calopteryx splendens is not very common on Corfu and seems to be restricted to a few localities. The males are metallic blue with a dark brown band across the wings, blue metallic wing veins and a whitish or greenish “tail-light” (underside of S8-S10). In specimens from Corfu, the dark band across the wing reaches all the way to the tip, leaving only the base of the wing transparent. The females of *C. splendens* and *C. virgo* (both species occur on Corfu) are very similar looking, but the former is generally greener with almost transparent wings and distinct false pterostigmata situated close to the wingtip. The subspecies on Corfu has been considered to be *C. s. balcanica* FUDAKOWSKY, 1930, but recent studies of the European subspecies suggest that most of them are part of a hybrid population derived from several ancestral gene-pools from western Asia and the western Mediterranean. However, this issue is not yet fully resolved.

Key characters: The banded wings and the whitish or greenish “tail-light” in the males and the almost transparent wings with distinct false pterostigma (placed at a distance from the wing tip that is approximately as long as the pterostigma itself) in the females.

Behaviour: Males generally gather in groups during the mating period and the male and female separate during oviposition, but the male guards females

in his territory. This species lays endophytic eggs.

Flight season: May-July (IV-X).

Habitat: Inhabits open patches in otherwise shaded areas close to running water surrounded by lush vegetation. The preferred water temperature ranges from 18° to 24° C. It seems to favour unaltered waterways, but can sometimes be found in for example seepage-fed backwaters of rivers. On Corfu, both *C. splendens* and *C. virgo* are found in the latter type of habitat in an area surrounded by reeds where a small dirt-road, close to the river, overflows with water.

Size: Total 45-48 mm, abdomen 33-41 mm, hindwing 27-36 mm.



Figure 69. Mature female of *Calopteryx splendens*.



Figure 70. Male *Calopteryx splendens*, showing the transparent base of the wings.



Figure 71. *Calopteryx splendens* females have green, transparent wings.



Figure 72. *Calopteryx splendens* female displaying aggressive behaviour.

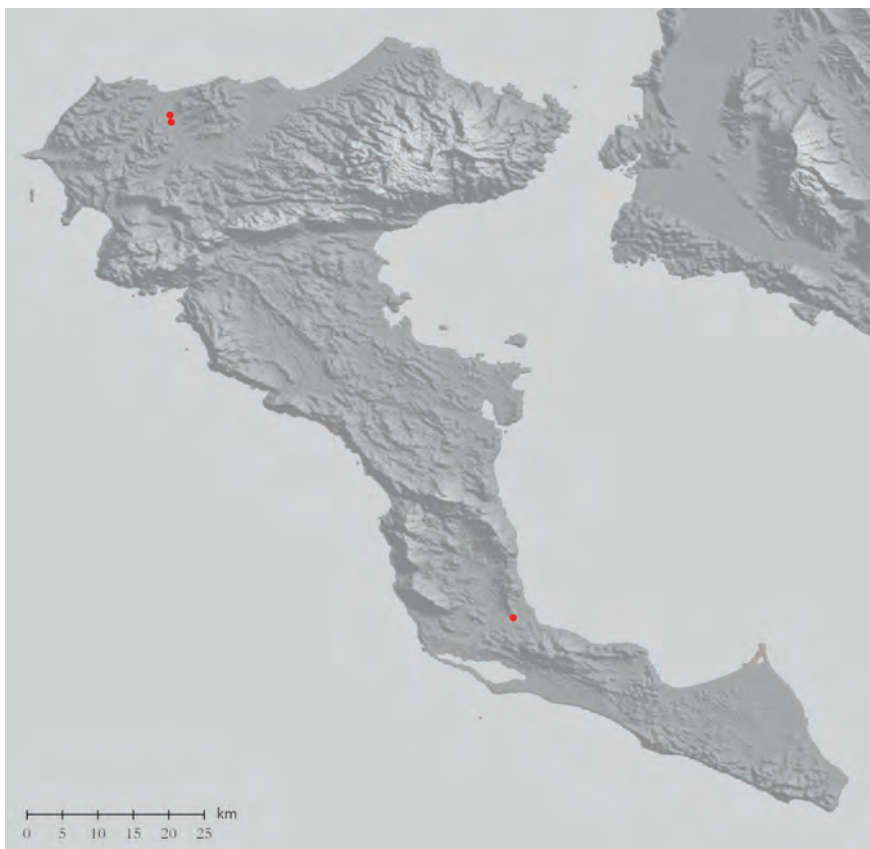


Figure 73. Localities for *Calopteryx splendens*.

Calopteryx virgo (LINNAEUS, 1758) – Beautiful Demoiselle



Figure 74. Mature male of *Calopteryx virgo*.

This is a rather common damselfly on Corfu that occurs in many shady habitats and that sometimes co-occurs with, or at least occurs close to, *C. splendens*. The males are metallic green with dark cobalt blue wings that are broad and almost paddle-shaped, especially the hindwings. The tip of the abdomen is reddish-brown on the ventral side. The females can be difficult to distinguish from those of *C. splendens*, but their wings are broader and darker and on Corfu andromorph females are the rule. The false pterostigma is more diffuse than in *C. splendens* and it is placed at a distance twice its length from the wing tip. The subspecies on Corfu is *C. v. festiva* (BRULLÉ, 1832).

Key characters: The broad, dark wings and reddish abdomen tip (Fig. 77, p. 84) in males and the dark-winged, often andromorph, females.

Behaviour: Male and female are separated during oviposition, but males guard females in their territories. This species lays endophytic eggs.

Flight season: May-August (III-X).

Habitat: *C. virgo* prefers shady, rather small habitats with cool, well oxygenated and slow moving water. The ideal water temperature in summer ranges from 13-18° C and the species is reported to be more susceptible to pollution than *C. splendens*.

Size: Total 45-49 mm, abdomen 31-42 mm, hindwing 24-36 mm.



Figure 75. Mature female of *Calopteryx virgo*.



Figure 76. *Calopteryx virgo* female defending her perch.



Figure 77. A *Calopteryx virgo* male displaying territorial behaviour (reddish underside of the abdomen tip inserted).



Figure 78. *Calopteryx virgo* pair forming a mating-wheel.



Figure 79. *Calopteryx virgo* males lack the false pterostigma on their wings.

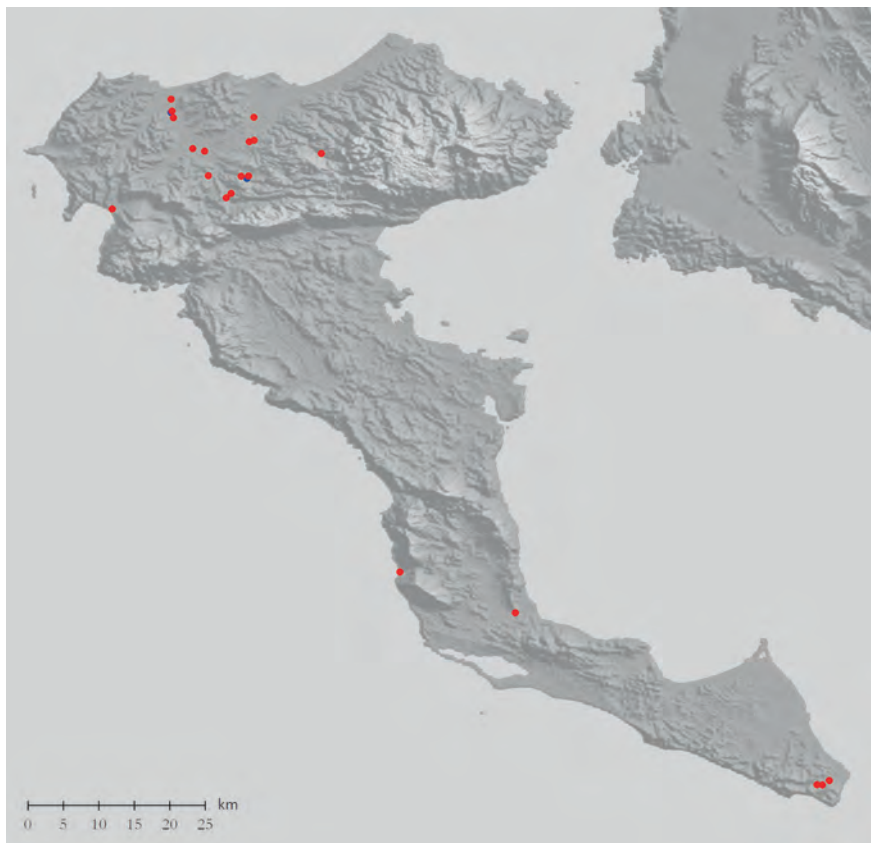


Figure 80. Localities for *Calopteryx virgo*.

Platycnemis pennipes (PALLAS, 1771) – Blue Featherleg



Figure 81. Mature male of *Platycnemis pennipes*.

This is a very common species on Corfu and it is found at many locations across the island. It is one of the easiest damselflies to recognize, and mature individuals can readily be determined by their enlarged, whitish tibiae, clearly visible even in flight. Mature males have a distinct black and blue appearance, while immature specimens are a powdery light blue, or even whitish, with black markings. Green specimens are sometimes encountered. Young females are light beige, gradually getting darker, becoming brownish yellow at sexual maturity and finally turning very dull and dark. Both sexes have “double” antehumeral stripes and characteristic broad heads.

Key characters: The feather-like tibiae and broad head.

Behaviour: *P. pennipes* usually flies low in the vegetation and teneral can often be found flying among brambles or other shrubby vegetation close to or at some distance away from water. They often aggregate for oviposition, which occurs in tandem and the female lays endophytic eggs. This species is dependent on floating vegetation to oviposit.

Flight season: May-September (III-X).

Habitat: The species prefers open, slow-flowing waters with floating vegetation. It can also be found in large, deeper lakes with prominent banks covered with rich vegetation.

Size: Total 35-37 mm, abdomen 27-31 mm, hindwing 19-23 mm.



Figure 82. Mature female of *Platycnemis pennipes*.



Figure 83. Old females of *Platycnemis pennipes* take on a dull, greenish hue.



Figure 84. Newly emerged *Platynemesis pennipes* female.



Figure 85. Mating pair of *Platynemesis pennipes*.



Figure 86. Mating-wheel of *Platynemesis pennipes*.



Figure 87. Dorsal view of *Platynemis pennipes* male.

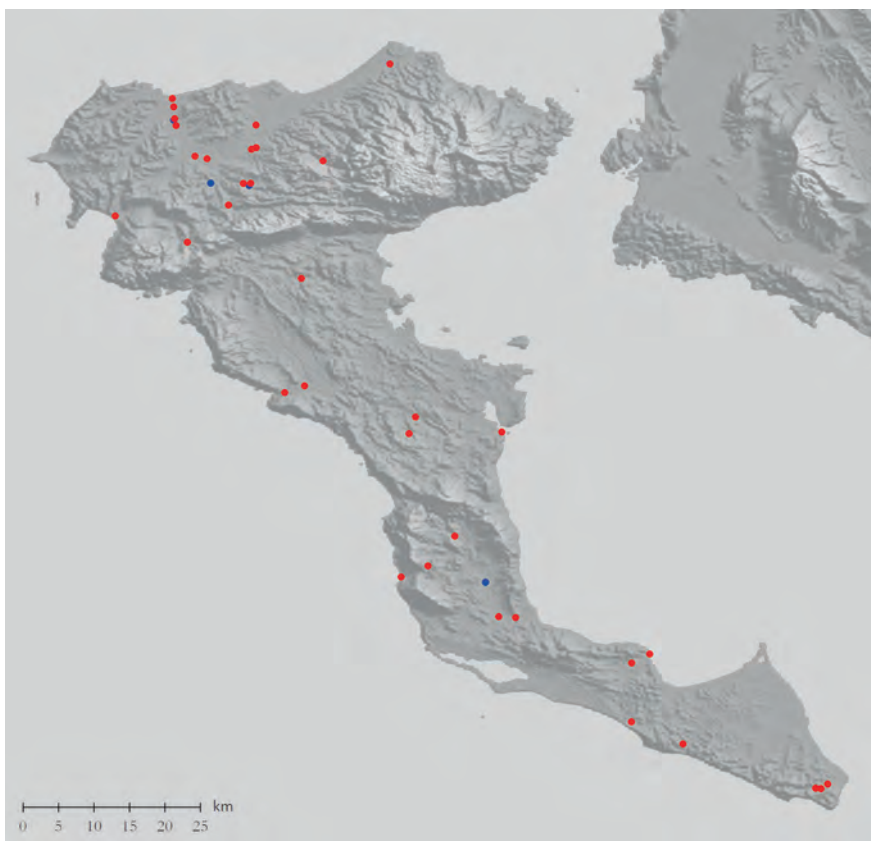


Figure 88. Localities for *Platynemis pennipes*.

Ceriagrion georgifreyi SCHMIDT, 1953 – Turkish Red Damsel



Figure 89. Male *Ceriagrion georgifreyi*.

C. Brochard

This species has its main distribution in Turkey and has only been recorded from three islands in Greece, Corfu (1971), Thasos (1997) and Zakynthos (1998). It replaces the very similar and closely related *C. tenellum* in this area, but the two species may co-occur on the Greek mainland. It is classified as Critically Endangered both in the European and the EU27 Red Lists and Vulnerable in the Mediterranean.

Key characters: This is a small damselfly with light red legs and a reddish pterostigma. The antehumeral stripe is reduced or absent and the side of the thorax is yellowish and the top dark or black. The males have all-red eyes and a red abdomen, while the eyes are bicoloured in red and green and the

abdomen black in the females. *C. georgifreyi* and *C. tenellum* can only be differentiated by using a hand lens. Males of the former have more slender lower appendages and a crown of black spines on the tip of S10. The females have two upright lobes on the front of the thorax behind the pronotum, which are lacking in *C. tenellum*.

Behaviour: *C. georgifreyi* is a weak flyer that flies low in the vegetation where it is protected from the wind.

Flight season: (V-VI).

Habitat: Seepages and small streams.

Size: Total 35-40 mm, abdomen 28-33 mm, hindwing 17-20 mm.

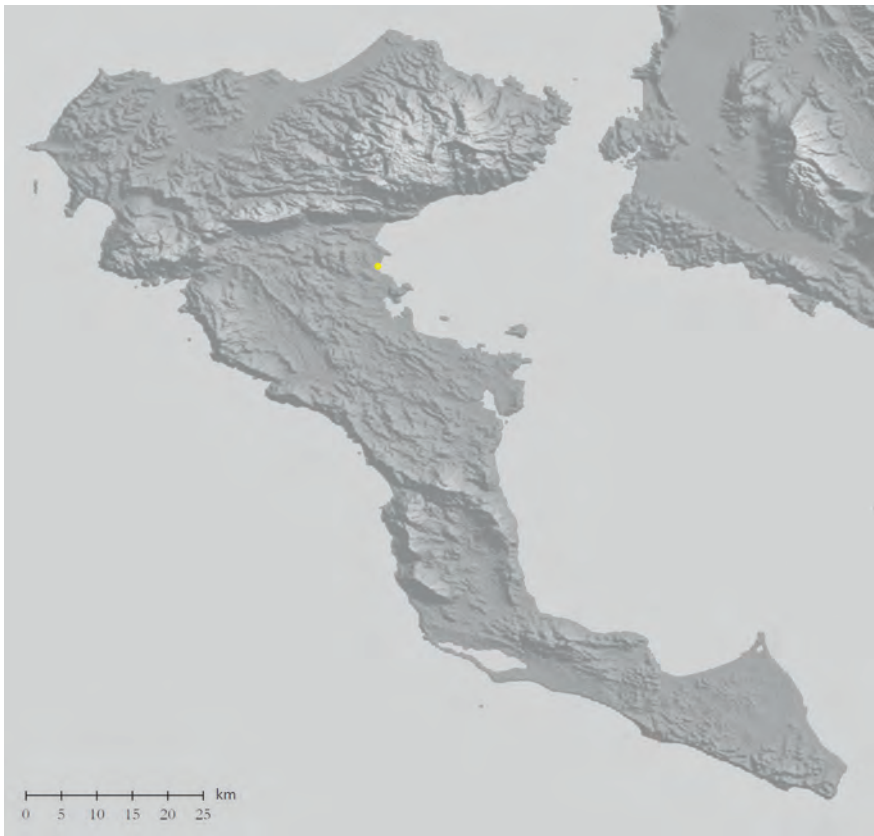


Figure 90. The only reported historic locality from Corfu for *Ceriagrion georgifreyi*.

Coenagrion puella (LINNAEUS, 1758) – Azure Bluet



Figure 91. *Coenagrion puella* male.

C. Brochard

Coenagrion puella and *C. pulchellum* are two species that both occur on Corfu and they can be difficult to separate. They may also coexist at the same locality and individuals therefore have to be carefully examined to ensure a correct identification. Males of *C. puella* are bright blue with thin, black spike-like markings on the sides of the abdomen, complete antehumeral stripes and a U-like mark on S2. Females are usually green but blue forms exist. Like *C. pulchellum*, females are best identified by the shape of the pronotum.

Key characters: The unbroken antehumeral stripes and the U-like mark on S2 in males and the shape of the pronotum in females.

Behaviour: Like most *Coenagrion* species it flies quite close to the ground among the vegetation a short distance from the water. Oviposition takes place in tandem and the female lays endophytic eggs



Figure 92. *Coenagrion puella* male.

F.-J. Schiel



Figure 93. *Coenagrion puella* male.

C. Brochard

Flight season: May (V-VII).

Habitat: *C. puella* flies in a variety of habitats that are rich in aquatic vegetation and have ample vegetation on their banks. The species prefers standing waters but also occurs in slow-flowing rivers and favours unshaded waters that are either mesotrophic or eutrophic.

Size: Total 33-35 mm, abdomen 22-31 mm, hindwing 15-24 mm.

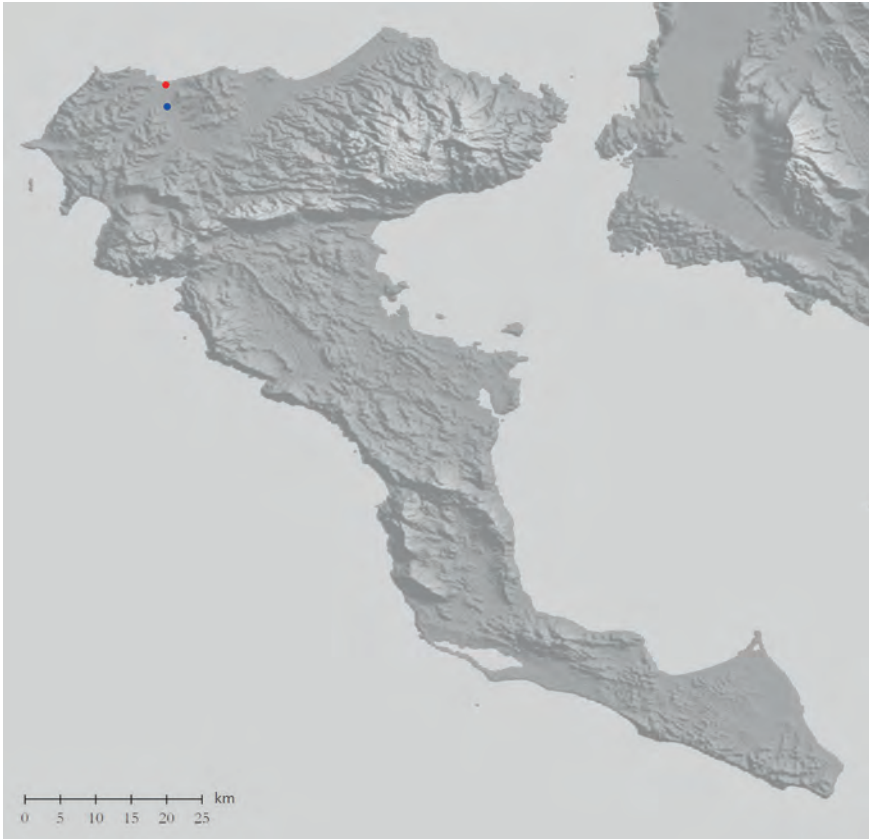


Figure 94. Localities for *Coenagrion puella*.

Coenagrion pulchellum (VANDER LINDEN, 1825) – Variable Bluet



Figure 95. Mature male of *Coenagrion pulchellum*.

Coenagrion pulchellum is quite common on Corfu and can be abundant in certain areas. It often occurs together with the very similar *C. puella*, with which it can be confused, but the males of *C. pulchellum* have dark blue markings and the antehumeral stripes are generally broken and resemble exclamation marks. However, an unbroken antehumeral stripe is not an uncommon feature among *C. pulchellum* males on Corfu. There is a typical Y-mark on the anterior part of the abdomen on S1-S2 and the pronotum (collar-like part behind the head) has a typical W-mark in both males and females. The females are either blue or green and can be more difficult to determine since they are more variable than females of similar species. Unlike the males, they have an unbroken, rather broad, antehumeral stripe and the only way to separate them from females of similar species is by the shape of the pronotum (Fig. 99, p. 98).

Key characters: The antehumeral stripes resembling exclamation marks and the Y-like mark on S1-S2 in males. The shape of the pronotum in both males and females (Fig. 99). Close examination of the females may be necessary as they are very similar to those of *C. puella*.

Behaviour: *C. pulchellum* flies low in the vegetation and is often found among grass and brambles a short distance from the water. Oviposition usually takes

place in tandem and the female lays endophytic eggs.

Flight season: April-August (IV-VII).

Habitat: It can occur in a wide range of habitats with standing or slow-flowing waters and lush vegetation on the banks and aquatic vegetation. The waters can range from oligotrophic to eutrophic. On Corfu, this species is common in Ropa Valley, especially in the southern and southeastern parts of Ropa River and in its small tributaries and ditches. In this area, the banks have ample vegetation and the water is partly shaded by Small Leaved Elm, White Poplar and *Salix* spp. In areas where the river has recently been cleared and the banks stripped of vegetation the species has disappeared, but can still be found along other stretches of the river and hopefully it will recolonize the stripped areas when the vegetation has grown back.

Size: Total 34-38 mm, abdomen 23-32 mm, hindwing 16-23 mm.



Figure 96. Mature female of *Coenagrion pulchellum*.



Figure 97. Blue female of *Coenagrion pulchellum*.



Figure 98. The antehumeral stripe in *Coenagrion pulchellum* male is sometimes complete.



Figure 99. Dorsal view of *Coenagrion pulchellum* female, showing the W-like shape of the back of the pronotum.

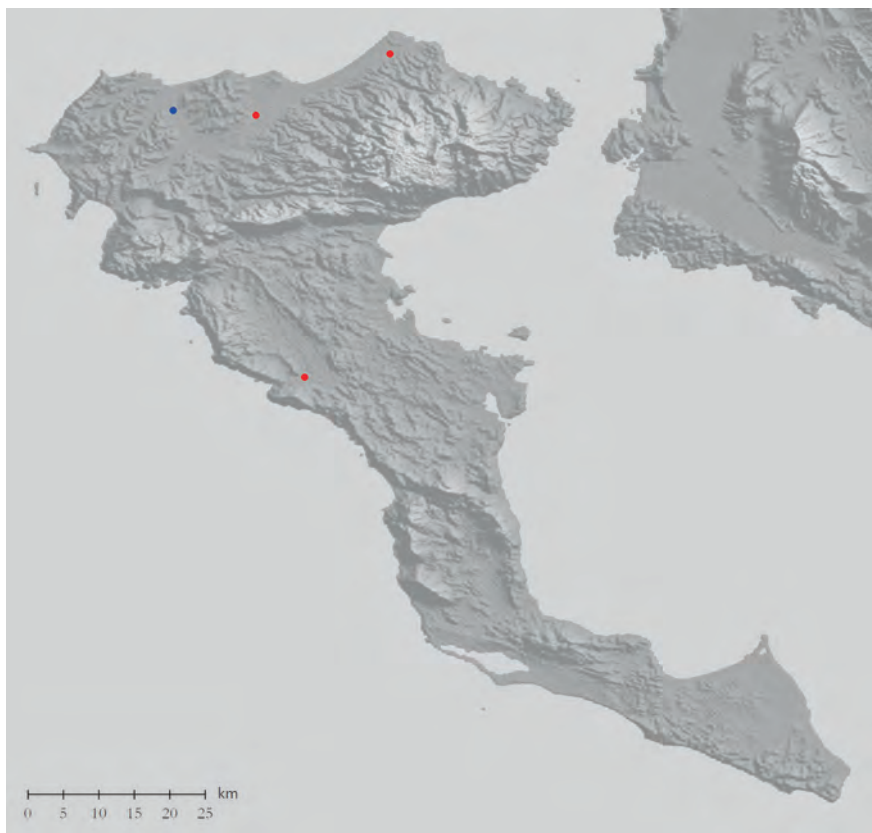


Figure 100. Localities for *Coenagrion pulchellum*.

Coenagrion scitulum (RAMBUR, 1842) – Dainty Bluet



Figure 101. Mature female of *Coenagrion scitulum*.

This is yet another delicate blue *Coenagrion* species and also one of the smallest. It usually flies in habitats with calm or standing waters. The long, pale pterostigma, twice as long as wide, separates it from other similar species in our area. The males have a black mark on S2 that looks like the head of a cat or a pitchfork. S3-S5 are blue with black markings, while S6-S7 are entirely black and S8-S9 have a blue “tail-light”, similar to that in *Ischnura elegans*. The males of *C. scitulum* resemble those of *C. coerulescens*, but the latter species does not occur in Greece. The females can be green or blue and have “torpedo”-shaped markings on their abdomen.

Key characters: The “cat-like” mark on S2 in males and the long and pale pterostigma in both sexes.

Behaviour: *C. scitulum* undertakes quick flights over the water. Oviposition occurs in tandem on floating vegetation and the female lays endophytic eggs.

Flight season: May (IV-VII).

Habitat: The species occurs in standing, or sometimes slow-flowing, shallow waters rich in aquatic vegetation. It prefers sun-exposed sites. We have only found this species at a few localities, but more thorough investigations of possible habitats have to be conducted to be able to draw any conclusions.

Size: Total 30-33 mm, abdomen 20-27 mm, hindwing 14-20 mm.



Figure 102. Male *Coenagrion scitulum*.



Figure 103. *Coenagrion scitulum* in tandem.

H. Hunger

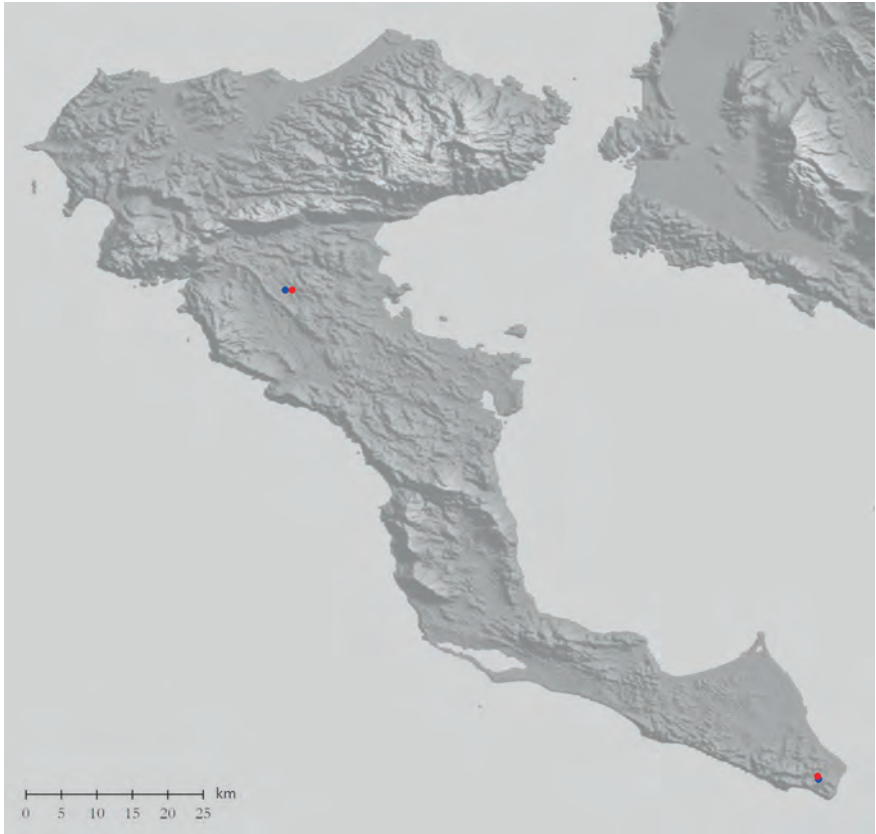


Figure 104. Localities for *Coenagrion scitulum*.

Enallagma cyathigerum (CHARPENTIER, 1840) – Common Bluet



Figure 105. Female *Enallagma cyathigerum*.

C. Bergendorff

This is a widespread species in Europe, but it is absent from parts of the Balkan. In mainland Greece it is confined to the northern parts and to one locality in the Peloponnese. It has not been reported from Corfu since 1939 and then from only one locality in Ropa Valley where it is no longer found and it may no longer be present on Corfu.

Key characters: *E. cyathigerum* looks quite similar to many of the other blue damselflies, but the side of the thorax is more or less uniformly coloured, only interrupted by a very thin line. The antehumeral stripes are broad and the postocular spots are large in both sexes. There is a “mushroom-like” black mark on S2 and S8-S9 are completely blue in males. Females have black torpedo-like marks on S3-S7.

Behaviour: The males are often seen patrolling over open water or resting

on floating vegetation.

Flight season: (V-VIII).

Habitat: This species can be found in most types of waters but may be absent from very small water assemblages.

Size: Total 29-36 mm, abdomen 22-28 mm, hindwing 15-21 mm.



Figure 106. Female *Enallagma cyathigerum* (note the vulvar spine).

R. Jödicke



Figure 107. Male *Enallagma cyathigerum*.

R. Jödicke



Figure 108. Male *Enallagma cyathigerum*.

C. Bergendorff

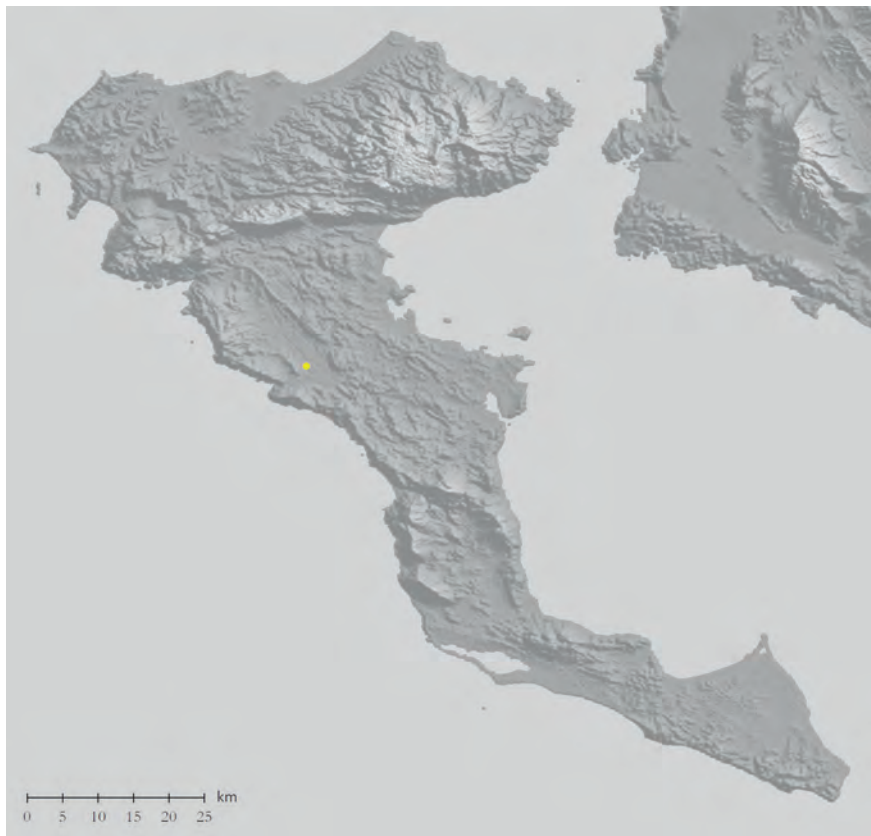


Figure 109. The only reported historic locality from Corfu for *Enallagma cyathigerum*.

Erythromma lindenii (SÉLYS, 1840) – Blue-eye Damselfly



Figure 110. Mature male of *Erythromma lindenii*.

This species, formerly placed in the genus *Cercion*, is a slender dragonfly with males that have clear blue eyes, broad blue antehumeral stripes and a short “tail-light” that extends all the way to the tip of the abdomen. The abdomen is mainly blue with a characteristic goblet-shaped black mark on S1-S2 and spear-like black marks on S3-S6. Females have green eyes, green antehumeral stripes, blue thorax sides and the sides of the abdomen can be either brownish or blue-green. The dorsal side of the abdomen is bronze-black and the sides blue. The postocular spots on the back of the head are narrow and often connected to form a thin line, and the pterostigma is long and pale in both males and females.

Key characters: The blue eyes and broad antehumeral stripes in males and the narrow postocular spots in both sexes.

Behaviour: This species flies very close to the water surface, resting on floating vegetation and on reeds and other vegetation protruding from the water close to the shore. Oviposition takes place in tandem and the female lays endophytic eggs.

Flight season: April-July (IV-X).

Habitat: Found in sunny, well-oxygenated, shallow waters such as lakes, gra-

vel pits and wide slow-flowing rivers rich in aquatic vegetation. On Corfu, it has been found at the mouth of a larger river, at a shallow eutrophic lake and in a large reservoir. It tends to disappear when waters are cleared from aquatic and floating vegetation.

Size: Total 30-36 mm, abdomen 24-28 mm, hindwing 19-21 mm.



Figure 111. Mature female of *Erythromma lindenii*, showing the blue abdomen sides.



Figure 112. Immature male of *Erythromma lindenii*.



Figure 113. Mating pair of *Erythromma lindenii*.

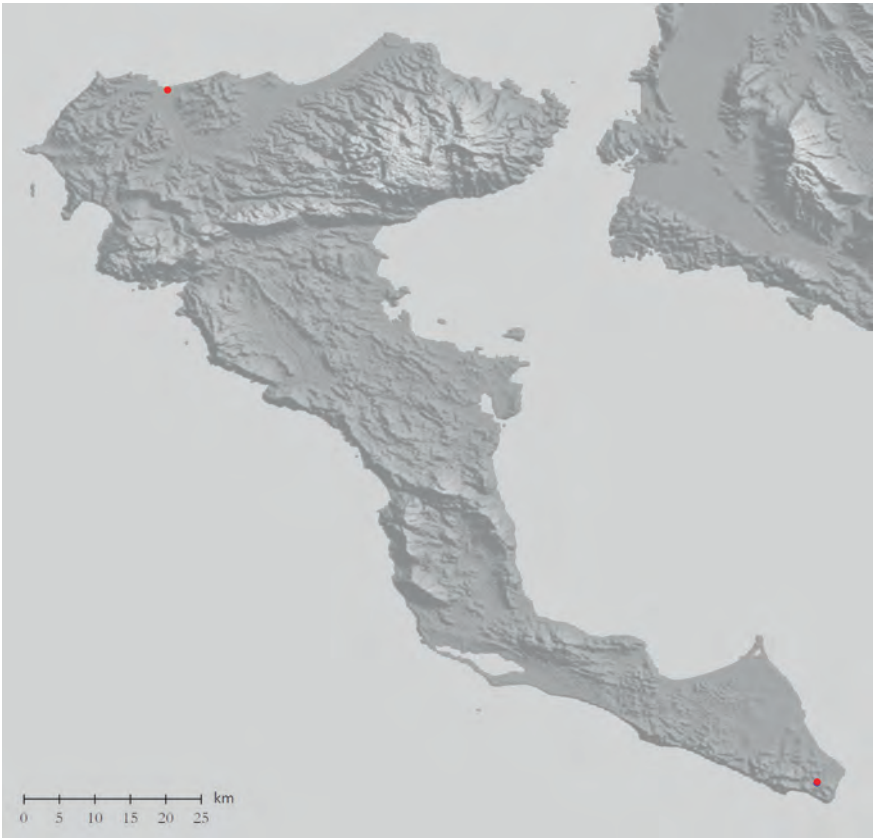


Figure 114. Localities for *Erythromma lindenii*.

Erythromma viridulum (CHARPENTIER, 1840) – Small Redeye



Figure 115. Mature male of *Erythromma viridulum*.

This is a very dainty little dragonfly with males that have bright red eyes and that cannot really be confused with males of any other species on Corfu (the similar looking but larger *E. najas* does not occur in Greece). The side of the thorax is blue, the antehumeral stripe is thin, sometimes broken and occasionally very faint. There is an x-like mark on S10, blue colouration on the sides of S2-S3 and S8 and the upper appendages curve inwards. Females have yellow eyes that sometimes are tinted with red, but they are never bright red as in the males. The antehumeral stripes are broad, unbroken and typically yellow but can also be blue or green. The sides of the thorax, as well as the base and tip of the abdomen, are normally blue, which distinguishes *E. viridulum* females from those of *E. lindenii*, which usually are greenish or brownish in these parts.

Key characters: The red eyes and the thin or broken antehumeral stripes in males and the lack of postocular spots in both sexes.

Behaviour: Both males and females fly close to the water surface and males perch on floating vegetation and vegetation growing in the water or near the water-edge. The female lays endophytic eggs and the larva has been reported to be tolerant of slightly brackish conditions.

Flight season: June-September (V-X).

Habitat: *E. viridulum* prefers eutrophic, unshaded shallow standing or very slow-flowing waters with abundant aquatic vegetation, but it can be also be found in brackish waters. We have found it in the broader part of Ropa River, at a small lake surrounded by a large reed-belt and in a reservoir.

Size: Total 26-32 mm, abdomen 22-25 mm, hindwing 16-20 mm.



Figure 116. Mature female of *Erythromma viridulum*.



Figure 117. The bright red eyes are characteristic of *Erythromma viridulum* males.



Figure 118. Side-view of an *Erythromma viridulum* male.



Figure 119. *Erythromma viridulum* males have a thin, usually unbroken antehumeral stripe and a bronze tinted black abdomen.

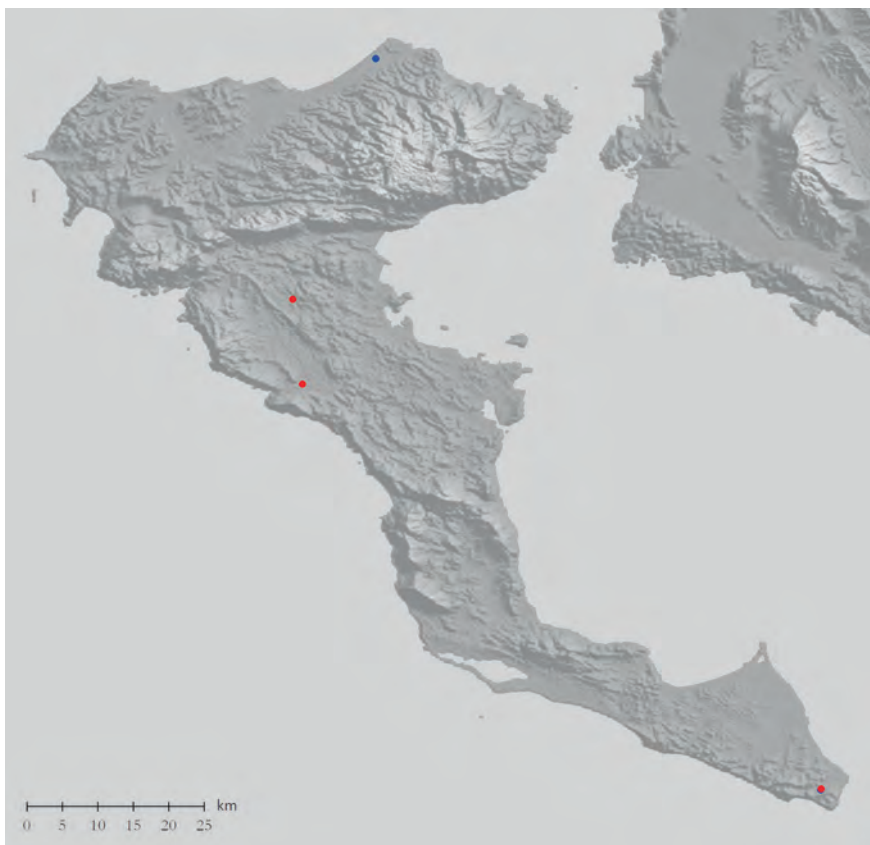


Figure 120. Localities for *Erythromma viridulum*

Ischnura elegans (VANDER LINDEN, 1820) – Common Bluetail



Figure 121. Mature male of *Ischnura elegans*.

This is a common species on Corfu, found in many eutrophic habitats all over the island. The mature male has a black, bronze-tinted abdomen that is yellowish underneath and a blue tail-light restricted to S8. The sides of the thorax are blue and the dorsal side is black with two narrow blue antehumeral stripes. There is a diagnostic black projection on the pronotum behind the head only visible at close inspection, but it is sometimes lacking in females (sometimes also in males from certain areas). Immature males are green, and females occur in five different colour forms and immature colour stages. The *A-type* or *violacea* form has a violet thorax that turns blue at maturity, like in the males, and they are therefore often referred to as andromorphs. The *B-type* or *infuscans* form is also violet when immature, but develops green colouration on the thorax and on the tail-light. The *C-type* or *rufescens* females have reddish thorax and blue tail-light and either turn green, like *infuscans*, or become reddish-green when reaching maturity. The latter form is called either mature *C-type* or *rufescens-obsolata*. Mature green females are sometimes referred to as *typica*.

Key characters: The black bronze-tinted abdomen with vivid blue tail-light on S8 in mature males and the bicoloured pterostigma on the forewings.

Behaviour: Males are territorial and mature males and females keep close to

the water. They fly low among the vegetation and females oviposit alone and lay endophytic eggs.

Flight season: April-October (III-XI).

Habitat: *I. elegans* prefers standing waters but also occurs in slow running streams. It is tolerant to some salinity, but not to acidic conditions, and seems to tolerate pollution better than most other species. We have found this species in a variety of habitats and it is often seen flying in the vegetation close to some of the lagoons on Corfu. It is also found in the dune-pools at Korission.

Size: Total 30-34 mm, abdomen 22-29 mm, hindwing 14-21 mm.



Figure 122. Mature andromorph female of *Ischnura elegans*.



Figure 123. Dorsal view of immature male *Ischnura elegans*.



Figure 124. Immature *C*- or *rufescens*-type female of *Ischnura elegans*.



Figure 125. Female *Ischnura elegans* of *A*- or *violacea*-type.



Figure 126. *A*- or *violacea*-type female of *Ischnura elegans*.



Figure 127. Newly emerged *Ischnura elegans* female.



Figure 128. *Ischnura elegans* male lacking antehumeral stripes.



Figure 129. *Ischnura elegans* pair forming a mating wheel (note the green colour of the mature *typica* female).



Figure 130. Mature *C-* or *rufescens-obsolata*-type female of *Ischnura elegans*.

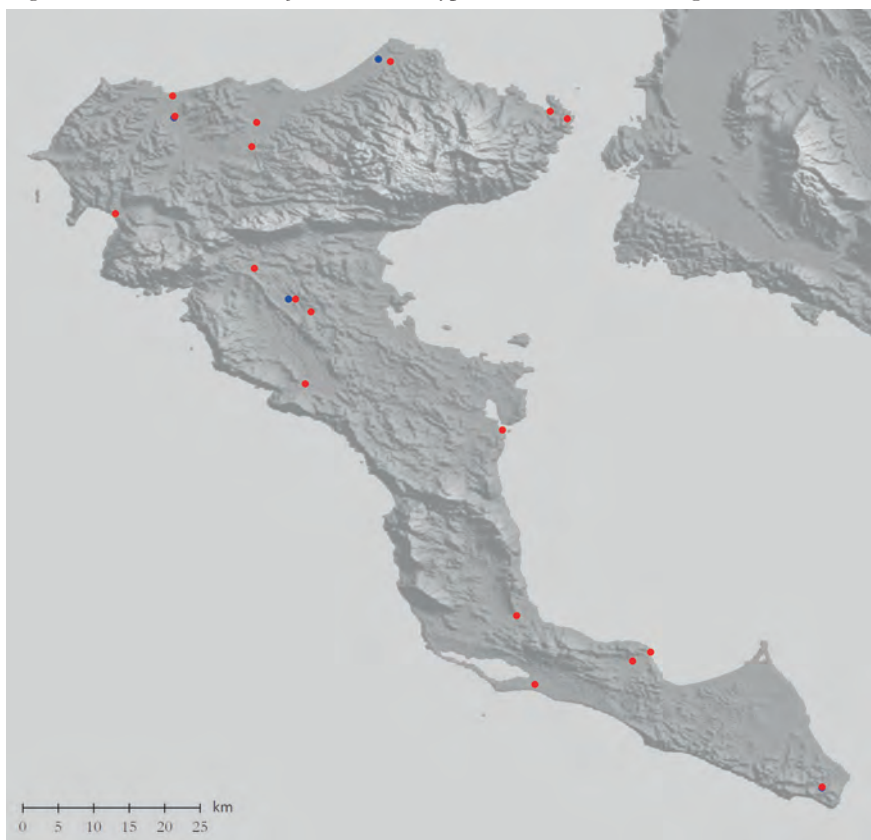


Figure 131. Localities for *Ischnura elegans*.

Pyrrhosoma elisabethae SCHMIDT, 1948 – Greek Red Damsel



Figure 132. Mature male of *Pyrrhosoma elisabethae*.

Pyrrhosoma elisabethae was previously considered to be a subspecies of *P. nymphula*, a widespread species in Europe. The two species are very similar and can only be separated by structural differences in the male appendages and by folds in the pronotum in females. However, *P. nymphula* has never been reported from Corfu so the risk of misidentification here should be slim. *P. elisabethae* is only known from southern Albania and Greece and has, so far, been found in rather few places. It is listed as a Critically Endangered species in the European and EU27 Red Lists and as Endangered in the Mediterranean one. Between 1954 and 1998 *P. elisabethae* was reported from six sites on Corfu and the total number of individuals found was a mere 13 (10♂ and 3♀). Today only one of the original sites has a viable population, but the species has been found at five additional locations.

Mature males have red eyes, a red abdomen with only S7-S9 being black, red antehumeral stripes and a black thorax with yellow sides. The antehumeral stripes in immature males may be yellow instead of red. Females are more variable and the abdomen can be entirely black or black and red. The degree of red may vary between individuals and three main colour-forms are generally recognised, *melanotum*, *typica* and *fulvipes*, where the latter seems to be rare. Red females have a thin longitudinal line on the abdomen and each segment is bordered by a yellow ring. The antehumeral stripes can be yellow or red.

Key characters: The red eyes, yellow thorax sides and red abdomen in males and the yellow antehumeral stripes and black abdomen in females. The thin, longitudinal line on the back of the abdomen in red females.

Behaviour: *P. elisabethae* flies low in the vegetation and can often be found at some distance from the water. Oviposition occurs in tandem and the eggs are deposited in the vegetation just above or slightly beneath the water surface. We have only observed oviposition in a shallow ditch with clear, well oxygenated water and ample vegetation on its banks.

Flight season: March-June (IV-VI).

Habitat: Very little is known about the habitat requirements of this species, but it has been suggested that it is limited to larger streams or spring fed ponds and lakes and that these habitats have disappeared from Corfu. However, both our own observations and observations made by W. Lopau on Corfu suggest that it is mainly confined to ditches or small slow moving waters that may dry out in summer. Our observations suggest that shaded, but not too dark, habitats are preferred and that rich vegetation of grass and herbaceous plants, both on the banks and in areas beyond, is essential for this species. Most of the areas inhabited by this dragonfly are shaded by an open canopy of trees.

Size: Total 36-38 mm, abdomen 28-30 mm, hindwing 20-24 mm.



Figure 133. Mating in *Pyrrhosoma elisabethae*.



Figure 134. Male of *Pyrrhosoma elisabethae*.



Figure 135. *Melanotum* form of female *Pyrrhosoma elisabethae*.



Figure 136. Side view of *Pyrrhosoma elisabethae* female.



Figure 137. Mature male of *Pyrrhosoma elisabethae*.

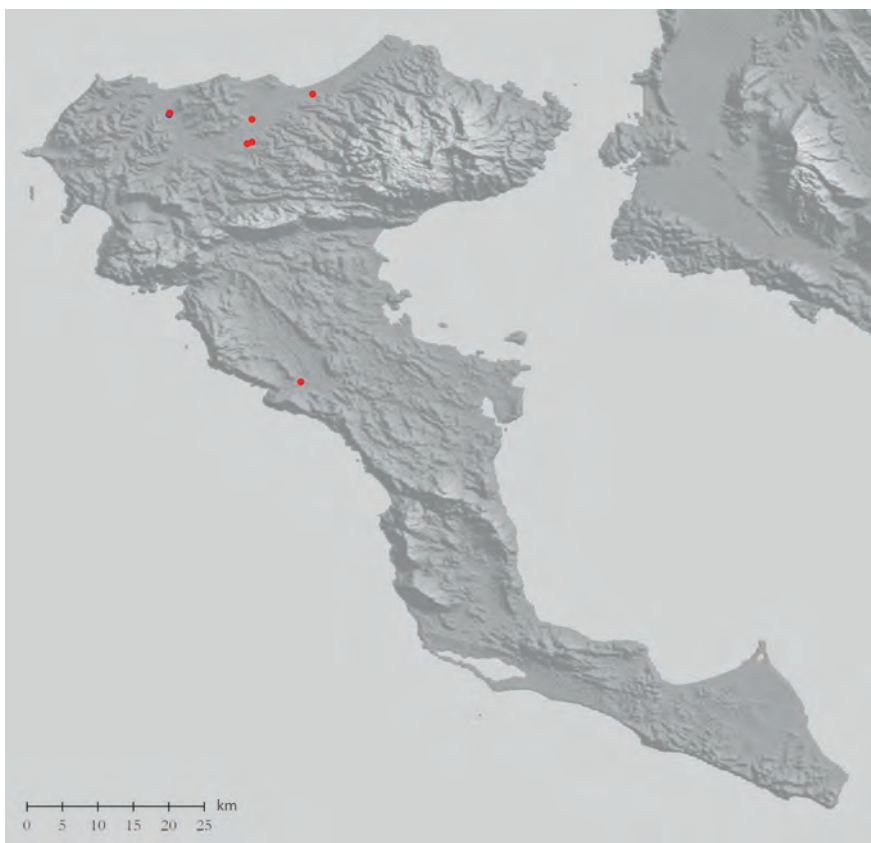


Figure 138. Localities for *Pyrrhosoma elisabethae*.

Aeshna affinis VANDER LINDEN, 1820 – Blue-eyed Hawker



Figure 139. Mature male of *Aeshna affinis*.

This is one of two comparatively small, similar and closely related *Aeshna* species found on Corfu. The male, very conspicuous in flight, has bright blue eyes and green thorax sides that become strongly infused with blue in mature individuals. The abdomen is black with clear blue markings, but S2 is blue with a black “African mask” mark. The antehumeral stripes are green and short. The females and immature males are brownish with green or yellow markings and the mask-like mark on S2 is brown and green or yellow. The appendages in females are comparatively short, i.e. shorter than S9 and S10 combined. The females sometimes develop male colouration, a common phenomenon in *Aeshna* species.

Key characters: The “African mask” mark on S2, blue and black in mature males, but brownish and yellow in females and immature males. The bright blue eyes and large blue abdominal spots in mature males. A pterostigma that is relatively long, at least longer than in *A. mixta*. The female appendages are short and barely extending beyond the abdomen tip. This species was reported from Corfu for the first time in 1978.

Behaviour: The males patrol back and forth about a meter and a half above the water surface over a small area and often stop to perch in the vegetation. *A. affinis* is the only *Aeshna* species that lays eggs in tandem, but females

sometimes also lay eggs alone and the eggs are endophytic. This is a migrant species and a strong flyer that sometimes appears in large numbers. It hunts away from water in many different habitats.

Flight season: April-July (V-IX).

Habitat: *A. affinis* prefers standing waters that dry out slowly during the summer months and a rich riparian vegetation of low rushes, bulrushes or reeds.

Size: Total 57-66 mm, abdomen 39-49 mm, hindwing 37-42 mm.



Figure 140. Mature female of *Aeshna affinis*.



Figure 141. Dorsal view of a mature *Aeshna affinis* male.



Figure 142. *Aeshna affinis* females have plain, greenish thorax sides and short antumeral stripes.

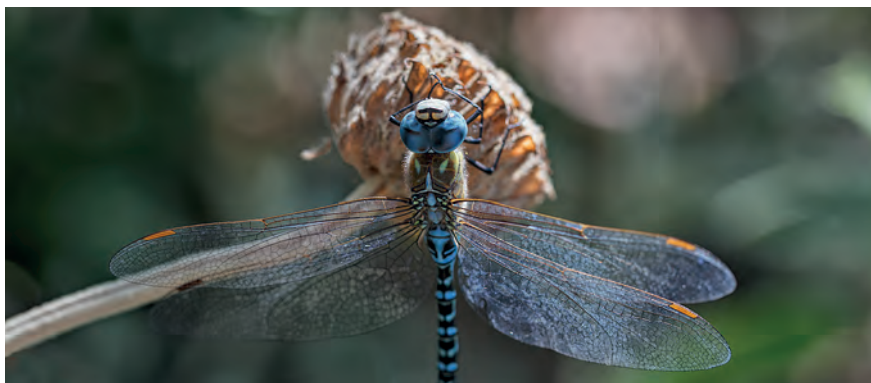


Figure 143. Mature *Aeshna affinis* male, showing the blue and black “African mask” marking on S2.

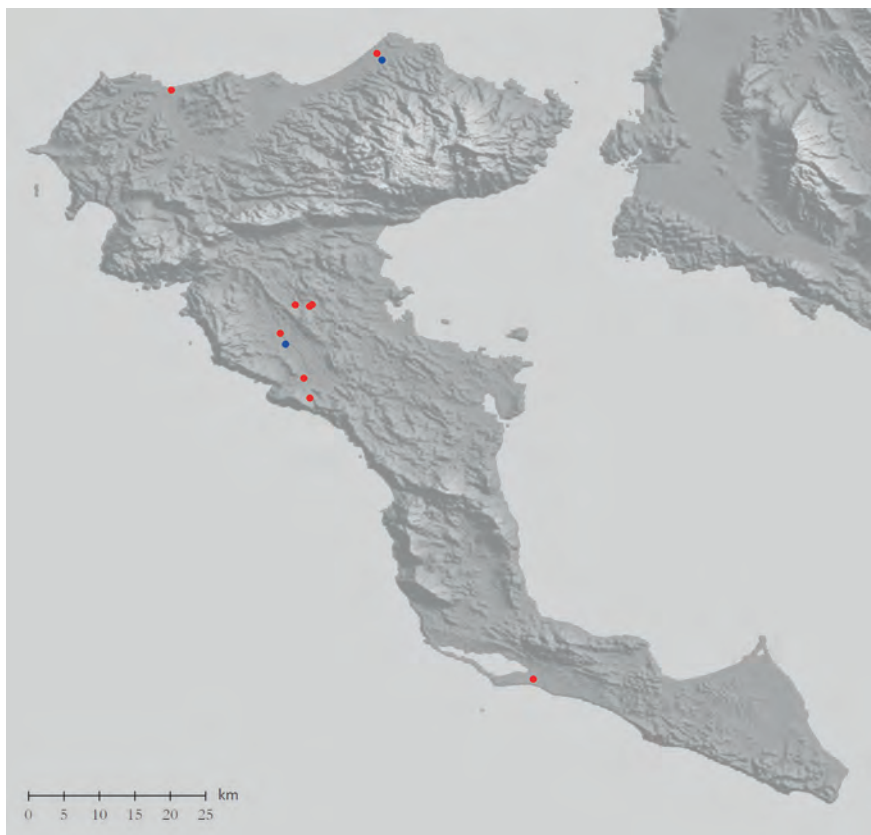


Figure 144. Localities for *Aeshna affinis*.

Aeshna isoceles (MÜLLER, 1767) – Green-eyed Hawker



Figure 145. Mature male of *Aeshna isoceles*.

This is an all-brown species with few markings and bright green eyes. There is a dark yellow triangle on the upper side of S2 and two yellow markings on the side of the thorax. The males have a narrow, amber-coloured patch at the base of the hindwing. The wings are otherwise clear and untinted. The sexes are very similar looking.

Key characters: The only uniformly brown *Aeshna* species found on Corfu. *Aeshna grandis* is the other brown coloured species in Europe, but this species does not occur in Southern Europe. The clear wings, yellow triangle on S2 and bright green eyes are diagnostic characters for *A. isoceles*.

Behaviour: The males often stop to perch during their patrol flights and both sexes keep close to water. Females oviposit on their own and lay endophytic eggs.

Flight season: April-September (IV-VIII).

Habitat: *A. isoceles* inhabits several types of standing or slow flowing waters with rich vegetation. The species is often strongly associated with the aquatic plant called Water Soldier (*Stratiotes aloides*).

Size: Total 62-66 mm, abdomen 47-54 mm, hindwing 39-45 mm.

Synonym: *Anaciaeschna isoceles*.



Figure 146. Mature female of *Aeshna isoceles*.



Figure 147. Newly emerged *Aeshna isoceles* male.



Figure 148. Dorsal view of *Aeshna isocetes* male.



Figure 149. Side view of female *Aeshna isocetes*.



Figure 150. The amber-coloured patch on the hindwing of *Aeshna isoceles* males distinguishes it from the otherwise very similar females.

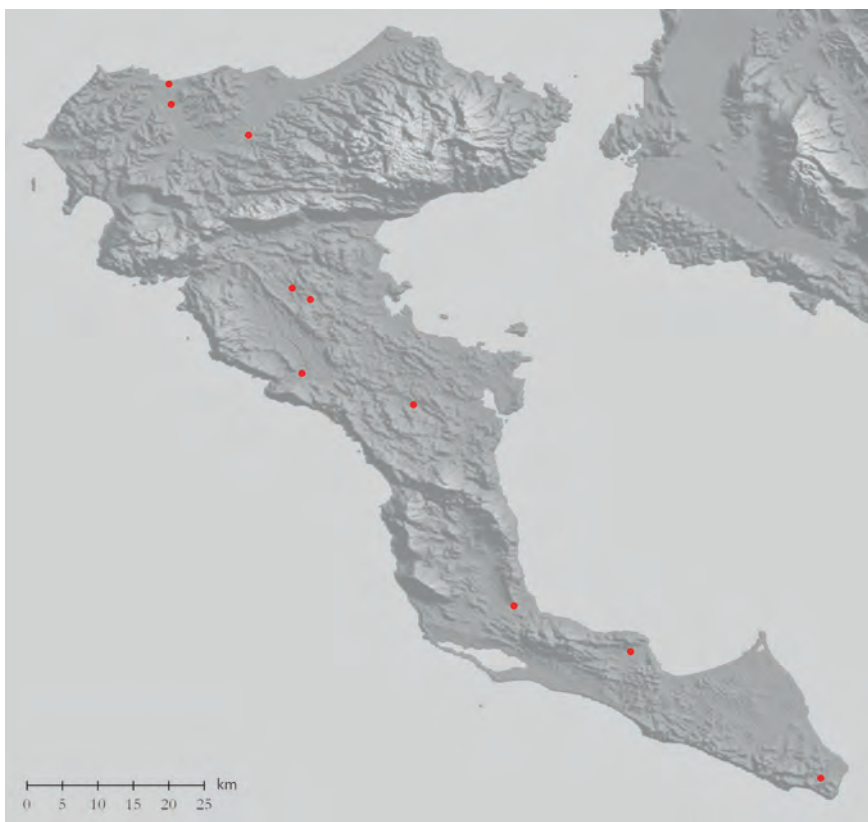


Figure 151. Localities for *Aeshna isoceles*.

Aeshna mixta LATREILLE, 1805 – Migrant Hawker



Figure 152. Mature male of *Aeshna mixta*.

This, like *A. affinis*, is a small dragonfly and the males have similar colouration, but *A. mixta* appears much duller. The blue eyes in mature males are also less bright than in *A. affinis*, and the lower part of the eye is often yellowish or brownish. The overall appearance of the mature male is more brownish than black, the blue spots on the abdomen are rather small and the thorax sides are yellow and infused with blue. The antehumeral stripes are short and yellow in both sexes and both have a typical “nail like” yellow mark on S2. The female appendages are long and extend well beyond the abdomen tip.

Key characters: The yellow “nail-like” marking on S2 and the relatively dull colouration. The males have yellow markings on the side of S1 and S2.

Behaviour: The males patrol low at breeding sites, but fly much higher when hunting and can be found hawking close to the treetops in the evenings. Like *A. affinis* it is a migrant species. Females lay eggs alone and the eggs are endophytic.

Flight season: June–November (V–XII).

Habitat: *A. mixta* breeds in several different types of standing or slow flowing waters surrounded by some riparian vegetation such as reed. It is quite tolerant to brackish water but does not like acidic water-bodies. A rather com-

mon species in well vegetated waters, especially in the reed-belt around the ponds and small lakes in central Corfu.

Size: Total 56-64 mm, abdomen 43-54 mm, hindwing 37-42 mm.



Figure 153. Immature males of *Aeshna mixta* have light blue “double spots” on the abdomen and a yellow nail-like mark on S2.



Figure 154. Dorsal view of *Aeshna mixta* female.



Figure 155. Side view of *Aeshna mixta* female.



Figure 156. Immature male of *Aeshna mixta* showing the short antehumeral stripes and spikelike mark on S2.

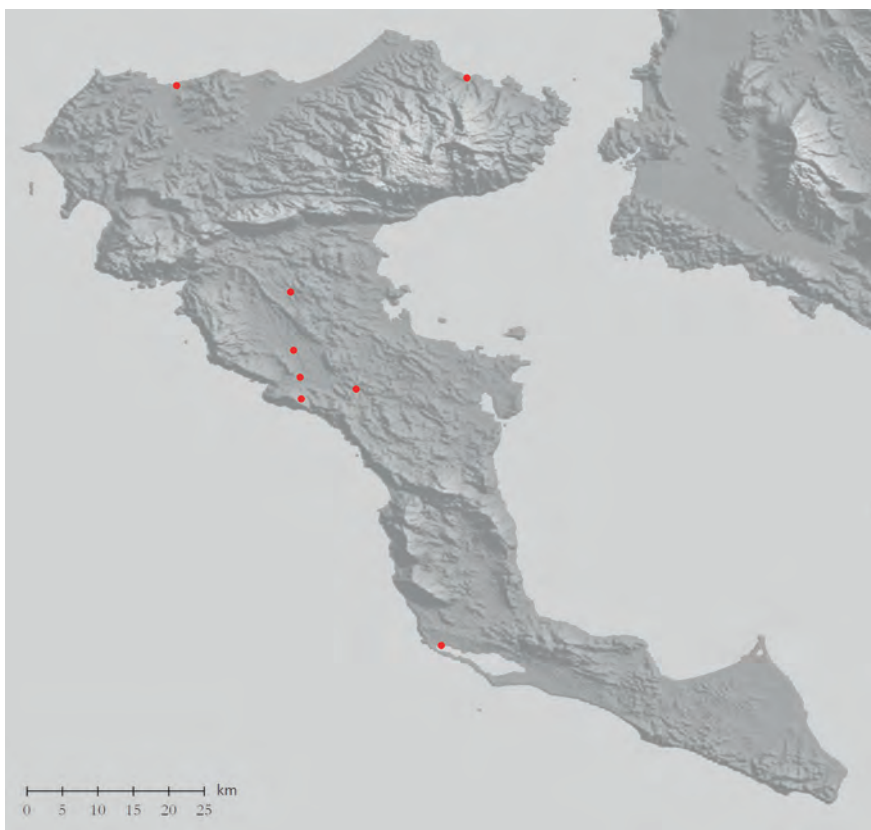


Figure 157. Localities for *Aeshna mixta*.

Anax ephippiger (BURMEISTER, 1839) – Vagrant Emperor



Figure 158. Mature female of *Anax ephippiger*.

A. ephippiger is a strongly, or even obligate, migratory species that often leaves its breeding habitat at its teneral stage, right after the emergence from the larva. Large swarms of migrating dragonflies are frequently entering the Mediterranean and the populations here depend on influx of individuals from Africa and Asia, but the number of individuals arriving varies considerably between years. This is the smallest of the three *Anax* species found on Corfu and it is sometimes placed in the genus *Hemianax*. Both sexes have a sandy ground colour and males have a bright blue saddle-mark on the upper side of S2 and sometimes part of S3. This mark may also be present in females and immature males but is then often less distinct. The basal ring on S1 is brown in males and they have two black bars on the frons. The head is broad and globular in shape and the abdomen shorter and slenderer than in other *Anax* species. The eyes are brown at the top, but the lower part is greenish yellow and viewed from above the eyes form an almost perfect semicircle in both sexes.

Key characters: The relatively small size, the blue saddle-mark that is present only on the upper side of S2, the brown ring on S1, and the double bars on the frons in mature males distinguish this species from the larger *A. parthenope*. The brown eyes in both sexes of *A. ephippiger* also separate it from the latter species, which has green eyes.

Behaviour: This is a diurnal species, but it is often very active at dusk. It usually oviposits in tandem, but male sometimes let go of the female after a while and she then continues the process on her own.

Flight season: December (III-XII).

Habitat: Reproduction takes place in seasonal waters that often dry out completely in summer. The species has been reported from many different habitats, except from forests. At present our only observation of this species is from the Korission lagoon in December.

Size: Total 61-70 mm, abdomen 43-56 mm, hindwing 43-48 mm.

Synonym: *Hemianax ephippiger*.



Figure 159. *Anax ephippiger* female showing the two black bars on the frons.



Figure 160. Females of *Anax ephippiger* often lack the blue saddle mark at the base of the abdomen.

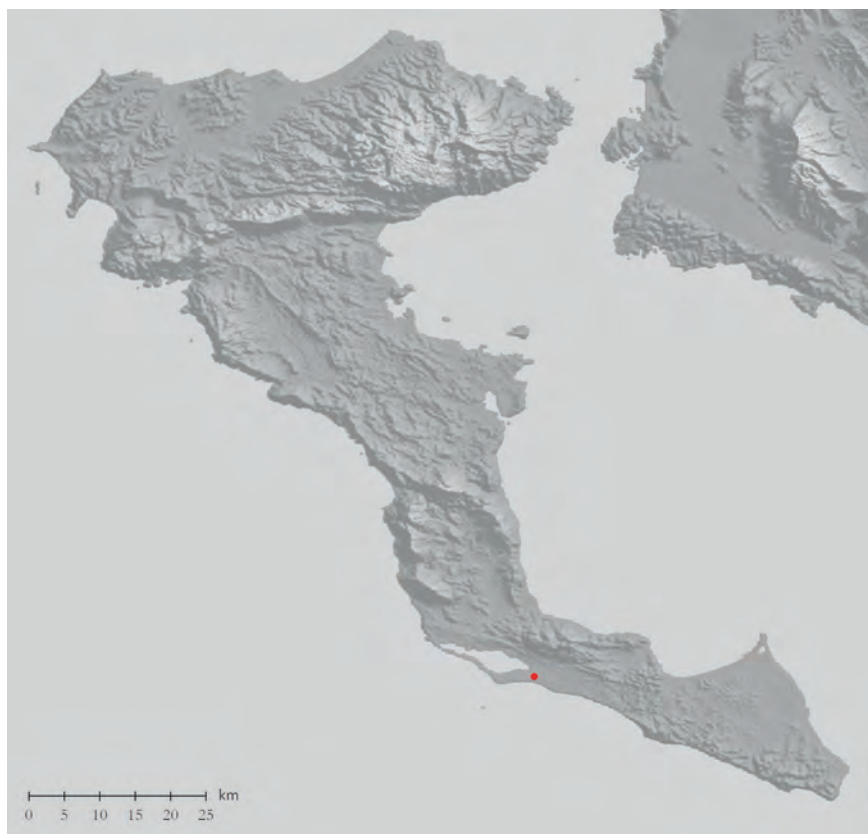


Figure 161. Locality for *Anax ephippiger*.

Anax imperator LEACH, 1815 – Blue Emperor



Figure 162. Mature male of *Anax imperator*.

This is a common species, originally from Africa, that has spread through Europe and quite recently has colonised the northern parts. Its expansion northwards during the last decade has been significant and it is now established in most parts of Europe. *A. imperator* is a large, colourful and spectacular species. The thorax is green and there is a black pentagon-like mark at the back of the frons in both sexes. The abdomen is blue with a black dorsal line in mature males, while it is green in both females and immature males. Very fresh individuals can have a thin yellow ring on S2, but this feature disappears with age. The lower appendage is square (not pointed) in males and when mature they have a blue area on the thorax in front of the forewings. The colour of the eyes can be either green or blue.

Key characters: The mainly green thorax and green S1 in both sexes and the blue abdomen with black dorsal markings and square lower appendages in males. The black pentagon mark on the frons in both sexes.

Behaviour: The males have a very typical patrolling behaviour and fly with the abdomen held in a slightly downward position. Females oviposit on their own on floating vegetation or deadwood away from the shore and the eggs are endophytic.

Flight season: May–September (IV–XI).

Habitat: *A. imperator* prefers large, standing waters with abundant vegetation but also inhabits many, both natural and artificial, larger water-bodies. The species is quite tolerant to brackish water. On Corfu it is mainly inhabiting smaller rivers in areas where the water is deeper and the riverbanks well vegetated but where the water is open enough for them to be able to patrol freely back and forth.

Size: Total 62-75 mm, abdomen 46-53 mm, hindwing 44-51mm.



Figure 163. Ovipositioning female of *Anax imperator*.



Figure 164. *Anax imperator* male, showing the plain green thorax sides.



Figure 165. Mature female of *Anax imperator*.



Figure 166. *Anax imperator* showing the pentagon-shaped, black mark on the frons.

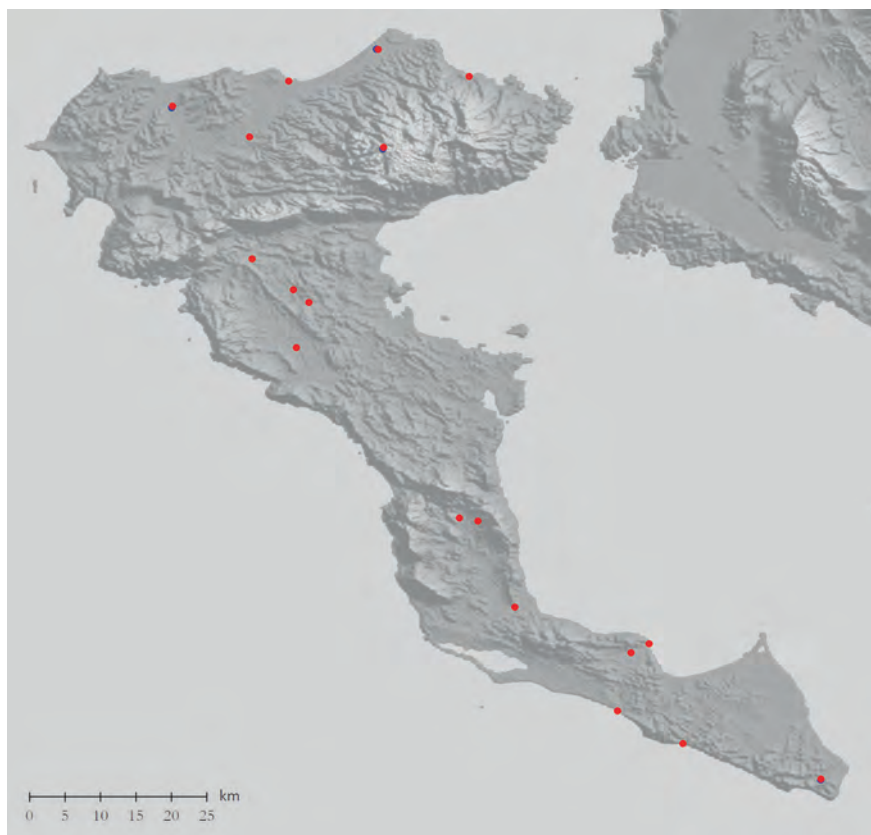


Figure 167. Localities for *Anax imperator*.

Anax parthenope (SÉLYS, 1839) – Lesser Emperor



Figure 168. Mature male of *Anax parthenope*.

A. parthenope has a similar colour to that of *A. ephippiger*, but the former has green eyes and the saddle-mark is much more pronounced, wraps around the entire S2 and often extends into S3. The lower appendages in males are very short and the basal ring on S1 is typically yellow. Size-wise it is slightly smaller than *A. imperator*. The abdomen is usually brown with a black dorsal stripe in males but often takes a bluish tone in females. Both sexes have green eyes and mature individuals often have wings that are tinted brown between the node and the pterostigma. The thorax is brown but can sometimes be tinged grey or green.

Key characters: The green eyes and the distinct blue saddle mark.

Behaviour: Males and female usually fly in tandem during oviposition, but females can also lay eggs alone and the eggs are endophytic.

Flight season: April-October (III-X).

Habitat: Prefers large standing waters and can be found in many places on Corfu.

Size: Total 62-75 mm, abdomen 46-53 mm, hindwing 44-51 mm.



Figure 169. A rare male morph of *Anax parthenope* with a blue abdomen.



Figure 170. Dorsal view of a brown *Anax parthenope* female.



Figure 171. Side-view of a light brown coloured *Anax parthenope* female.



Figure 172. *Anax parthenope* ovipositioning in pair.



Figure 173. *Anax parthenope* showing the black triangle and bluish bar on frons.



Figure 174. Profile of the head of *Anax parthenope* (note the all-green eyes).

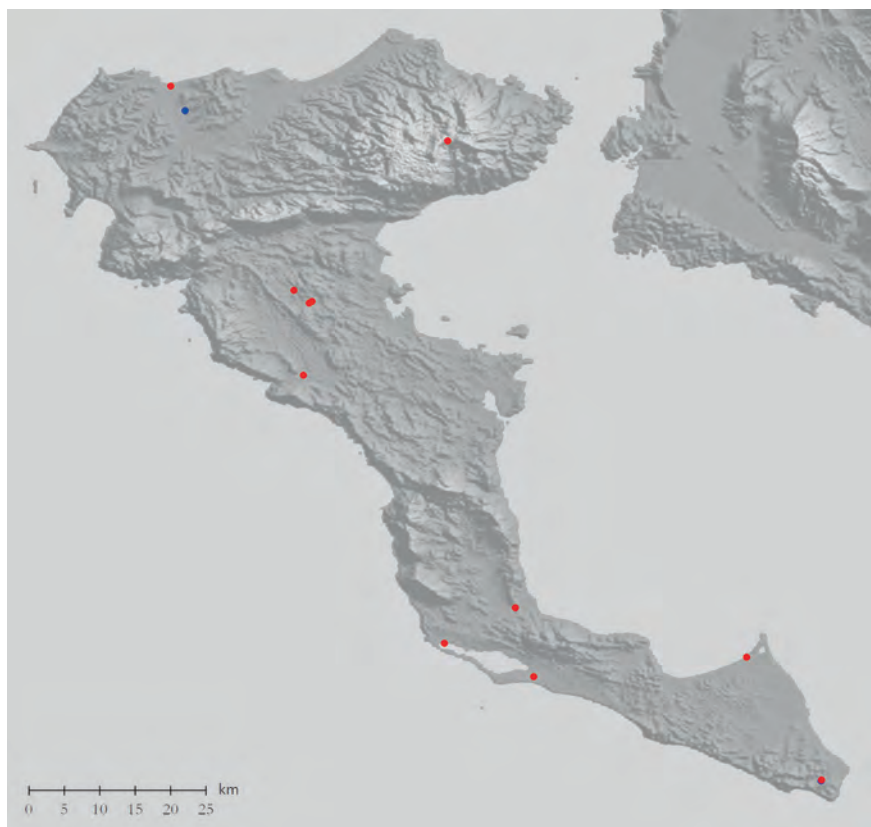


Figure 175. Localities for *Anax parthenope*.

Brachytron pratense (MÜLLER, 1764) – Hairy Hawker



Figure 176. Mature male of *Brachytron pratense*.

Brachytron pratense is a small aeshnid with a rather stout body and may be confused with some of the smaller *Aeshna* species. However, it differs in having a hairy body, a more compact abdomen and an earlier flight season. The males have blue eyes and a black abdomen with two blue marks on each segment, except on S1 that only has one central blue mark. The abdomen lacks waist, the lower appendages are rather short, the thorax has two green antehumeral stripes and the sides are green with two complete black lines. The female has short, yellow antehumeral stripes, pairs of elongated yellow spots on each abdominal segment and a single yellow dot on S1.

Key characters: The small size (for an aeshnid), hairy body and the pairs of blue dots on each segment of the abdomen, blue in males and yellow in females.

Behaviour: Males patrol between clearings and the vegetation at a rather low altitude. This rather curious species flies close to you for inspection. It often perches in hanging vertical position in the vegetation. Females oviposit on their own and their endophytic eggs are often deposited in floating dead vegetation.

Flight season: March-September (III-VI).

Habitat: *B. pratense* prefers standing or slow-flowing waters rich in both riparian and aquatic vegetation.

Size: Total 54-63 mm, abdomen 37-46 mm, hindwing 34-37 mm.



Figure 177. Mature female of *Brachytron pratense*.



Figure 178. Dorsal view of a male *Brachytron pratense*.



Figure 179. The thorax side of *Brachytron pratense* has two unbroken black lines.

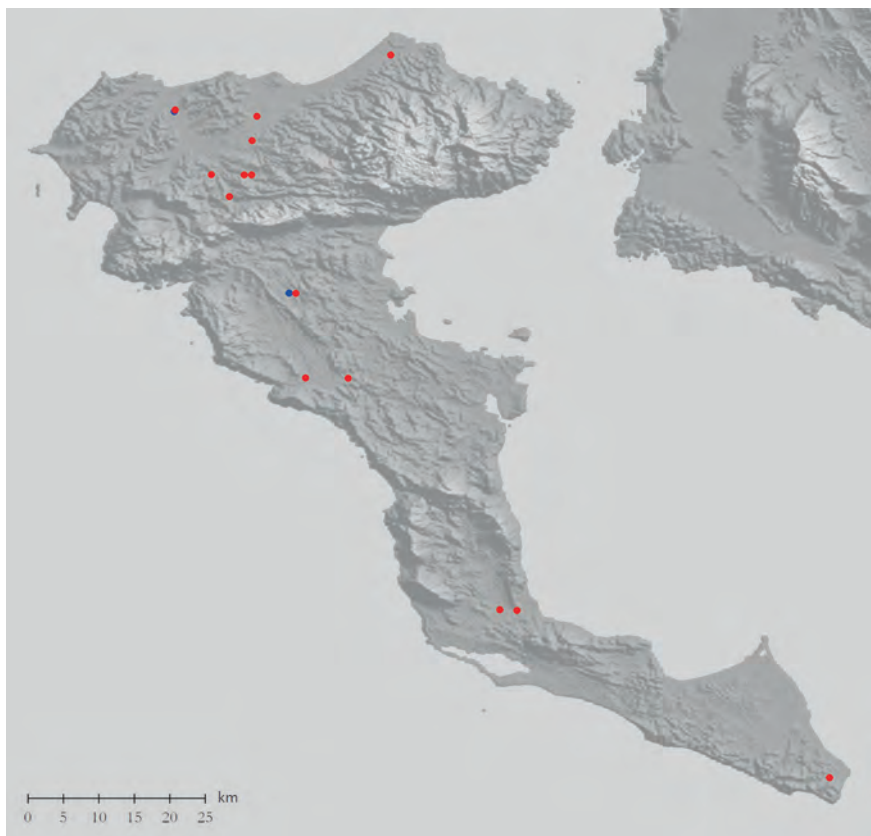


Figure 180. Localities for *Brachytron pratense*.

Caliaeschna microstigma (SCHNEIDER, 1845) – Eastern Spectre



Figure 181. Mature male of *Caliaeschna microstigma*.

Caliaeschna is another monotypic genus holding the smallest European aeshnids, characterised by a small, dark pterostigma, which also has given rise to its scientific name (*microstigma*). Mature males are dark-brown or black with blue markings, blue eyes and clearly hooked blue antehumeral stripes. A vertical bar partly connects the blue markings on S9 and S10, and there is a black bar on the white or cream coloured frons. The females have a lighter brown body colour, yellow, more subtle markings and the antehumeral stripes are not hooked.

Key characters: The short and dark pterostigma, often less than 2 mm in length and the black bar on the whitish frons present in both males and females. The hooked blue antehumeral stripes and partly fused blue spots on S9 and S10 that form a tail-light in males.

Behaviour: The males patrol low and slow along the length of the river in search of females. This species dislikes open sunlight and keeps to shady parts of the river, and it is most active during late afternoon and at dusk. Groups of insects can be found hunting over streams and along rows of trees at twilight, and it is this behaviour of suddenly appearing like shadows or ghosts that have given rise to the species' vernacular name. Females oviposit alone and the eggs are endophytic. The larvae live in submerged moss, leaf

litter, among rocks, or under stones.

Flight season: June-July (IV-VIII).

Habitat: *C. microstigma* is decreasing in Europe due to habitat loss and is listed as Near Threatened both in the European and the Mediterranean Red List of IUCN. The species is known to inhabit fast-flowing, shady rivers and these habitats are quickly decreasing. On Corfu, this dragonfly is found along shady rivers where the water is fast flowing in winter and spring, but where the flow slows down, or stops entirely, later in the season, and where the water may more or less dry out.

Size: Total 50-60 mm, abdomen 39-47 mm, hindwing 35-41 mm.



Figure 182. Dorsal view of mature *Caliaeschna microstigma* female.



Figure 183. *Caliaeschna microstigma* male (note the short, characteristic pterostigma).



Figure 184. Side view of a *Caliaeschna microstigma* female.

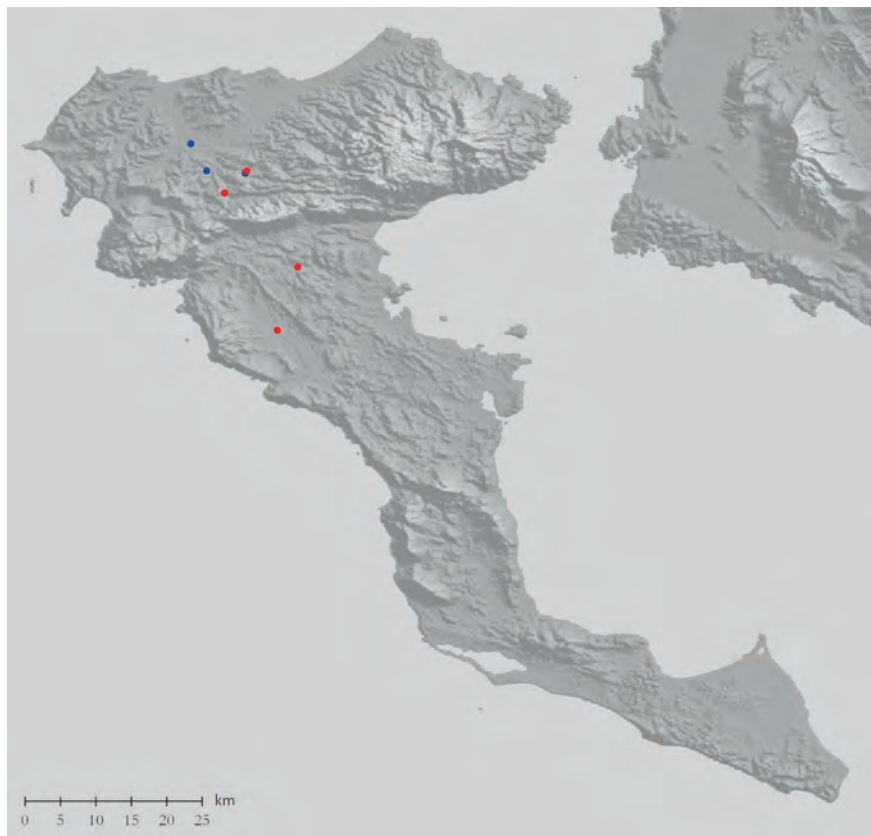


Figure 185. Localities for *Caliaeschna microstigma*.

Gomphus schneiderii SELYS, 1850 – Turkish Clubtail



Figure 186. Mature male of *Gomphus schneiderii*.

Gomphus schneiderii is a black dragonfly with yellow or green markings and an extended, oar like abdomen tip. It is very similar to *G. vulgatissimus* and it is sometimes regarded as a subspecies of the latter. Hybridization between the two occurs in areas from Montenegro to Thrace where they overlap and where intermediate forms occur. As there are no intermediate forms on Corfu, the species occurring here is understood to be *G. schneiderii*. The shape of the male appendages distinguishes *G. schneiderii* from *G. vulgatissimus*.

Key characters: The blue eyes, but in some individuals on Corfu these are more green than blue. A yellow central stripe on the abdomen that runs from S1 and extends to S8 and S9 where it forms narrow dots. The yellowish antehumeral stripe that is similar in width to the adjoining black stripe.

Behaviour: Both males and females usually stay close to rivers but often retreat up into the canopy of nearby trees. Males can be seen perching on plants and rocks on the riverbank. Females oviposit alone and lay exophytic eggs.

Flight season: May-July (IV-VII).

Habitat: On Corfu, *G. schneiderii* is found in calm and slow flowing rivers with sandy or silty bottoms in areas shaded by larger trees. The species is listed as Near Threatened in the European and EU27 Red Lists due to habitat destruc-

tion but not in the Mediterranean counterpart. However, the distribution of *G. schneiderii* is entirely Mediterranean and the small rivers on Corfu, where this species flies, are threatened by pollution, over-fertilization and, above all, by desiccation, which may make it a vulnerable species here.

Size: Total 40-48 mm, abdomen 30-34 mm, hindwing 29-31 mm.



Figure 187. Side-view of a *Gomphus schneiderii* male.



Figure 188. Newly emerged *Gomphus schneiderii* female.



Figure 189. Side view of a newly emerged *Gomphus schneiderii* female.



Figure 190. Dorsal-view of a *Gomphus schneiderii* male.

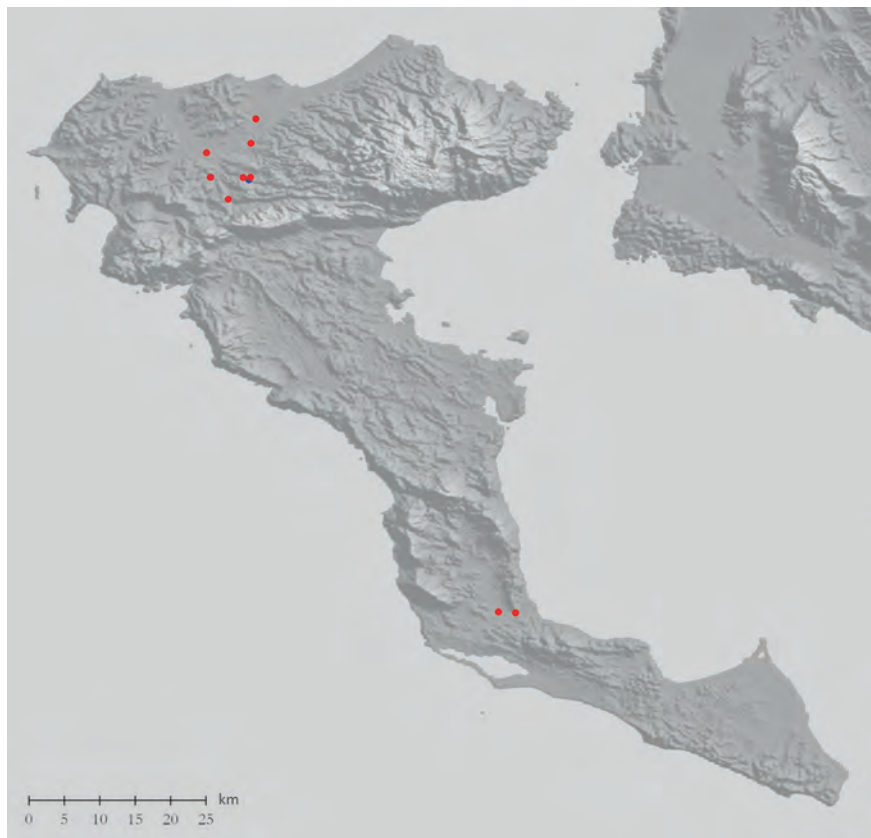


Figure 191. Localities for *Gomphus schneiderii*.

Lindenia tetraphylla (VANDER LINDEN, 1825) – Bladetail



Figure 192. Mature male of *Lindenia tetraphylla*.

Lindenia is a monotypic genus with one large, elegant and very spectacular species. This is a powerful flyer that has its main distribution in central and southwestern Asia. In Europe, large populations are found at Lake Skadar situated at the border between Montenegro and Albania and in Greece it occurs at Lake Vólvi in the northeastern part of the country and in the artificial Lake Doxi in the Peloponnese, to mention but a few places. New localities have recently been reported and it is possible that this species has been extending its range in Greece. It was first observed in Crete in artificial ponds or barrage lakes in 2013 and in an artificial reservoir on Corfu in 2014. Most individuals have a beige ground colour with dark markings, but a uniform dark or black body colour is sometimes found in males and this colouration is common on Corfu. The abdomen is long and slender with blade-like extensions on S7 and S8. Dark microscopic spines are present on the abdomen of males, being most frequent on S3 to S7. *L. tetraphylla* is listed as Vulnerable in the IUCN European Red List and as Near Threatened in the Mediterranean counterpart. We have found *L. tetraphylla* at the Moschopoulou Reservoir in southern Corfu every year since 2014 and both males and females have been observed. However, it is unclear if they are successfully breeding at the locality and further studies must be conducted to find larvae or exuviae.

Key characters: There is no other dragonfly on Corfu that can be confused with *L. tetraphylla*.

Behaviour: A strong flyer with migratory or wandering tendencies. Vagrant individuals frequently fly far away from suitable habitats. Males often perch on the ground with slightly raised abdomen. Females lay eggs unaccompanied and the eggs are exophytic.

Flight season: July (VI-IX).

Habitat: Larger natural or artificial lakes are preferred habitats for this species, but it can also occasionally be found in slow-flowing larger rivers. It has been recorded from brackish waters in Asia. However, in Europe most records come from fresh-water sites. Lakes surrounded by extensive reed-beds of *Phragmites australis* are usually preferred, and females have been seen ovipositing over beds of aquatic vegetation in such habitats. *L. tetraphylla* also inhabits sparsely vegetated waters, which is the case both in Crete and on Corfu.

Size: Total 69- 80 mm, abdomen 49-57 mm, hindwing 36-40 mm.



Figure 193. Mature female of *Lindenia tetraphylla*.



Figure 194. Dorsal view of a *Lindenia tetraphylla* female.

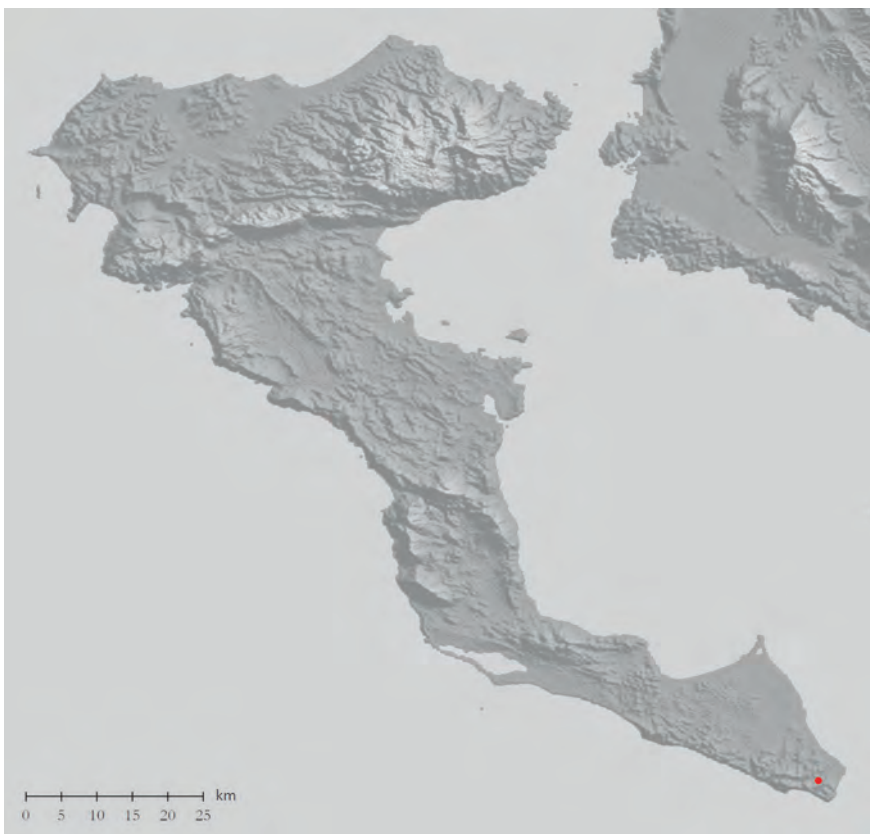


Figure 195. Locality for *Lindenia tetraphylla*.

Onychogomphus forcipatus (LINNAEUS, 1758) – Small Pincertail



Figure 196. Mature male of *Onychogomphus forcipatus*.

Onychogomphus forcipatus is a rather spectacular looking species with yellow and black colouration. Mature males have bright green or turquoise eyes and an unmistakable pincer-like appendage where the upper and lower parts are of similar length. Three subspecies are recognized and the most widespread, *O. f. forcipatus*, is the subspecies found on Corfu.

Key characters: The pincer-like appendages in males and the contrasting yellow and black colouration.

Behaviour: Males perch on gravel-banks or stones close to the water with their abdomen slightly raised. Females often fly low and rest in the vegetation. Oviposition is unaccompanied and the eggs exophytic.

Flight season: May-July (IV-IX).

Habitat: The species is often found in clearings of otherwise shady rivers in areas with sandy, gravelly, or silty bottoms and riverbanks. It is rather common in clearings along otherwise shaded rivers in northern Corfu.

Size: Total 46-50 mm, abdomen 31-37 mm, hindwing 25-30 mm.



Figure 197. Mature female of *Onychogomphus forcipatus*.



Figure 198. Side-view of thorax pattern of *Onychogomphus forcipatus*.



Figure 199. *Onychogomphus forcipatus* males often perch in stony or sandy patches on the ground.



Figure 200. *Onychogomphus forcipatus* male showing the distinct pincer-like appendages.



Figure 201. Female *Onychogomphus forcipatus*.

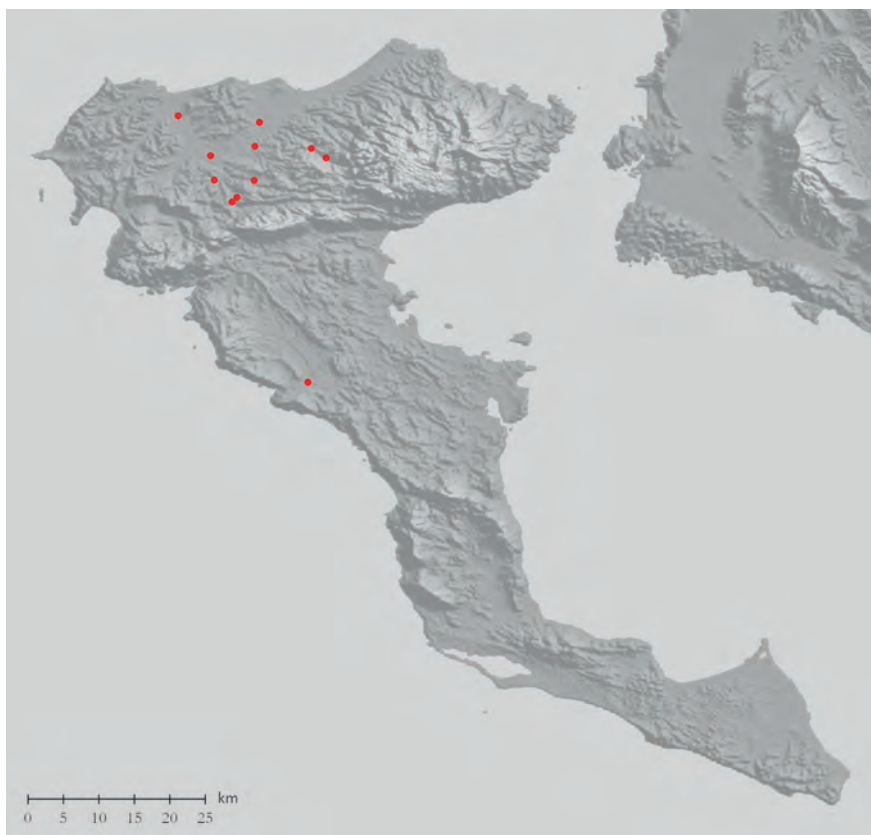


Figure 202. Localities for *Onychogomphus forcipatus*.

Somatochlora flavomaculata (VANDER LINDEN, 1825) – Yellow-spotted Emerald



Figure 203. Mature male of *Somatochlora flavomaculata*.

This is a medium-sized species with a rather dark body that has yellow spots on the side of the thorax and abdomen. However, the abdominal spots, which are larger in females, may fade with age. There are three distinct yellow spots on the side of the thorax. The male appendages are straight with smooth sides, and the female vulvar scale is shorter than the length of S9. *S. flavomaculata* was declining in Europe between 1960 and 1980 due to destruction of lowland marshes, but it has recovered in many places since then. However, the species is not very abundant on Corfu and was reported from the island for the first time in 1981. In Europe, it is found in the central and northern parts and on mainland Greece it occurs in the north-east.

Key characters: Dark body colour and yellow markings on thorax and abdomen.

Behaviour: Males defend their territories and patrol swiftly back and forth to chase off rivals. This species sometimes patrols the edge of woodlands far away from water. Females oviposit alone in flight and lay exophytic eggs.

Flight season: May–August (V–VI).

Habitat: *S. flavomaculata* flies close to small ponds, marshes, bogs, meadows

and ditches. On Corfu males are often seen patrolling near tall reed-beds and among tall tussocks of Pampas Grass (*Cortaderia selloana*) planted close to artificial ponds. The species is listed as Least Concern in all three of the Red Lists, and the European population is considered stable and its apparent rarity in Greece may just be due to lack of surveys. However, as the species occurs in marshlands, a habitat type that is threatened in Greece, and in areas on Corfu used for fly-tipping, there may be concerns for the species' future in these parts.

Size: Total 45-54 mm, abdomen 34-43 mm, hindwing 32-39 mm.



Figure 204. Dorsal-view of *Somatochlora flavomaculata* male.

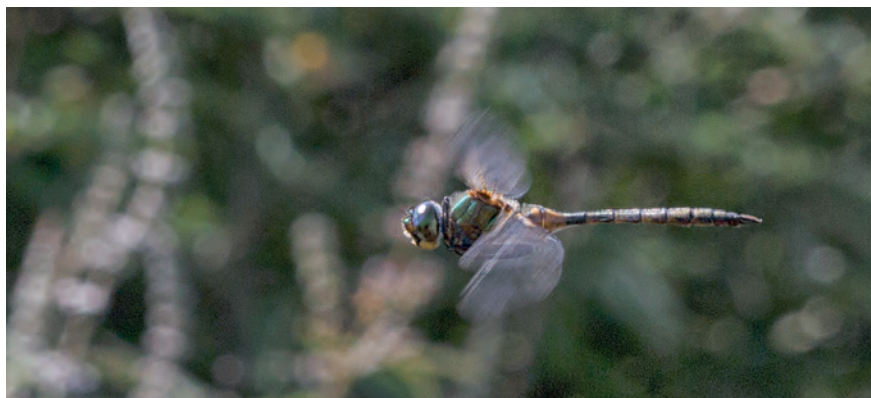


Figure 205. *Somatochlora flavomaculata* male patrolling his territory.

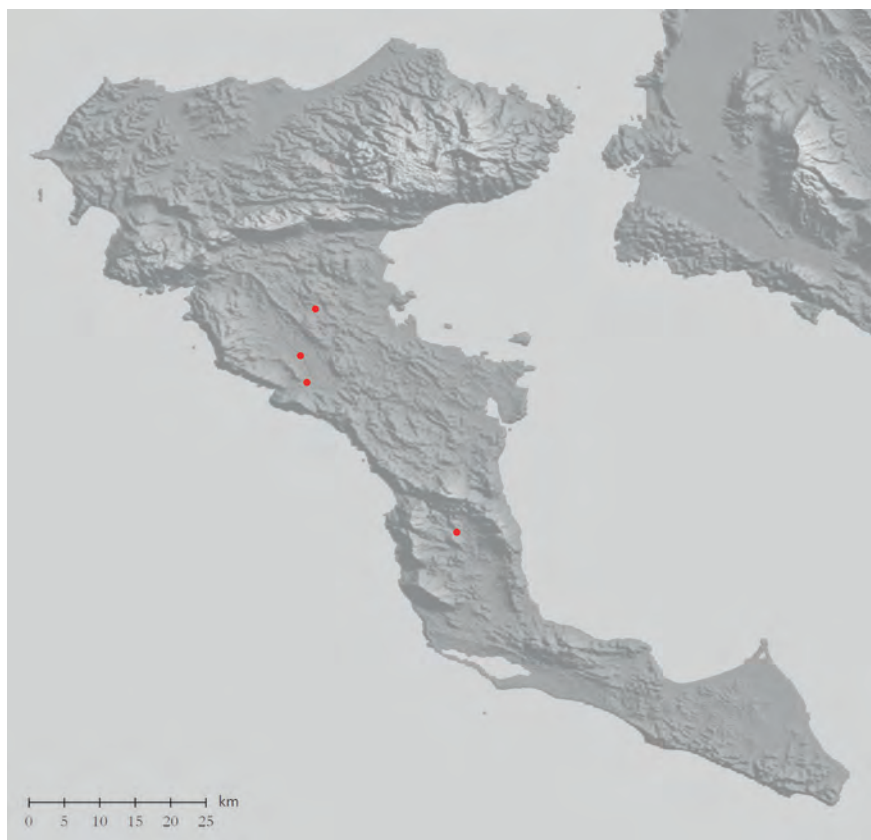


Figure 206. Localities for *Somatochlora flavomaculata*.

Somatochlora meridionalis NIELSEN, 1935 – Balkan Emerald



Figure 207. Mature male of *Somatochlora meridionalis*.

Somatochlora meridionalis has a metallic green body with yellow markings on S2 and S3 and a single yellow spot (rarely two) on the thorax side. A yellow bar connects the yellow spots on each side of the frons. The pterostigma is dark and the male appendages are rather long with quite pronounced teeth. The female vulvar scale is long and clearly visible with the naked eye (Fig. 208, p. 166). *S. meridionalis* replaces *S. metallica* in southern Europe, but the species' status is sometimes debated, and as there are few characteristics that clearly separate the two some experts still consider *S. meridionalis* as a subspecies of *S. metallica*.

Key characters: The green metallic body and the yellow markings on the frons.

Behaviour: Both males and females can be found briefly perching in the vegetation quite close to the ground. Females are rather shy and not always easy to spot, while males patrol openly along rivers or in clearings close to it. Oviposition takes place unaccompanied in flight and the eggs are exophytic.

Flight season: May-July (V-VIII).

Habitat: This species flies in deep shade along small rivers with running water. It is present along many small rivers and brooks but is never abundant.

Size: Total 50-55 mm, abdomen 35-44 mm, hindwing 34-38 mm.



Figure 208. Mature *Somatochlora meridionalis* female (note the spike-like vulvar scale).



Figure 209. Dorsal view of a *Somatochlora meridionalis* male.



Figure 210. *Somatochlora meridionalis* males sometimes stop to rest quite low in the vegetation.



Figure 211. *Somatochlora meridionalis* male (note the single yellow spot on the side of the thorax).

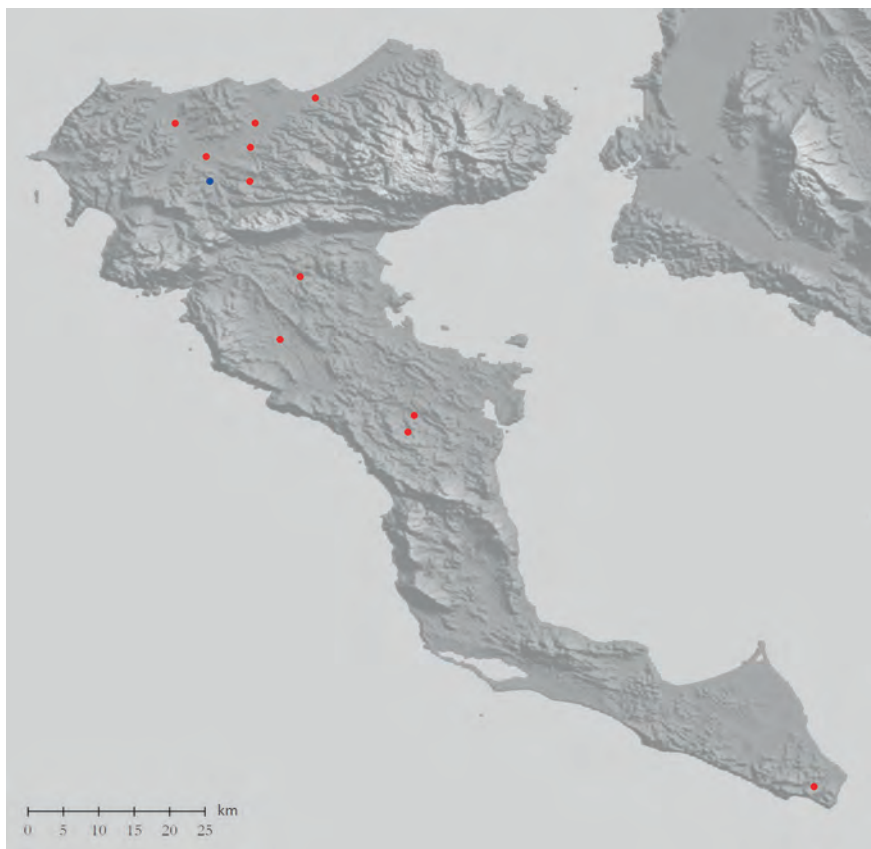


Figure 212. Localities for *Somatochlora meridionalis*.

Crocothemis erythraea (BRULLÉ, 1832) – Broad Scarlet



Figure 213. Mature young male *Crocothemis erythraea*.

This is a rather spectacular dragonfly with mature males that are vividly scarlet. Even if of similar size and colouration to that of the *Sympetrum* species, it is easily recognized by its relatively short and broad abdomen. It is a stockily built dragonfly that lacks any black markings. Females and immature males are yellowish brown with pale antehumeral stripes and a white stripe on the dorsal side of the thorax between the wings. Sometimes older females take on a reddish hue, but usually they just darken. Both sexes have yellow patches on the base of their wings and a long, pale pterostigma encircled by a dark border. This is a common species in Africa, in the Mediterranean and in the Arabian Peninsula that has expanded its range northwards quite recently. It was first recorded from Corfu in 1965.

Key characters: The all-red mature males, the stocky body and the broad abdomen. The white dorsal stripe on the thorax in females.

Behaviour: A robust and aggressive dragonfly that during the mating period undertakes short dashing flights over the water surface. Mature individuals often fly far away from water to hunt and often stop to rest in warm, open spaces on the ground. Mating takes place in flight and the female deposits the exophytic eggs in the water on her own.

Flight season: May–October (III–X).

Habitat: Inhabits most types of open waters, including brackish lagoons. It is a heat-loving species that sometimes also occupies sheltered waters with dense aquatic vegetation.

Size: Total 36-45 mm, abdomen 18-33 mm, hindwing 23-33 mm



Figure 214. Fresh *Crocothemis erythraea* female.



Figure 215. Immature *Crocothemis erythraea* female.



Figure 216. Immature *Crocothemis erythraea* male.



Figure 217. Old *Crocothemis erythraea* female.

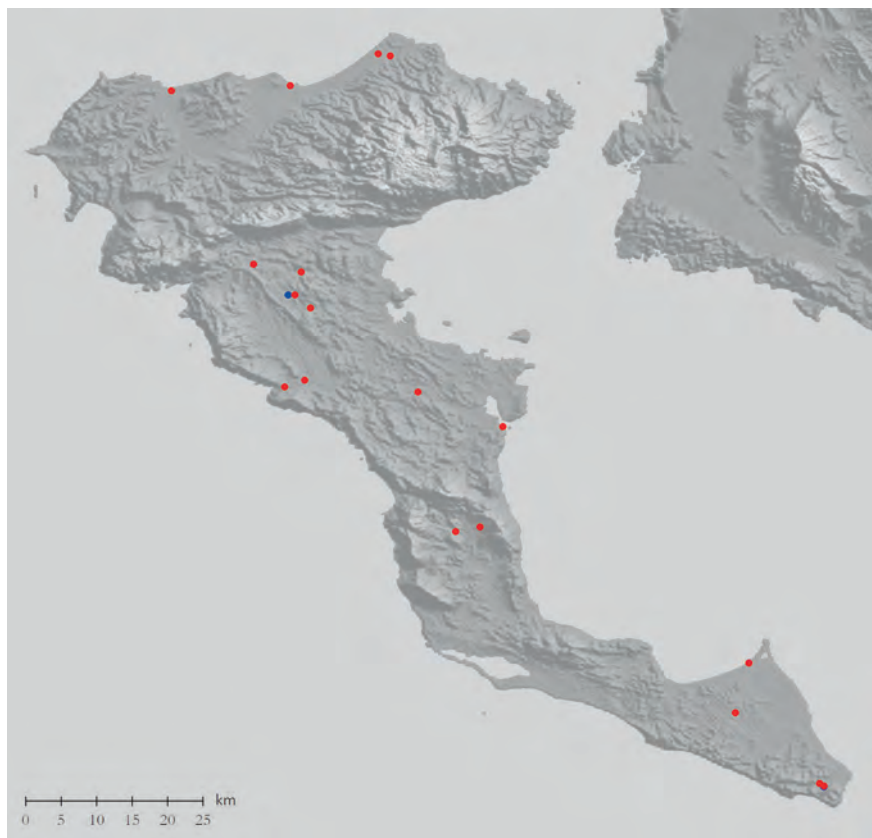


Figure 218. Localities for *Crocothemis erythraea*.

Libellula depressa LINNAEUS, 1758 – Broad-bodied Chaser



Figure 219. Mature male of *Libellula depressa*.

L. depressa is a short and robust species easily recognized by its broad and flat abdomen that is light blue pruinose with yellow markings on the side. There are dark blotches at the base of both fore- and hindwings and two blue or white antehumeral stripes on the thorax in males. However, these may disappear with age. Young immature males have the same brownish yellow colouration as the females. The female could, viewed from a distance, be mistaken for a hornet (*Vespa crabro*) because of her short, brownish abdomen bordered with yellow marks. Both male and females have large brown eyes.

Key characters: The broad, flat abdomen and the dark blotches on the base of the wings. No other dragonfly on Corfu can be confused with this species.

Behaviour: Males show very aggressive behaviour and defend their territories fiercely, patrolling close to the water and often perching at a prominent spot with a good view. Mating takes place in flight and females oviposit on their own on floating vegetation. The eggs are exophytic. In most cases only a few individuals are seen together at the same locality on Corfu, but occasionally 10-15 individuals have been observed together during mating.

Flight season: May-August (IV-VIII)

Habitat: *L. depressa* is most frequently found in small, stagnant or standing

waters like garden ponds, watering holes for cattle, or even in temporary puddles. This dragonfly is one of the first species to colonize a newly dug pool or similar type of water.

Size: Total 39-48 mm, abdomen 22-31 mm, hindwing 32-38 mm.



Figure 220. Mature female of *Libellula depressa*.



Figure 221. Side view of a female *Libellula depressa*.



Figure 222. Dorsal view of a *Libellula depressa* male, showing the black blotches at the base of the wings.

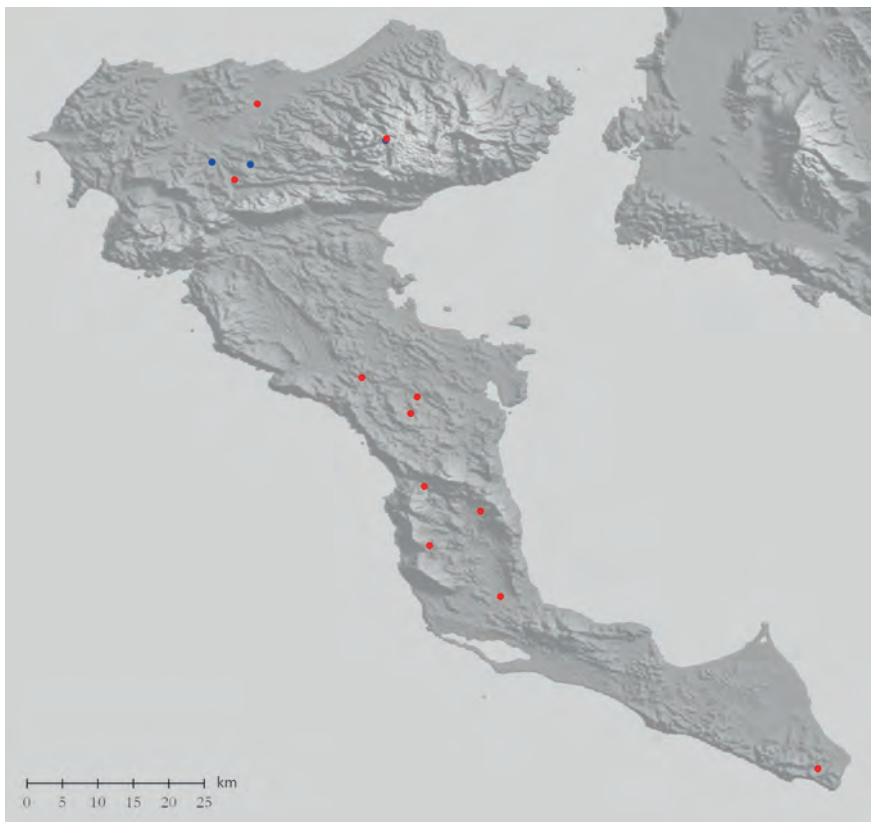


Figure 223. Localities for *Libellula depressa*.

Libellula fulva MÜLLER, 1764 – Blue Chaser



Figure 224. Mature male of *Libellula fulva*.

This is a medium sized dragonfly with a rather broad, blue abdomen with a black tip covering S8-S10. Mature males often have dark scratch-marks on the sides of the abdomen left after copulation. The thorax is dark and hairy, the eyes blue-green turning lighter with age and the face is black. The hindwings have black basal blotches with a light yellow horizontal streak while the forewings only have a black streak. A small black spot is sometimes present on the wingtips. The female is all yellow or orange brown and has a black central stripe on the abdomen. There are black blotches on the hindwings, black streaks on the forewings, a yellow tint on the front of both fore- and hindwings and dark spots on the wingtips. Immature males have the same colouration and markings as young and mature females, while old females can be very dark. The males of *L. fulva* can at first glance be confused with some of the *Orthetrum* species, but the former has a much wider abdomen and black blotches on the hindwing.

Key characters: The relatively broad and flat abdomen, the black blotches on the hindwing and the black face in males.

Behaviour: Males perch on stems or branches close to the water and often droop their wings forwards in a very characteristic way. Mating starts off in the air, but the couple quickly forms a mating wheel and then settles down in

the vegetation. Females oviposit alone in the water and the eggs are exophytic.

Flight season: April-July (IV-VII).

Habitat: Slow-flowing rivers, streams and canals and small lakes, all with rich riparian vegetation, are preferred habitats for *L. fulva*. The females need open water surfaces to oviposit.

Size: Total 42- 45 mm, abdomen 25-29 mm, hindwing 32-38 mm.



Figure 225. *Libellula fulva* male with claw-marks from copulation on the abdomen.



Figure 226. Mature female of *Libellula fulva*.



Figure 227. Newly emerged *Libellula fulva* female.



Figure 228. *Libellula fulva* female (note the dark marks on the wingtips).

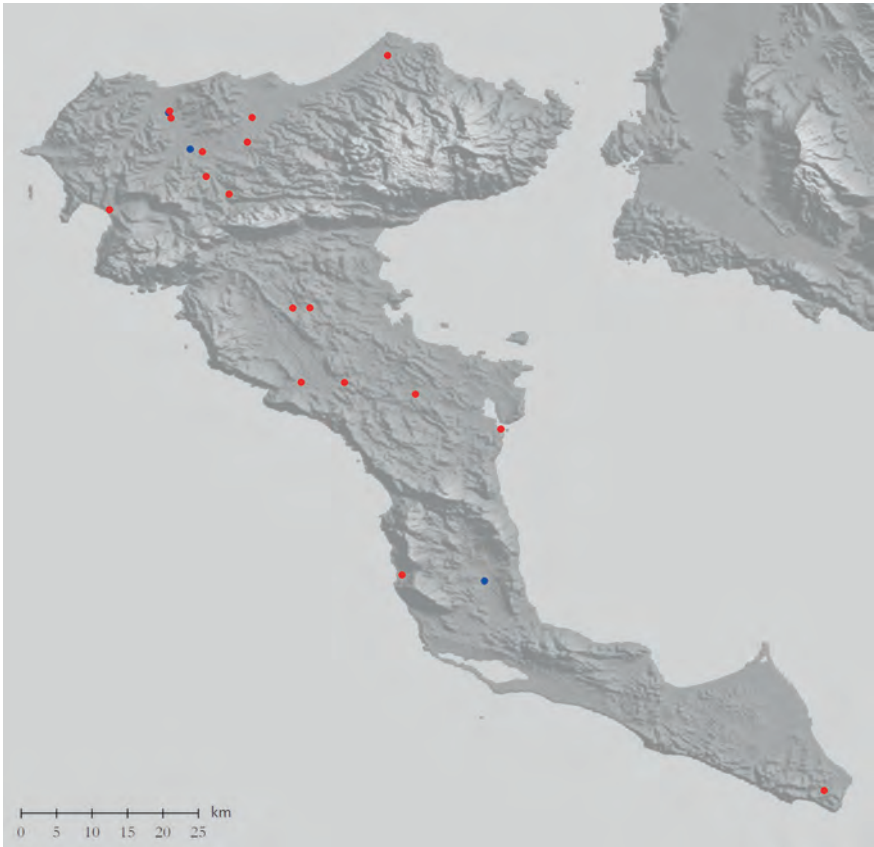


Figure 229. Localities for *Libellula fulva*.

Orthetrum brunneum (FONSCOLOMBE, 1837) – Southern Skimmer



Figure 230. Mature male of *Orthetrum brunneum*.

This is a medium sized dragonfly with males that develop their characteristic blue pruinosity with age. Immature males are yellowish brown like females. The face is pale blue and the pterostigma is small, brown and surrounded by a thin dark line. The male abdomen is rather broad and tapering towards the tip, while the female abdomen is not. The females are all brown, including the face, but the eyes are blue. Older females may develop a dull, bluish hue. There is a thin, black dorsal line on the abdomen with a single dot on each side, i.e. a pair of dots on each abdominal segment.

Key characters: The all blue, including the face, mature males, the small brown pterostigma. The two dots bordering the black dorsal line are diagnostic for the females. These characters distinguish *O. brunneum* from *O. coerulescens* where the males have a brown face. The females have dots on each side of the dorsal line instead of a connecting bar, as is the case in *O. coerulescens*.

Behaviour: *O. brunneum* often rests on the ground or on low vegetation at the edge of slow moving waters. This dragonfly is one of the species that seems to benefit from the rise in temperature and has consequently expanded northwards in recent years. It is quite common on Corfu but not as widespread as *O. coerulescens*. Mating takes place in tandem in the air and then in a mating wheel in the vegetation. Females oviposit alone directly into the water and lay

exophytic eggs. The male directs the female into his territory and guards her when she oviposits.

Flight season: May-October (IV-X).

Habitat: This species uses a wide range of habitats, from small streams and seepages from rivers, or ditches with slow flowing water, to springs and artificial pools. It prefers waters scarce in riparian and aquatic vegetation and occupies sites that are in their early stages of succession.

Size: Total 41-49 mm, abdomen 25-32 mm, hindwing 33-37 mm.



Figure 231. Mature female of *Orthetrum brunneum*.



Figure 232. *Orthetrum brunneum* male showing the blue frons.



Figure 333. *Orthetrum brunneum* female (note the two small, black dots on each segment of the abdomen).



Figure 234. Fresh *Orthetrum brunneum* males have a very vivid blue colour.



Figure 235. *Orthetrum brunneum* males often perch on or close to the ground.

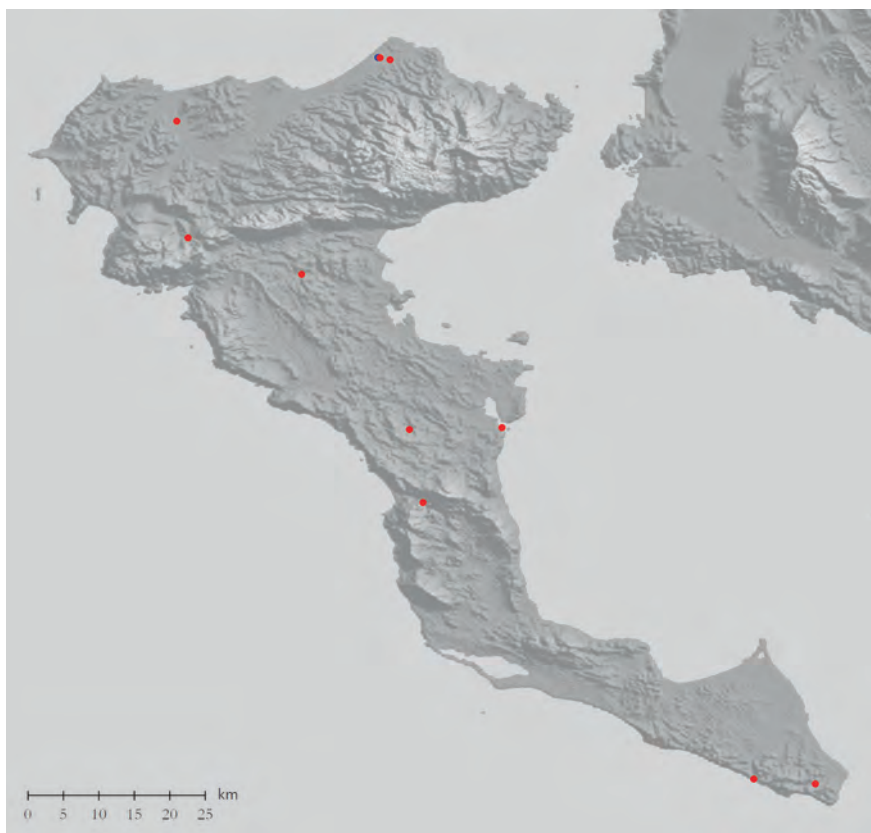


Figure 236. Localities for *Orthetrum brunneum*.

Orthetrum cancellatum (LINNAEUS, 1758) – Black-tailed Skimmer



Figure 237. Mature male of *Orthetrum cancellatum*.

This is a very active and fast flying species that manoeuvres swiftly and nimbly close to the water surface or close to the ground where it often stops to perch. Mature males have a blue abdomen with yellow sides, but the yellow disappears with age and increased blue pruinosity. The abdomen tip, usually S8-S10, is black, the eyes are blue-green and the pterostigma is black. The females have a yellow abdomen with black longitudinal bands, but in old specimens the abdomen turns bluish due to pruinosity. Immature males are even more yellow than the females and the longitudinal band on the abdomen is darker and more pronounced. *O. cancellatum* could, at first glance, be confused with *Libellula fulva*, but the former is longer and slenderer and generally lacks the dark scratch marks on the abdomen typically found on *L. fulva* males after copulation. In addition, the wings of *O. cancellatum* are clear and lack dark patches.

Key characters: The blue abdomen with a black tip in the males and the longitudinal black marks on a yellow abdomen in both young and mature females.

Behaviour: The flight of the males is fast and skimming and they often rest in open patches close to the water. Mating starts off in tandem in the air and then continues with a mating wheel on the ground or low in the vegetation.

The female oviposits alone directly in the water and the eggs are exophytic.

Flight season: April-September (IV-X).

Habitat: *O. cancellatum* prefers open waters with sparsely vegetated or bare margins. It is often associated with large standing or slow-flowing waters such as lakes, sandpits, or rivers. It can also be found in a variety of habitats except shady waters, fast running rivers and locations with oligotrophic, acidic water. It is a rather common species that has benefited from human activities.

Size: Total 44-50 mm, abdomen 29-35 mm, hindwing 35-41 mm.



Figure 238. Fresh female of *Orthetrum cancellatum*.



Figure 239. Older female of *Orthetrum cancellatum* from September showing pruinosity.



Figure 240. A very dark, older *Orthetrum cancellatum* female from August.



Figure 241. Immature male *Orthetrum cancellatum*.

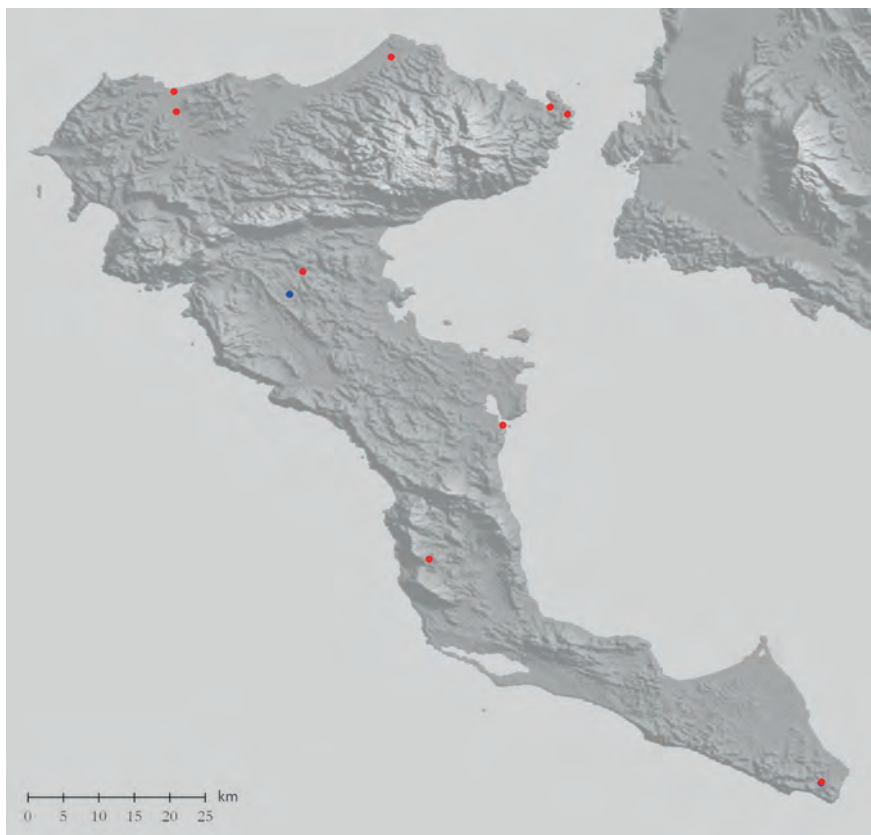


Figure 242. Localities for *Orthetrum cancellatum*.

Orthetrum coerulescens (FABRICIUS, 1798) – Keeled Skimmer



Figure 243. Mature male of *Orthetrum coerulescens*.

Orthetrum coerulescens is the smallest, and one of the most common, of the *Orthetrum* species found on Corfu. This species is similar in size to the *Sympetrum* species and females and young males of *O. coerulescens* could be confused with some of these. The mature males have all-blue pruinose, slender and tapering abdomens and a large yellow pterostigma. The face is brown and the thorax of the specimens from Corfu is generally covered with blue pruinosity, giving the dragonfly an all blue appearance. The females are yellowish brown with pale antehumeral stripes, a thin central dorsal line on the abdomen and short horizontal dots on most of the abdominal segments. There is often a yellow tint at the base of the wings. Immature males are yellowish brown, like the females, but can have very dark abdomen sides. Old females have very dark, blue-grey abdomens. The subspecies on Corfu is considered to be *O. c. anceps* (SCHNEIDER, 1845).

Key characters: The brown face and large yellow pterostigma are diagnostic for mature males. The black dorsal bars on the abdomen and the pale antehumeral stripes are features characteristic for mature females.

Behaviour: This species prefers to perch in the vegetation and rarely rests on the ground. The males patrol rather low and choose twigs on low bushes or grass as lookout points. Like other *Orthetrum* species, *O. coerulescens* rests with

the wings pointing forwards. Mating takes place in tandem and, even if the female oviposits the exophytic eggs on her own, the male is guarding her.

Flight season: April-October (IV-X).

Habitat: *O. coerulescens* prefers mainly unshaded locations with slow running waters such as small rivers, streams and ditches, but it also inhabits marches, springs and quarries.

Size: Total 36-45 mm, abdomen 23-38 mm, hindwing 28-33 mm.



Figure 244. Fresh female of *Orthetrum coerulescens*.



Figure 245. An old, pruinose *Orthetrum coerulescens* female.



Figure 246. Immature *Orthetrum coerulescens* female.



Figure 247. Immature *Orthetrum coerulescens* male showing the brown frons.

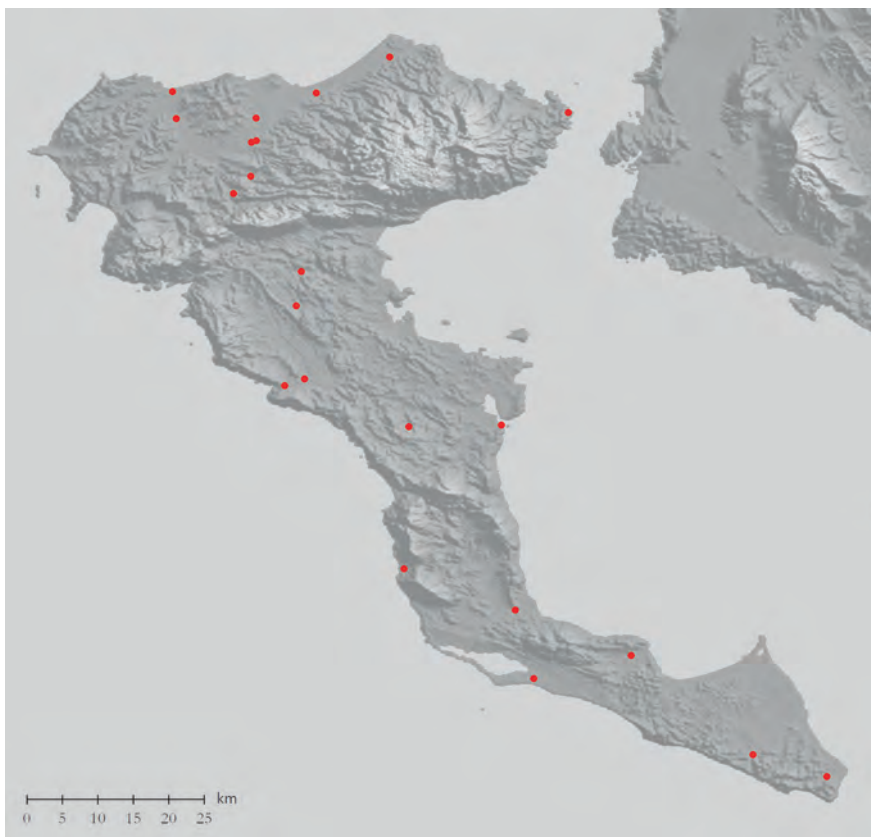


Figure 248. Localities for *Orthetrum coerulescens*.

Selysiotthemis nigra (VANDER LINDEN, 1825) – Black Pennant



Figure 249. Mature male of *Selysiotthemis nigra*.

This is a late addition to the dragonfly fauna of Corfu, first reported in 2009. It has a short body and a large head and mature males are blackish-grey. The broad wings are clear with a very shiny appearance and have a short, pale pterostigma bordered by thick black lines resembling an equals (=) sign. The females have a yellowish body colour and pale legs. The thorax in females and immature males has a dark brown pattern and there is a dark central line on the abdomen.

Key characters: The broad clear wings with indistinct venation and pale pterostigma resembling an “=” sign.

Behaviour: *S. nigra* hovers quite low and stops to rest at prominent vegetation or other objects that extend around a meter above ground. It frequently migrates far away from the breeding grounds. Both males and females often rest with their abdomen and wings slightly raised. Mating takes place in tandem and the female deposits her exophytic eggs by dipping her abdomen tip into the water.

Flight season: June–September (V–IX).

Habitat: It is only known to breed in the Moschopoulou Reservoir.

Size: Total 30–38 mm, abdomen 21–26 mm, hindwing 24–27 mm.



Figure 250. Mature female of *Selysiothemis nigra*.



Figure 251. *Selysiothemis nigra* female resting very close to the ground.



Figure 252. Immature male of *Selysiotthemis nigra*.



Figure 253. Side view of an immature *Selysiotthemis nigra* male.



Figure 254. *Selysiothemis nigra* male (note the transparent wings and dark borders of the pterostigma).

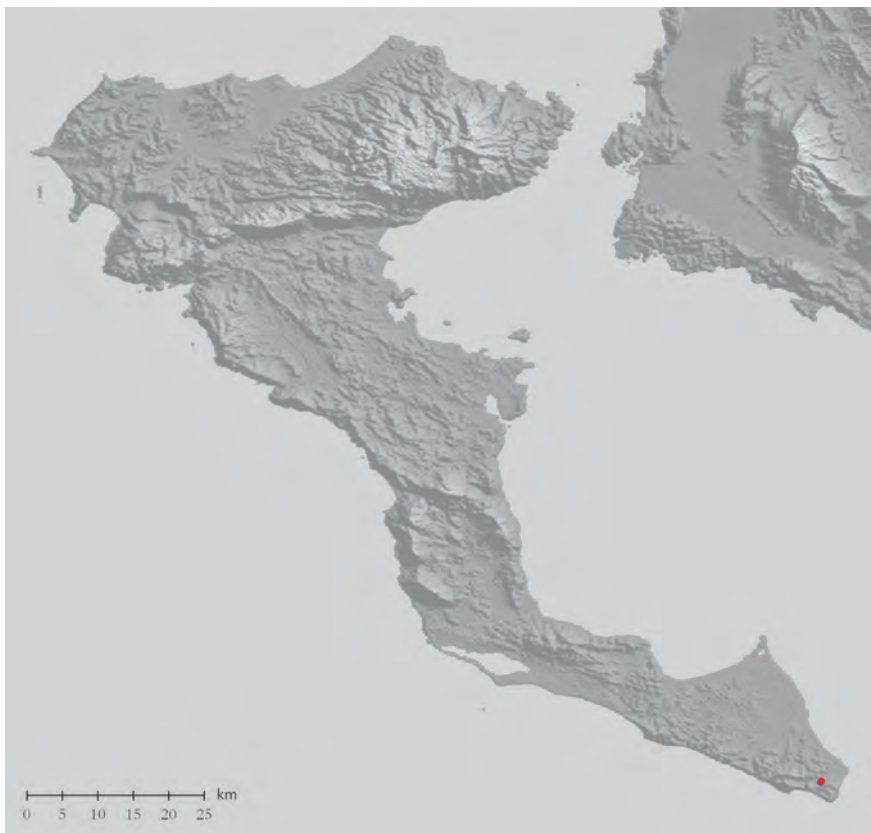


Figure 255. Locality for *Selysiothemis nigra*.

Sympetrum flaveolum (LINNEUS, 1758) – Yellow-winged Darter



Figure 256. Male *Sympetrum flaveolum*.

A. Borkenstein

This is a highly dispersive species with a rather patchy distribution in Greece that has not been reported from Corfu since 1912. Large swarms often invade an area, breed there for a couple of years and then disappear again. The males are easily recognized by the large saffron yellow patches at the base of the hindwings. Females also have the same type of patches, but they may vary in size and may also be absent.

Key characters: The large yellow patches on the hindwings of both sexes separate this species from other darters. The male abdomen has straight sides, not clubbed, and it is orange on the top and on most of the sides. The underside is black and there is a continuous black line along the lower side of the abdomen. The yellowish coloured females have a continuous dorsal black line on the abdomen that separates them from *S. sanguineum* females.



Figure 257. Female *Sympetrum flaveolum*.

C. Bergendorff

Behaviour: The species has a rather slow and fluttering flight and the females typically oviposit in dry mud.

Flight season: (V-VIII).

Habitat: Reproduces in shallow waters rich in vegetation such as flooded meadows.

Size: Total 32-37 mm, abdomen 19-27 mm, hindwing 23-32 mm.

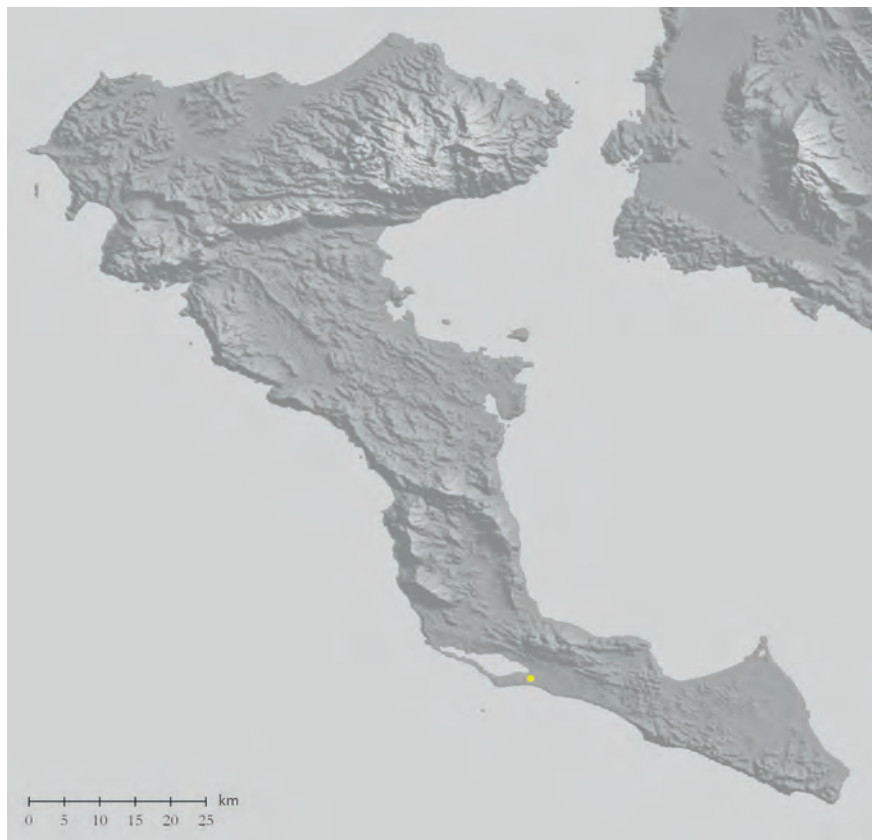


Figure 258. The only reported historic locality from Corfu for *Sympetrum flaveolum*.

Sympetrum fonscolombii (SELYS, 1840) – Red-veined Darter



Figure 259. Mature male of *Sympetrum fonscolombii*.

This, the largest of the *Sympetrum* species, is a quite colourful dragonfly with a very active behaviour. The bicoloured eyes are brownish red at the top and blue or blue-grey beneath and the pterostigma is pale with thick black borders. The legs are black with distinct yellow stripes and the abdomen is not clubbed but has straight parallel sides. The hindwings have yellow blotches that usually are larger than in *S. sanguineum* but smaller than in *S. flaveolum*. Mature males have a bright red abdomen and the veins on the front of the wings are red, but sometimes other veins are also red. The eyes are red at the top and blue beneath. The sides of the thorax have a bluish green or white dash mark. Females and immature males have a yellow body colour and black marks on S8-S9. The pterostigma is very pale and the wing veins are yellow rather than red. Older females darken considerably and can have a bluish tone on the side of the abdomen, while the dorsal side is more brownish. The eyes retain the typical blue underside even in ageing females. The thorax sides are yellow with a grey or blue tint.

Key characters: The bicoloured eyes that are reddish brown at the top and blue beneath. The wing veins that are red in mature males and yellow in immature males and females and the white margins along the sides of the frons, the latter particularly pronounced in males.

Behaviour: This is a distinctly territorial species that spends a great deal of time on the wings and only briefly stops to perch in a prominent elevated position.

Flight season: April-October (III-XII).

Habitat: *S. fonscolombii* prefers standing waters that are warm, shallow and have no or very little vegetation, but it is also found in more open areas in some densely vegetated rivers. This species is often found in large groups together with other *Sympetrum* species at quite a distance from their breeding water.

Size: Total 35-44 mm, abdomen 20-30 mm, hindwing 24-30 mm.



Figure 260. Fresh female of *Sympetrum fonscolombii*.



Figure 261. *Sympetrum fonscolombii* males have red veins at the front of their wings and yellow patches at the base of the hindwings.



Figure 262. Immature males of *Sympetrum fonscolombii* lack red colouration and resembles a female.



Figure 263. *Sympetrum fonscolombii* female showing the blue underside of the eye and the thin, black “moustache” reaching down to the middle of the eye.



Figure 264. Immature *Sympetrum fonscolombii* male.

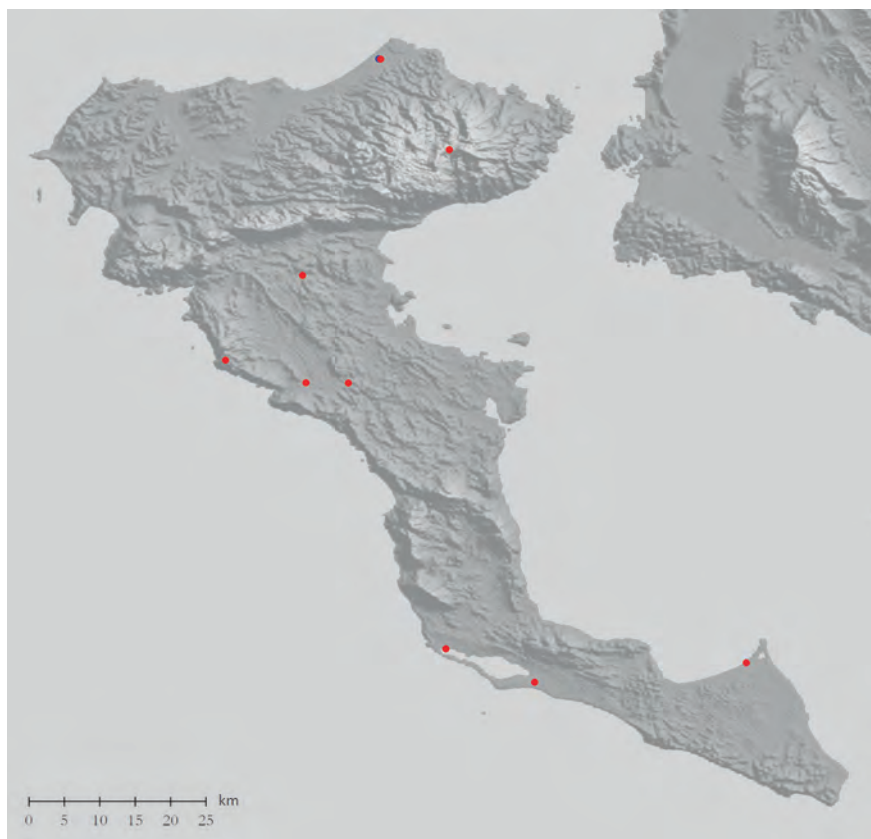


Figure 265. Localities for *Sympetrum fonscolombii*.

Sympetrum meridionale (SELYS, 1841) – Southern Darter



Figure 266. Mature male of *Sympetrum meridionale*.

Sympetrum meridionale is the most uniformly coloured of all darter species in our area. The male abdomen usually lacks black markings and the thorax sides are also plain without any distinct colours or markings. However, there are two small characteristic dark dots on each side of the thorax. The legs are predominantly pale, the wings unmarked and very translucent and the pterostigma is long, pale and bordered by thick black lines. *S. meridionale* is often heavily infested by red mites.

Key characters: Even if this dragonfly lacks distinctive black markings it can sometimes be confused with other red darter species and especially with *S. striolatum* with which it co-occurs. However, both males and females in *S. meridionale* give a much paler overall impression. The very narrow, almost invisible, black line at the base of the frons and the dots on the side of the otherwise plain thorax are diagnostic characters. The lack of black marks on S8-S9 and the pale legs are other features typical of *S. meridionale*.

Behaviour: This is a lively and cautious dragonfly, often seen flying at quite a distance away from water. Sexually mature individuals do not appear until August or September. It mates in tandem and the female often deposits her eggs in damp mud in areas that later will be inundated with water.

Flight season: May-December (III-XI).

Sympetrum meridionale – Libellulidae

Habitat: Standing, shallow waters with abundant vegetation.

Size: Total 35-40 mm, abdomen 22-28 mm, hindwing 25-30 mm.



Figure 267. Mature female of *Sympetrum meridionale*.



Figure 268. Fresh *Sympetrum meridionale* males have two light anthumeral stripes on an otherwise plain thorax.



Figure 269. *Sympetrum meridionale* female showing the plain side of the thorax with two very small black dots.



Figure 270. *Sympetrum meridionale* females turn brown with pruinose blue underside of the abdomen when aging.



Figure 271. Side view of *Sympetrum meridionale* male showing the mostly yellow legs.

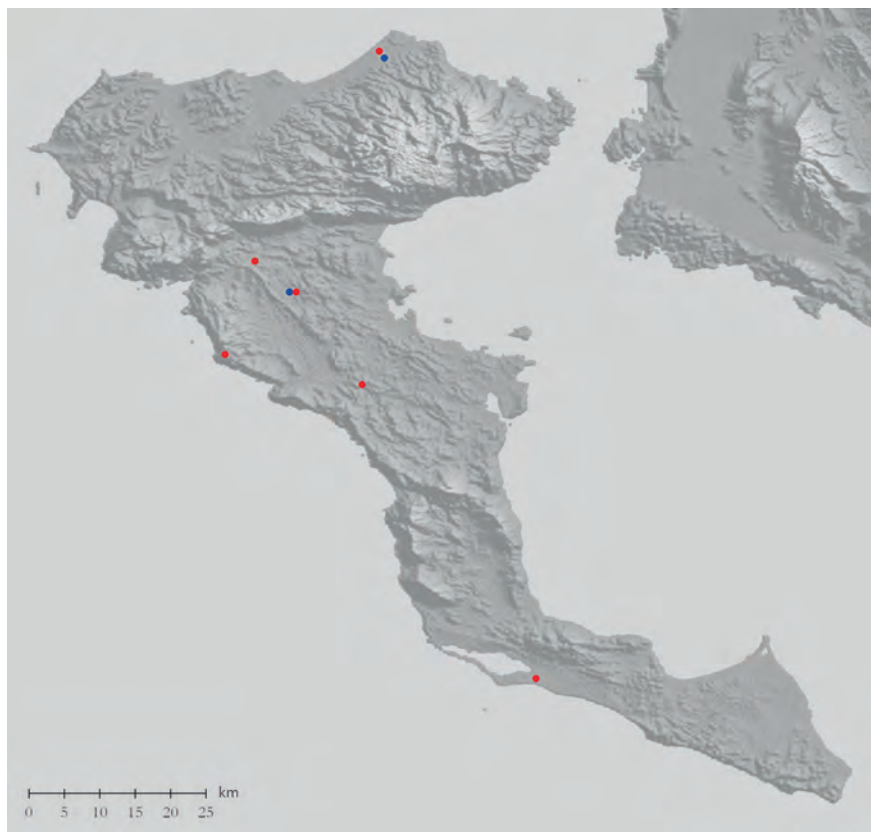


Figure 272. Localities for *Sympetrum meridionale*.

Sympetrum sanguineum (MÜLLER, 1764) – Ruddy Darter



Figure 273. Mature male of *Sympetrum sanguineum*.

This is the reddest of the Corfu darters and it is quite easily recognized by its entirely black legs, not found in any other *Sympetrum* species on the island. Mature males have a deep red, clubbed abdomen, a red face, uniformly coloured thorax and clear wings with yellow patches at the base. Yellow wing-patches are also present in females and immature males. Like in most darters, the abdomen has black marks on S8-S9. The black line or “moustache” at the back of the frons is shaped like a horseshoe and reaches down half the length of the eye. Both mature females and immature males are yellow or brownish yellow in colour. The females have a thin, black dorsal line and black marks on every segment on the abdomen. The abdomen sometimes becomes tinted red in mature females. Both sexes lack antehumeral stripes. This species was first reported from Corfu in 1981.

Key characters: The blood-red abdomen in males and the entirely black legs of all ages of both males and females are diagnostic characters.

Behaviour: Males perch on lookouts a short distant from the water from where they make short darting flights to hunt and chase away competitors. The female produces few but comparatively large eggs. She seldom dips her abdomen into the water, but either drops the eggs directly into the water, onto the vegetation, or into wet mud, i.e. the eggs are exophytic. Young individuals

often fly away to hunt quite some distance from water.

Flight season: May-September (V-VIII).

Habitat: *S. sanguineum* occurs in many, mainly permanent, standing or very slow-flowing waters rich in vegetation. On Corfu it also flies close to the coast and around the salt marshes.

Size: Total 34-38 mm, abdomen: 20-26 mm, hindwing 23-31 mm.



Figure 274. Mature female of *Sympetrum sanguineum*.



Figure 275. Side view of a *Sympetrum sanguineum* male (note the entirely black legs).



Figure 276. Dorsal view of a *Sympetrum sanguineum* female.



Figure 277. Immature *Sympetrum sanguineum* male.



Figure 278. The black “moustache” on *Sympetrum sanguineum* reaches down to the middle of the eye.

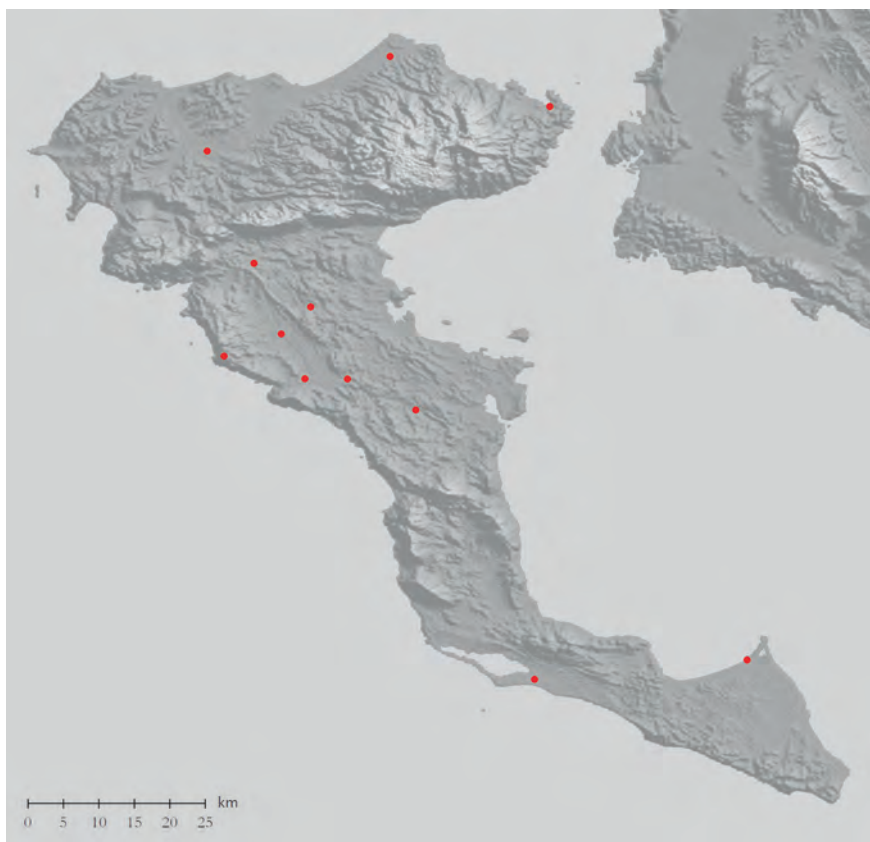


Figure 279. Localities for *Sympetrum sanguineum*.

Sympetrum striolatum (CHARPENTIER, 1840) – Common Darter



Figure 280. Mature male of *Sympetrum striolatum*.

This is a common species on Corfu and the only one on the island that really can be confused with *S. meridionale*. It is one of the largest species and usually the one with the duller colours. The male abdomen is a rather subdued red, only weakly clubbed and with black markings on S8-S9. There are two bright yellow patches interrupted by a brownish red band on the side of the thorax, and the tibia and femur are black with a yellow line on the sides. Young females and immature males are yellow, but the females darken considerably with age and can also take on a reddish hue. The black line on the back of the frons is short, just reaching the edge of the eyes, and there are narrow yellow patches on the base of the wings in both sexes.

Key characters: The two yellow patches on the thorax side in the males are diagnostic.

Behaviour: Like other darters it is fast, agile and territorial. Males use the same perch to monitor surroundings and return to it after e.g. hunts, and they also make short flights out over open water. Both males and females frequently stop and rest in sunny patches on the ground. Immature individuals often fly far from water to hunt. Females oviposit in open waters, preferably among vegetation. The eggs are exophytic.

Flight season: May-December (I-XII).

Habitat: *S. striolatum* occupies many different habitats, but prefers warm, shallow, standing waters with little vegetation.

Size: Total 35-44 mm, abdomen 20-30 mm, hindwing 24-30 mm.



Figure 281. *Sympetrum striolatum* female showing red male colouration on the upper side of the abdomen.



Figure 282. The “moustache” of *Sympetrum striolatum* does not extend downwards along the eye.



Figure 283. Old *Sympetrum striolatum* female.



Figure 284. Side view of *Sympetrum striolatum* female.



Figure 285. Older *Sympetrum striolatum* specimens often get hairy at the end of the season.

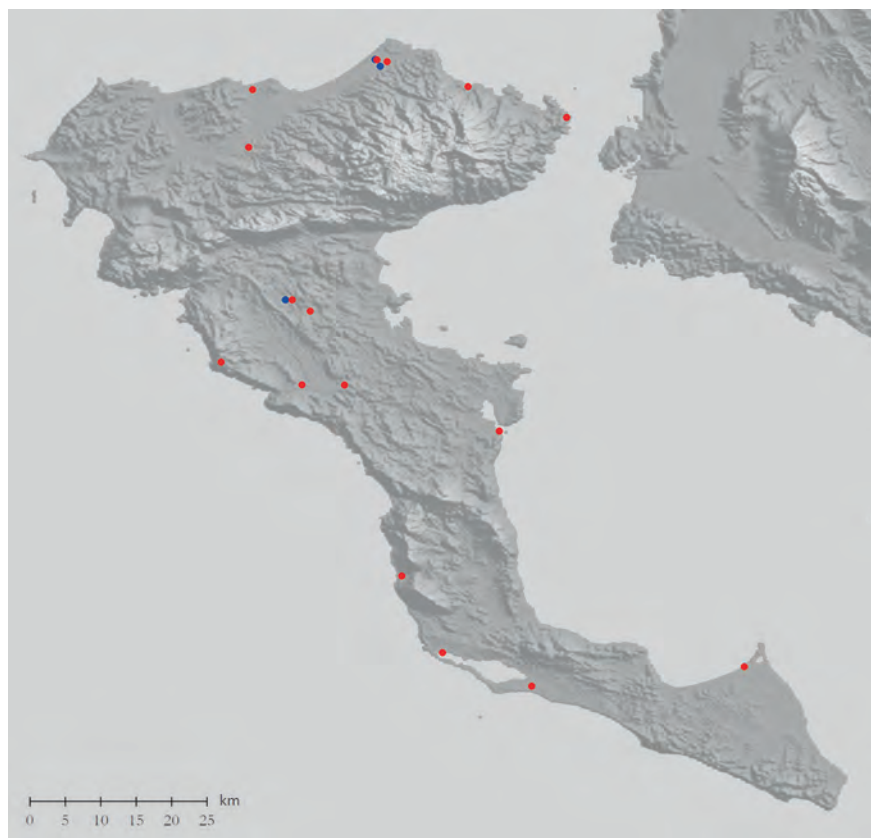


Figure 286. Localities for *Sympetrum striolatum*.

Trithemis annulata (PALISOT DE BEAUVOIS, 1807) – Violet Dropwing



Figure 287. Mature male of *Trithemis annulata*.

The garish colours of red and violet in mature males together with their characteristic pose of dropped wings and raised abdomen, the so-called obelisk position, makes it difficult to confuse *T. annulata* males with males of any other species in our area. The red wing veins, shiny red frons and bright red top of the eye are other characteristic features in mature males. Newly emerged males are yellow and go through stages of orange and red before reaching maturity and obtaining their characteristic violet pruinosity. Young females are yellow, turning nut-brown with age. The hindwings of both males and females have large amber patches at the base, and the females also have a small amber patch on the base of the forewing. The top of the eye in females is brown, the wing veins yellow, S8-S9 on the abdomen have a dorsal bar, and, like the males, they often perch in the obelisk position.

Key characters: The violet pruinosity, shiny red frons and red top of the eye are diagnostic for mature males. The black dorsal bar on the abdomen, the amber patches on the base of the wings and the yellow wing veins are characters that identify the females.

Behaviour: The males perch in prominent spots close to the water, often in the obelisk position.



Figure 288. Mature female of *Trithemis annulata*.

Flight season: May-September (IV-XI).

Habitat: *T. annulata* prefers warm, standing or slow-flowing waters.

Size: Total 32-38 mm, abdomen 17-29 mm, hindwing 20-35 mm.



Figure 289. A fresh *Trithemis annulata* female.



Figure 290. Immature *Trithemis annulata* male.



Figure 291. *Trithemis annulata* males have red veins on the front of their wings.

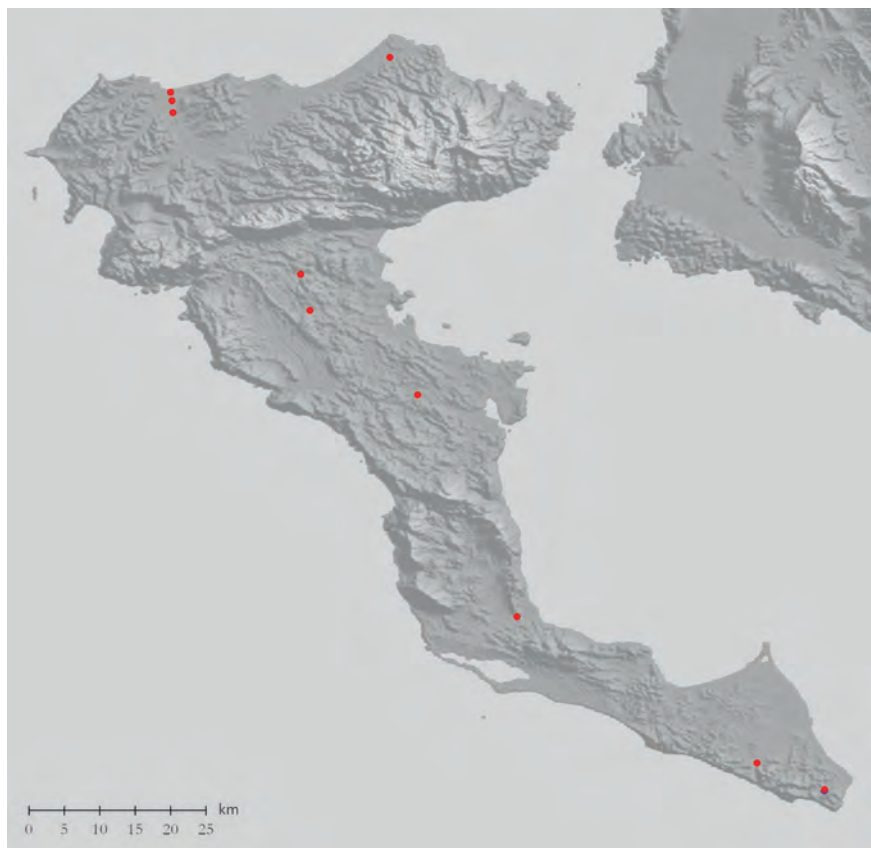


Figure 292. Localities for *Trithemis annulata*.

Summary

Many odonatologists have visited Corfu over the years and species have regularly been added to the list of resident dragonflies, but only a few of these additions can be counted as recent arrivals. In 1983 only 23 species were reported, compared to the in total 43 reported and the 39 found here today. An additional three species, the Yellow-winged Darter (*Sympetrum flaveolum*), the Common Bluet (*Enallagma cyathigerum*) and the Dark Spreadwing (*Lestes macrostigma*) were reported from the island in the early 1900s, but these have not been found since and may well have disappeared. A fourth species, the Turkish Red Damsel (*Ceragrion georgifreyi*), was reported in 1971, but the area where it was found has been much altered in recent years and we have not been able to find it there or anywhere else on the island. However, as it prefers habitats such as seepages and small streams it may still exist in areas that are difficult to find or hard to reach, but it is also possible that it has disappeared due to habitat loss. The later additions to the island's dragonfly fauna, the Violet Dropwing (*Tritthemis annulata*) in 1994, the Black Pennant (*Selysiothemis nigra*) in 2009 and the Bladetail (*Lindenia tetrphylla*) in 2014 are all heat-loving species with migratory tendencies that most probably have colonised the island recently. The first is an aggressive species that has spread to many waters on the island, while the other two are confined to a reservoir in the south. The Black Pennant population seems to be well established, but it is still too early to tell if the same is true for the Bladetail.

One of the goals of this book has been to find out how different species are distributed on the island, and to get a first indication of species incidence. Corfu has a high dragonfly species richness (many species present), but the number of species varies considerably between localities or habitats and some species have high incidence, i.e. are found in many localities, while others are restricted to a few. This is expected since many species have different requirements, and some are more tolerant and more generalistic in their choice of habitat, while others are much more restricted or specialized. As can be seen from Appendix II, the incidence for the different species varies between one and 33 localities. The Blue Featherleg (*Platynemesis pennipes*) is, by far, the most common species with both high incidence (found at 33 (45 %) of the 74 localities) and high abundance, i.e. many individuals are found at each locality. This species was considered abundant already back in 1983 and it is most probably favoured by the rich occurrence of bramble and similar types of vegetation found growing all over the island. On Corfu, this species seems to prefer waters with richly vegetated banks situated in areas with shrubbery nearby, but it also occurs in quite deeply shaded areas (note that all references to abundance are only rough estimates and that no actual counting of ima-

gines has, as of yet, been undertaken). The Keeled Skimmer (*Orthetrum coerulescens*) is the second most common species and it is found in relatively open habitats and in both running and standing waters. It is abundant and often co-occurs with species such as the Southern Skimmer (*O. brunneum*) and the Blue Chaser (*Libellula fulva*), to mention but a few. Both species are abundant when found. The Beautiful Demoiselle (*Calopteryx virgo*) is another common species with high incidence and so are the Common Bluetail (*Ischnura elegans*) and the Broad Scarlet (*Crocothemis erythraea*), but the latter is less abundant. Among the Darters the Common Darter (*Sympetrum striolatum*) lives up to its name being the most common. It occurs in great abundance during autumn and quickly colonizes waters where vegetation has been cleared so that sun and light can reach the water surface.

Six species are found at five (7%) localities or less, and of these the Vagrant Emperor (*Anax ephippiger*) is a migratory species that has only been recorded by us once, and it is doubtful if it reproduces on the island. The Bladetail (*Lindenia tetraphylla*) and the Black Pennant (*Sehiothemis nigra*) are recent arrivals and the latter is abundant and seems to have become well established at the Moschopoulou Reservoir in the south of Corfu. The Bladetail occurs at the same water but is much less abundant, only five to ten individuals have been observed at each survey. The Common Winter Damsel (*Sympecma fusca*) is a widespread species throughout Europe and can be found in nearby Albania and on the Greek mainland. It was reported from Corfu in 1939 but was considered to have disappeared. However, we have found it, but at another location than that from where it was originally reported. It is possible that this species is present in other places on the island but has been overlooked since it is very inconspicuous, both in colour and behaviour. It flies low in the vegetation, which turns yellow and dry quite early in the season, and the dragonfly can therefore be difficult to spot.

The Dainty Bluet (*Coenagrion scitulum*) was not reported from Corfu until 2012 when it was observed at two localities, Gaiderana in central Corfu and the Moschopoulou Reservoir near Kavos in the south. It was found in very low abundance when first encountered, as has been the case when we resurveyed the same localities. We have so far not encountered it at any of the other surveyed waters. The Dainty Bluet has a patchy distribution in Europe and it prefers sunny, standing or slow flowing waters rich in aquatic vegetation and these habitats are not common on Corfu anymore. The adults we have encountered flew quite a distance from the water and it is possible that they spread out over nearby areas to hunt. They may also be difficult to find if you do not survey the area at the right time, i.e. either when they first emerge or when they mate. This may well be a rare and threatened species on Corfu, but the areas around Gaiderana and Gavrolimni have to be more thoroughly sur-

veyed to be able to establish their status. The Azure Bluet (*Coenagrion puella*) is another uncommon species that has only been reported from the Foniassa River. This species also occurs in low abundance and a larger stretch of this long river and its tributaries (The Melissoudi River system) need to be surveyed in many different areas to be able to assess its status. The Azure Bluet reproduces in a variety of waters in Europe but prefers waters with aquatic vegetation. The Variable Bluet (*C. pulchellum*) is much scarcer in Europe than the Azure Bluet, but on Corfu the opposite seems to be the case and it has both a higher incidence (four localities, 5%) as well as a higher abundance. This species is especially abundant in the Ropa River in areas close to the golf-course, but dredging and clearing of vegetation on the river banks have been carried out in the summer of 2017, and it is too early to tell if this will affect this and other dragonflies in the area negatively.

The Blue-eye (*Erythromma lindenii*), The Eastern Spectre (*Caliaeschna microstigma*) and the Small Redeye (*Erythromma viridulum*) are other species with low incidence, but with either moderate or high abundance when encountered. It is, at least theoretically, possible that some of these species may be found in additional places since there are potentially suitable waters still to be surveyed. The Banded Demoiselle (*Calopteryx splendens*) was believed to have disappeared from Corfu when the island's dragonfly fauna was reviewed in 2010. It had then not been reported since 1965 and only from one locality in the south. We have encountered this species at three localities and at two of these it co-occurs with its close relative, the Beautiful Demoiselle (*Calopteryx virgo*), which is Corfu's third most common dragonfly and also the most abundant of the two. Furthermore, the Beautiful Demoiselle is more shade-tolerant and therefore able to breed in larger stretches of the rivers, while the Banded Demoiselle needs more open or somewhat wider parts of the river to thrive. It is possible that it used to be more common in areas closer to the mouth of some of the rivers, but that these areas either have become too developed or too polluted for the dragonflies to be able to breed there.

The Greek Red Damsel (*Pyrrosoma elisabethae*) is listed as a Critically Endangered species in the European and the EU27 Red Lists and as Endangered in the Mediterranean one. It was reported from the Perama area in 1978 and 1981, but it has not been found there again in later conducted surveys. It has also been reported from other localities where it later seems to have disappeared. We have recorded it at six localities so far, all small runlets with richly vegetated banks shaded by trees, but these localities also have adjacent semi-shaded meadows where the dragonfly can be found hunting in the vegetation. To be able to survey this species, the time of its emergence must be pinpointed and areas adjacent to or beyond the breeding waters examined.

The Turkish Clubtail (*Gomphus schneiderii*), the Small Pincertail (*Onychogom-*

plus forcipatus) and the Balkan Emerald (*Somatochlora meridionalis*) are examples of dragonflies that have been found at new localities as more surveys have been conducted. The abundance of the Small Pincertail is moderate, while the other two species only have been encountered a few at the time in each of the localities. All of the above species fly in shaded areas, but the Small Pincertail utilizes more open locations such as small sunny glades along an otherwise shaded river. The Yellow-spotted Emerald (*Somatochlora flavomaculata*) has a patchy distribution in south-eastern Europe and this is also the case on Corfu. This species flies in the reed belt of small ponds or lakes and is never encountered in abundance.

Many of the localities that were visited and surveyed by odonatologists between 1940 and 1980 have changed considerably over the last decades. The area surrounding the wetlands at the Chalikiopoulou Lagoon has been heavily developed and so has the nearby Perama area. The coastal wetlands at Gouvia and Ipsos have shrunk due to the rapidly increasing tourism and the construction of hotels and other tourist venues. The same applies to the long stretch of wetlands along the northern coast from Acharavi to Sidari. The Ropa Valley previously contained extensive wetlands, but it has been drained for cultivation on several occasions during the 19th century. Some areas of the island have not been surveyed until quite recently and it is therefore impossible to draw any conclusions on the previous status of the species found there today.

The Corfu landscape is hugely influenced by human activities. Olive cultivation on a large scale was introduced by the Venetians in the 1700s and today olive groves cover large parts of the island. Drainage of wetlands and meadows has been carried out for centuries and open ditches and drainage canals are found in most of the valleys. Travellers have always been drawn to the island, but serious tourism did not begin until the 1960s and 70s. Today tourism is the main source of income and according to the Hellenic Statistical Authority (ELSTAT) about 1,4 million people visited the island in 2016, counting only people arriving via the airport (including both domestic and international passengers). In addition, approximately 800 000 embarking passengers (including Corfu residents) arrived on ferries, and of the approximately 600 000 cruise-ships passengers some 60% embarked.

The resident population has also increased during the last 30 years and many areas, as mentioned above, are heavily developed today. The seasonal and the permanent increase of people have both not only led to the destruction of many dragonfly habitats, but has also put severe pressure on the island's water supply and garbage handling.

The average annual precipitation on Corfu is high (around 1100 mm, Fig. 4, p. 10), but there is substantial variation between years. The effect of the increasing temperature on the water situation is unclear but may well be a

negative factor due to e.g. higher water evaporation. Precipitation for December 2016 and 2017 was exceptionally low (3 mm) and in combination with the hot summer of 2017 this caused many of the small ponds and lakes, which normally contain water permanently, to dry out completely. Fortunately, the winter of 2017-18 has been wet so there is hope that the groundwater level will be restored and that there will be enough water for the dragonflies and other aquatic fauna to be able to breed successfully This said, there is a serious and urgent need to take measures to preserve the island's water-supply and to decrease the amount of water consumption.

Pollution of waters is another problem and even if there is no heavy industry on the island, waters get polluted by sewage from households and hotels. If large amount of waste water from olive-presses are allowed to drain directly into rivers and other waters, it may become a risk to the aquatic fauna,



Figure 293. Garbage dumping in or close to water is sadly a common sight on Corfu.

which may suffocate when oily water becomes trapped in stretches of the river where pools of standing water are formed. Agricultural pesticides and the occurrence of eutrophication are other occurring problems, as are infilling of small ponds and temporary wetlands by rubble and garbage.

It is not only the pollution and loss of waters that have become a problem

on Corfu, but also the constant increase in the amount of garbage accumulating on the island and the lack of a functioning and sustainable disposal or recycling of household and hotel waste. The current, 30-year-old, garbage landfill, which has been declared illegal, is situated in the Onofrious Valley, a very sensitive area with several small lakes, ponds and wetlands. It is highly probable that the leakage from the landfill has negatively affected the quality of the waters in this area.

Adding to the problem is the apparent lack of respect or regard for natural waters in general. Fly-tipping is common, and garbage is often disposed of in storm-drains, small rivers and ponds. Some small coastal wetlands are filled-in by seaweed that is removed from the beaches as the importance of those waters for the island's amphibious fauna is not understood and respected. Many of the small wetlands on the island are actually protected by Greek domestic legislation, a fact that does not seem to be generally known.

Free access to clean water is something that many people take for granted, and water is often freely wasted without thinking about the consequences. In times of increasing temperature and tourism this behaviour is irresponsible, especially not on a small Mediterranean island. Corfu may be blessed with high winter rainfall, but if the consumption and pollution of water continue the situation may soon become severe, not only for the resident dragonflies and other aquatic fauna, but also for people and especially for those depending on tourism for their livelihood. This also relates to the garbage problem where a sustainable solution is critical and must be dealt with quickly, both for the sake of the island's fauna and for the sake of the people living here.

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- The WWF Greece inventory report “Greek Island Wetlands Database”. http://www.oikoskopio.gr/ygrotopio/index.php?lang=en_US

Appendix I

Flight (blue) and mating (M) observations and number of localities on Corfu 2012-2017 for the 43 species of Odonata reported from the island (Total number of localities of the present study = 74) .

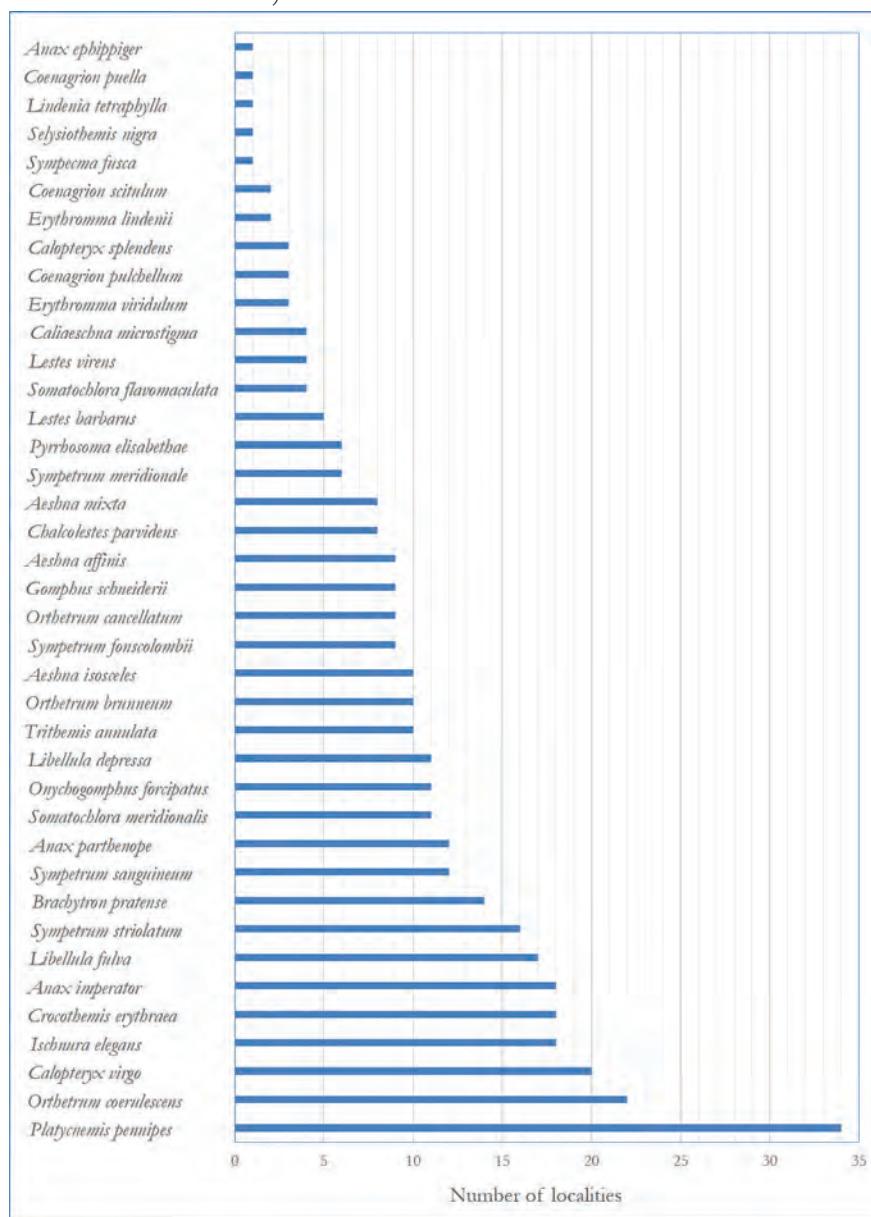
Species	January	February	March	April	May	June	July	August	September	October	November	December	No of localities
<i>Aeshna affinis</i>													9
<i>Aeshna isoeles</i>													10
<i>Aeshna mixta</i>									M	M	M		8
<i>Anax ephippiger</i>													1
<i>Anax imperator</i>					M								18
<i>Anax parthenope</i>					M				M				12
<i>Brachytron pratense</i>				M									14
<i>Caliaeschna microstigma</i>													4
<i>Calopteryx splendens</i>													3
<i>Calopteryx virgo</i>						M							20
<i>Ceragrion georgifreyi</i>													0
<i>Chalcolestes parvidens</i>									M	M	M		8
<i>Coenagrion puella</i>					M								1
<i>Coenagrion pulchellum</i>				M	M	M							3
<i>Coenagrion scitulum</i>													2
<i>Crocothemis erythraea</i>													18
<i>Enallagma cyathigerum</i>													0
<i>Erythromma lindenii</i>					M		M						2
<i>Erythromma viridulum</i>													3
<i>Gomphus schneiderii</i>													9
<i>Ischnura elegans</i>				M	M		M	M		M			18
<i>Lestes barbarus</i>													5

Appendix I: Species activity

Species	January	February	March	April	May	June	July	August	September	October	November	December	No of localities
<i>Lestes macrostigma</i>													0
<i>Lestes virens</i>											M		4
<i>Libellula depressa</i>					M								11
<i>Libellula fulva</i>						M							17
<i>Lindenia tetraphylla</i>													1
<i>Onychogomphus forcipatus</i>													11
<i>Orthetrum brunneum</i>					M		M			M			10
<i>Orthetrum cancellatum</i>					M								9
<i>Orthetrum coerulescens</i>						M	M	M	M				22
<i>Platynemesis pennipes</i>					M	M	M	M					34
<i>Pyrrhosoma elisabethae</i>					M								6
<i>Sehysiothemis nigra</i>													1
<i>Somatoclora flavomaculata</i>													4
<i>Somatoclora meridionalis</i>													11
<i>Sympetma fusca</i>													1
<i>Sympetrum flaveolum</i>													0
<i>Sympetrum fonscolombii</i>									M	M			9
<i>Sympetrum meridionale</i>												M	6
<i>Sympetrum sanguineum</i>													12
<i>Sympetrum striolatum</i>									M	M	M		16
<i>Trithemis annulata</i>													10

Appendix II

Number of localities for the 39 species of Odonata presently found on Corfu (Total number of localities = 74).



Appendix III

WWF Greece: Inventory report Greek Island Wetlands Database (No = Y222KER (Kerkyra) number; PD = protected by Greek Presidential Decree 229/2012; Fresh < 5 psu; Brackish 5-18 psu; Saline >18 psu).

Type/Name	Area	Water	No	PD
Small lakes and ponds				
Akoli Pond	1.48	Brackish	31	x
Anemomylos Marsh	1.71	Fresh	20	x
Beleniotes Pond	1.09	Fresh	56	x
Bertanou Lake	6.16	Fresh	23	x
Boutsouli Pond	3.25	Fresh	43	x
Chyta Pond	0.95	Fresh	49	x
Erimitis/Savoura Marsh	2.46	Fresh	32	x
Gaidarana Marsh	23.29	Fresh	28	
Gavrolimni Lake	5.19	Fresh	27	x
Katapinos Plateau	3.74	Fresh	48	x
Kerkyra Golf Ponds	4.02	Fresh	21	
Kloudatiki Pond	1.80	Fresh	50	x
Korission Lake	613.22	Salty	14	
Kounopina Pond	1.9	Fresh	29	x
Limnopoula Kanavou	0.65	Fresh	62	
Makris Pond	0.75	Fresh	33	x
Martis Pond	9.20	Fresh	45	
Skoteini Pond	4.42	Fresh	22	x
Syvilatika Pond	1.51	Fresh	53	x
Temploni Pond	4.45	Fresh	54	x
Vatos Pond	0.63	Fresh	60	
Vromolimni	1.45	Brackish	30	x
Inland marshes				
Fontana Marsh (Fundana)	11.24	Fresh	51	
Koritoi Marsh	2.06	Fresh	52	x

Appendix III: WWF Greek wetlands

Lagoons				
Antiniotisa Lagoon	98.72	Salty	35	
Chalikiopoulo Lagoon	266.38	Salty	15	
Reservoirs				
Chyta Reservoir	0.15	Fresh	59	
Moschopoulou Reservoir	2.93	Fresh	1	
Coastal marshes and estuaries				
Akrotiri Tourko Marsh	1.68	Brackish	19	x
Almyros Marsh	19.87	Brackish	37	
Alykes Potamos Bay	8.32	Salty	17	
Alykes Saltpans and Marshland	141.27	Brackish	5	
Apraos Bay Marsh 1	3.06	Brackish	34	x
Apraos Bay Marsh 2	1.08	Brackish	57	x
Astrakeri Marsh	1.67	Brackish	55	x
Douvieris Estuary	0.21	Brackish	42	
Fonissa Estuary	0.96	Brackish	36	x
Gardenas Estuary	1.17	Brackish	9	
Gouvía Marsh	2.57	Salty	24	x
Gouvies Marsh	6.72	Salty	18	x
Griti Estuary	2.19	Brackish	7	
Kakismenos Estuary	0.44	Brackish	38	
Kalyviotis marsh	0.12	Brackish	8	
Kavos marsh	10.38	Brackish	2	
Kontokali Marsh	1.96	Brackish	44	x
Loxidas Estuary	0.44	Brackish	41	
Marathias Beach - Estuary 1	0.55	Brackish	11	
Marathias Beach - Estuary 2	0.16	Brackish	10	
Megas Estuary	1.16	Brackish	47	
Messongi Estuary	1.86	Brackish	13	
Molos Marsh	0.79	Brackish	6	
Petríti Beach Estuary	1.32	Brackish	12	x

Appendix III: WWF Greek wetlands

Potami Estuary Bouka	17.99	Brackish	4	
Potamos Estuary	7.01	Brackish	16	x
Stravopotamos Estuary	5.36	Brackish	25	x
Vogas Estuary	0.19	Brackish	61	



Figure 294. Keeled Skimmer (*Orthetrum coerulescens*).

