

Dragonflies of the Golfo Dulce Region, Costa Rica

Piedras Blancas National Park
“Regenwald der Österreicher”

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Contents

The “Tropical Research Station La Gamba”	4
The rainforests of the Golfo Dulce region	6
Introduction	8
History and diversity of dragonflies	8
Adults and larvae	8
Life cycle	9
Morphology of the adult	10
Identification	11
Tropical dragonflies	11
Odonatological field trips around La Gamba	12
Forests	12
Cultivated landscapes	13
Forest margins	13
Zygoptera	14
Polythoridae	14
Calopterygidae	16
Megapodagrionidae	18
Pseudostigmatidae	20
Protoneuridae	21
Coenagrionidae	23
Anisoptera	28
Gomphidae	28
Libellulidae	29
Diversity of dragonflies in La Gamba	50
Acknowledgements	50
References	51
Dragonflies on the web	51
Picture credits	52

The „Tropical Research Station La Gamba“

Roland Albert

Secretary General of the „Society for the Preservation of the Tropical Research Station La Gamba“
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The main building of the Tropical Research Station

In 1991, Michael Schnitzler, a distinguished musician and former professor at the University of Music and Performing Arts in Vienna, founded the "Association Rainforest of the Austrians" (*Verein Regenwald der Österreicher*). Over many years, he collected contributions in Austria and forwarded the funds to the Costa Rican government. With the money, the government purchased large tracts of forest from landowners and placed it under the control of the "Parque Nacional Piedras Blancas", thereby preserving the Esquinas Rainforest in southwestern Costa Rica. It soon became apparent that this protected area also provided ideal conditions for promoting Austrian research and teaching programmes in rainforests.

To make the area more accessible, the "Association Rainforest of the Austrians" bought an old farmhouse (a *finca*) in 1993. This formed the nucleus for a tropical field station, located directly on the border of the National Park near the small village of La Gamba. With the support of the "Association Rainforest of the Austrians", the Ministry of Science and Research and the University of Vienna, the "Tropical Research

Station La Gamba" flourished and grew. It now comprises several buildings and includes comfortable living and research facilities for more than 30 visitors as well as a botanical garden. In 2008 an air-conditioned laboratory was constructed with the support of the Faculty of Life Sciences of the University of Vienna. With its infrastructure, the field station is currently on the threshold of becoming an internationally established research institution and education centre, focussing on the exploration and conservation of Neotropical rainforests. Since its foundation, many scientists have carried out field research in the Esquinas rainforest and many visitors have admired its beautiful surroundings.

As well as supporting research and teaching activities, the station helps the inhabitants of La Gamba by means of a series of applied projects to improve their living conditions. These projects are partly run in collaboration with the nearby "Esquinas Rainforest Lodge", another brainchild of Michael Schnitzler, which represents an Austrian example of sustainable ecotourism. Indeed, the lodge was recently awarded the official Costa Rican "Three-Leaf Certificate of Sustainable Tourism". We are particularly proud that the former European Commissioner for Agriculture, Dr. Franz Fischler, has been a patron of the "Society for the Preservation of the Tropical Station La Gamba" (*Verein zur Förderung der Tropenstation La Gamba*) since 2006.

Numerous scientific publications have resulted from research performed at the Tropical Research Station La Gamba, including about 60 doctoral and diploma theses. The scientific work initially focussed on the flora and vegetation of the Esquinas forest but it has now broadened to



Students crossing the Rio Bonito during a field course

include a wide range of other topics, such as animal-plant interactions, herpetology, ornithology, entomology (especially studies of butterflies), limnology, chemical eco-physiology, bio-geochemistry, geography and sociology. About 50 field courses and excursions have been organized, enabling students and scientists from universities all over the world to visit the Piedras Blancas National Park.

Our Society is particularly interested in providing all our visitors, and beyond that the many friends and admirers of the tropics, with information on the biology and ecology of the local and regional rainforests and of the adjacent cultural land. Following the publication of an internationally acclaimed "Field Guide of Flowering Plants of the Golfo Dulce Rainforests" in 2001, five colourful brochures have to date been published: "Amphibians and Reptiles of the Golfo Dulce Region", "The Birds of the Golfo Dulce Region, Costa Rica", "Das Leben hier und dort - La vida aquí y allá", "Ecosystem diversity in the Piedras Blancas National Park and adjacent areas (Costa Rica)" and "Fruits in Costa Rican Markets", as well as a scientific monograph "Natural and Cultural History of the Golfo Dulce Region, Costa Rica",.

We are now proud to offer a further colourful issue dealing with a group of animals - the dragonflies - that may at first sight appear less obvious than the region's birds, amphibians or reptiles. However, due to its high precipitation the region of La Gamba, with its numerous ponds, runoffs and brooks, harbours a huge diversity of these beautiful animals. We owe the appearance of this booklet to Stefan Schneeweis, who has enthusiastically carefully gathered information and photographic records from the ecologically diverse surroundings of La Gamba, where primary and secondary rainforests are closely associated with cultivated land. A booklet on "Corbiculate bees of the Golfo Dulce region, Costa Rica" is being published simultaneously.

It is our hope that this booklet - as our former brochures and books - will be a source of information and joy to lovers of tropical life, to scholars and students, to teachers and researchers at the University and - finally - to all the friends of the "Rainforest of the Austrians" and the "Tropical Research Station La Gamba".

For further information see:
www.lagamba.at
www.regenwald.at



The "Comedor"



Scientists in the air-conditioned laboratory



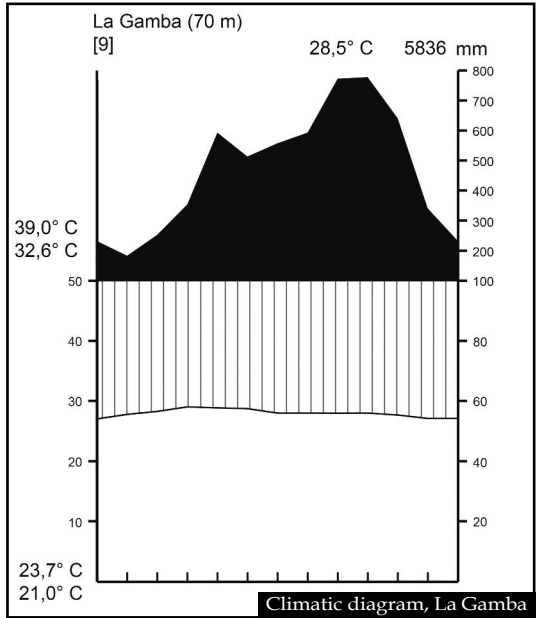
The pond in the garden of the station

The rainforests of the Golfo Dulce region

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The Golfo Dulce region is located in the southern corner of the Pacific coast of Costa Rica, near the border with Panama. Within this region are the Corcovado and Piedras Blancas national parks. The forests of the region are the only moist or wet evergreen lowland forests that still exist on the Pacific coast of Central America. The elevations range from sea level to 745 m on the Cerro Rincón, Península de Osa; the annual precipitation is up to 6,000 mm with a short or almost nonexistent dry season from December until March; the relief is strongly structured at the



Morning clouds above the forest

landscape level and contains many microhabitats and niches; and the soil types are diverse and the vegetation highly dynamic. All of these factors, coupled with the biogeographical position of the Golfo Dulce, have led to a very species-rich forest: about 2,700 species of higher plant have been recorded from the area.

The tallest trees in the moist and wet evergreen lowland forests grow up to 60 m high



Waterfall on the Quebrada Chorro



Students with a huge tree with buttress roots in the forest

(e.g. *Anacardium excelsum*, *Parkia pendula*, *Carapa guianensis*, *Brosimum utile* and *Caryocar costaricense*). Most trees retain their foliage throughout the year. Palms (about 45 species) such as *Socratea exorrhiza*, *Iriartea deltoidea*, *Welfia regia* and *Asterogyne martiana* are typical features of the forest. *Heliconia* herbs are obvious near streams and in gaps. Lianas (e.g. *Bauhinia* and *Entada*), vines and epiphytes (Bromeliaceae, Orchidaceae) are found on many trees. About 100 species of orchid (e.g. vanilla) and 40 species of bromeliad are distributed in the region.

Hemi-epiphytic plants of the genus *Clusia* are abundant in the very wet parts of the forest while fig trees (*Ficus*) are more frequent in the drier regions (on the Corcovado plains). On the coast, the coconut palm (*Cocos nucifera*) and the "tropical almond tree" (*Terminalia catappa*) are the most conspicuous plants; in the mangroves this position is taken by red man-

grove (*Rhizophora mangle*) and mangle pinuela (*Pelliciera rhizophorae*). In addition to the various types of primary and secondary forest, the area also features other types of habitat such as pastures, pools, rivers, cultivated land and various kinds of plantation (e.g. oil palm, teak and manioc). Bees are very abundant and are found in all habitats.

Costa Rica's geographic location on the 'bridge' between North and South America and the fact that the country formed a kind of refuge for tropical animals and plants during the last ice age has led to remarkable biogeographical patterns. Restricted-range plants and animals are abundant and many reach their northern limits in southern Costa Rica. The region is an excellent place for naturalists to enjoy tropical nature. An extensive system of trails in the Corcovado and Piedras Blancas national parks (La Gamba) offers wonderful insights into tropical rainforests.



Interior of the forest of the NP Piedras Blancas

Introduction

Visitors to the La Gamba Research Station will find a rich array of tropical life. As well as an overwhelming diversity of plants, they will see birds and butterflies, two of the most popular and conspicuous groups of animals. Hummingbirds, noisy toucans, and brilliant butterflies like the iridescent *Morpho* or the spectacular *Heliconius* are well known throughout the world. But there are many other groups which are just as recognisable yet not as widely known. Unfortunately there is often a dearth of knowledge about such organisms, and access to the relevant literature is difficult. Sometimes, however, we just need a little help to find them. Dragonflies are skilled fliers, fearless predators, and passionate lovers, and once you notice them, you will find them fascinating.

The ecology and behaviour of the Central American dragonfly fauna has been laid out in detail in the specialist literature (see references), and more interested readers are invited to consult these sources. This booklet is designed as a pocket guide to the identification of the most frequently observed species around La Gamba. The descriptions of characteristics and differences between the species are limited to essential information. Although identification can be difficult, and for some species beyond the scope of this booklet, it should be possible to recognise most of the common species present in the region. For the interested observer, this booklet will serve as an introduction to the diversity of a fascinating group of animals. We hope it will raise awareness of the diversity of dragonflies, but also of how urgently we need to work for their conservation.

History and diversity of dragonflies

The first fossil records of a group called Protodonata, closely resembling today's dragonflies and thought to represent their ancestral form, date from the Upper Carboniferous period 325 million years ago. With a wingspan of 70 cm, *Meganeura monyi* was one of the largest insects ever to have lived on the planet. Today's dragonflies are considerably smaller, but these ancient insects still have a valuable place in the

ecosystem. Today the order Odonata (dragonflies) is divided into three suborders, the most common being the smaller Zygoptera (also known as damselflies) and the larger Anisoptera. A third suborder, the Anisozygoptera, which combines characteristics of the other two groups, is represented by two species in Nepal and Japan.

Approximately 5700 species have been described so far, with almost equal numbers in Zygoptera and Anisoptera. Because larval growth responds positively to temperature, dragonflies are assumed to have developed in a warm climate. Today the greatest diversity is found in tropical regions, declining towards higher latitudes. Areas of the highest diversity are found in South America and South East Asia, especially in montane regions where examples of previously unknown species are often reported.

Adults and larvae

Zygoptera and Anisoptera can be easily identified as adults and larvae. Adult Zygoptera are usually finely built insects with slender abdomens. The eyes are separated and situated laterally on the head. Their fore wings and hind wings are fairly similar in shape and venation, and are held over the abdomen when resting. In flight they are less acrobatic than Anisoptera, and are often found patrolling in dense vegetation near the water's edge. The larvae of Zygoptera are small and slender, this shape often appearing pronounced by the presence of three flattened, elongated and highly tracheate caudal appendages that serve as respiratory organs. Three tropical families form the exception, showing either lateral gills on the abdomen (Euphaeidae and Polythoridae), or gill tufts at the end of the abdomen (Amphipterygidae).

Adult Anisoptera are built robustly, with a long or stout abdomen. Their large eyes cover almost the whole head and meet on top of the head, or they can be slightly separated as in the family Gomphidae. The wings differ in shape and venation and are held open when resting. Anisoptera can be observed perching on exposed structures along banks, or patrolling for hours over the

water surface. The larvae are stout and have three strong spines instead of lamellate appendages. They breathe by 'rectal ventilation', pumping water through the rectum, where a tracheate organ serves for gas exchange. Water can be expelled from the rectum very forcefully, so that the larva swims forward. This 'jet propulsion' is also used to escape predators.

Larvae and adults are predators and fairly opportunistic in their choice for prey, although specialisation does occur (see Pseudostigmatidae). Both developmental stages are perfectly adapted to this lifestyle. Larvae actively search out or ambush their prey, detecting it visually or by touch, and capture it by the rapid protrusion of the modified lower lip (or 'labium') which forms the so-called 'mask'. Adults detect prey with their large eyes. In flight, they can turn quickly, hover, and even fly backwards, since the flight muscles insert directly on the wing base, allowing them to move each pair of wings independently. Even fast-flying prey such as other dragonflies can be captured by their acrobatic manoeuvres, held by their legs, and then manipulated with their sharp mandibles.

Life cycle

Dragonflies are hemimetabolic insects, exhibiting incomplete metamorphosis and lacking a pupal stage like that in butterflies; the adult develops during the last larval stage. Their life cycle comprises three phases: egg, several larval stages, and adult. The larvae live predominantly in fresh water, inhabiting lakes, streams, bogs, and ephemeral water bodies. Only a handful of species are known to develop in the brackish water of marine marshes, or to have terrestrial larvae. Many species are generalists, capable of inhabiting a wide spectrum of freshwater systems. Some species, however, have narrow breeding site requirements and are thus sensitive to disturbances and habitat destruction. Many of these specialists are rare, but they can be used for the assessment of ecological freshwater status.

After mating, the female lays fertilised eggs either on the water (exophytic), or into (sometimes submerged) plants (endophytic). Before oviposition, suitable habitats for development are selected by the adults. During this selection they orientate on envi-

ronmental factors like the reflection of the aquatic surface, and the vegetation structure. After one or more weeks the embryo will have completely developed, and the first larva (prolarva) will be ready to hatch from the egg. Subsequently, having reached the water (in the case of endophytic eggs), the prolarva starts to moult (i.e. to leave the old cuticula), in a process called 'ecdysis'. During the larval phase, which can last from a few weeks up to several years, up to 15 ecdyses are completed, separated by periods of foraging behaviour and growth. In temperate regions, eggs or larvae can display a diapause, a reduction of metabolism and growth during winter.

The final larval stage, at which an adult is contained within the larval skin, sees the larva leaving the water for emergence. This spectacular scene usually takes place shortly before dawn. The larva climbs up a suitable structure, often a piece of aquatic vegetation, and searches for a firm grip with its legs. The larval skin then bursts at pre-formed points, and the young adult leaves the skin. After a short rest the adult unfolds its wings and abdomen by pumping in haemolymph. After emergence, the smooth and shimmering skin first has to harden. Then the dragonfly sets off on its maiden flight, leaving the site of emergence.

Young adults spend their first days on the side of the water in order to build up fat reserves, and to avoid interference from mature and territorial dragonflies. The sexual organs are not yet fully developed, and they start to mature during this period. In some tropical species, when breeding habitats have dried out, this pre-reproductive time can be prolonged for months until the beginning of the next wet season. When the sexual organs have fully developed, the adults turn to suitable water bodies for reproduction.

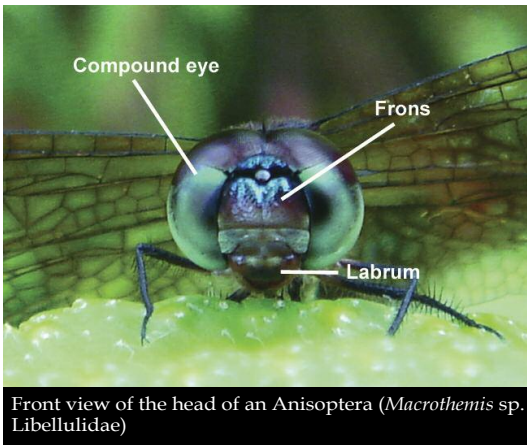
Males spend many days at reproductive sites, where they establish temporary territories that are defended against other males. Females are often dispersed around other habitats and only visit the water bodies for copulation and oviposition. When a female enters a territory, the male flies up and tries to grasp her with the caudal appendages, on the female's thorax in the case of Zygoptera, and on her head in Anisoptera. The male then bends its abdomen forward to transfer

sperm from its sexual organs to its copulation organ. Finally, the female bends her abdomen forward to bring her genitals into contact with the copulation organ of the male, forming the 'wheel of love' (see *Libellula herculea*). With its copulation organ, the male is able to remove sperm from previous copulations with other males and transfer its own sperm into the female. Copulation can take place while airborne or resting, and may take anything from a few seconds to many minutes. The female can start to lay eggs immediately after copulation. Males often guard the female during oviposition, either still attached or hovering next to her, to avoid other males attempting to copulate.

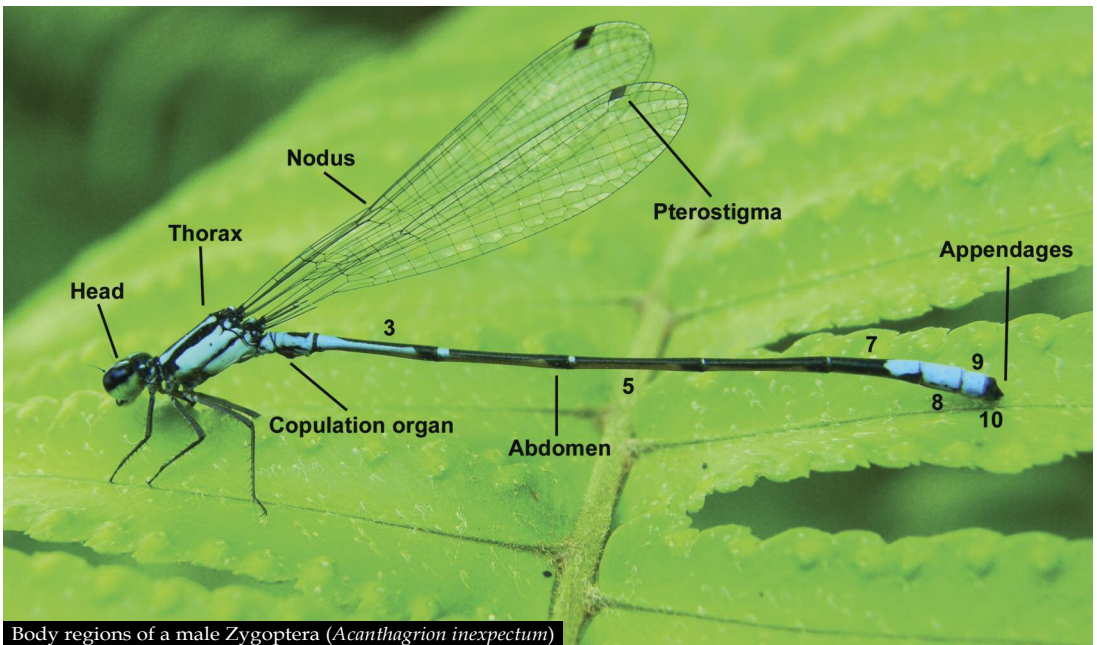
Morphology of the adult

The body of a dragonfly is separated into head, thorax and abdomen. The head bears two large compound eyes, three median ocelli, and two short antennae. Between the eyes, the 'frons' forms the frontal part of the head. Below the frons, the labrum covers the mouthparts, which handle prey. The colouration of eyes, frons, and labrum can be important characteristics for identification. The thorax consists of three segments, each with a pair of legs. The first segment (prothorax) is short. The second and third segments are fused and dorsally inclined backwards, and each has a pair of wings. The wings have five major veins and numerous crossveins. The front margin of the wing is formed by a vein called the 'costa'. Details of venation are variable, but two conspicuous structures are present in all species. The 'nodus' is a strong crossvein, inserted at the front edge of the wing approximately half way along its length. The 'pterostigma' is a dark cell at the distal part of the wing on the costal side. The base of the wing can be narrow for the length of several cells (petiolate), extended, or neither. The colouration and markings on the wings can be helpful characteristics for identification.

The abdomen consists of ten segments of variable length. The first two segments are short, segments 3-7 are long, and segments



Front view of the head of an Anisoptera (*Macrothemis* sp. Libellulidae)



Body regions of a male Zygoptera (*Acanthagrion inexpectum*)

8-10 become shorter again. In males, segments 2 and 3 bear the copulation organ ventrally. Females have ovipositors at the ventral side of segment 8, sometimes extending to the tip of the abdomen, or a small vulvar lamina. At the end of the abdomen are the appendages, two upper and two lower in Zygoptera males, and two upper and one lower in Anisoptera.

Identification

Characteristics for unambiguous identification include wing venation and the structure of the male copulation organ or the ovipositor. Examination of these structures requires specialist knowledge and the ability to capture individuals. Colouration, however, can also be useful for identification, although species-level determination is not always possible. Any individuals observed should be compared with the photographs, sizes, and descriptions of details in this booklet.

Males can be recognised by the presence of a secondary copulation organ at the ventral side of segments 2 and 3 of the abdomen, which forms a small but prominent structure absent in females. Females may have a conspicuous ovipositor on the ventral side at the end of the abdomen. In Anisoptera, the ovipositor may be reduced to a small laminate structure arising from the end of segment 8, and projecting towards segment 9. Males are usually brightly coloured and often have conspicuous markings on the wings. Females are usually dark or brownish yellow and less colourful.

Body and wing measurements may help to distinguish between similarly coloured species of different sizes. The body and abdomen sizes given in this booklet include the caudal appendages. Values given are either means of several individuals, or measurements of single individuals. Individual variation in body proportions can be up to several millimetres, and this should be borne in mind when comparing observed dragonflies with the values given in the description. Measures of size and body parts account for both sexes if not indicated otherwise.

The abundances of species are given for the region around La Gamba, and do not apply to their frequencies in Costa Rica or Central America.

The most frequently observed forms of different species are illustrated in this booklet. If an observed individual does not fit any of the photographs, this may be for one of two reasons. Either the species is not included in the booklet, or the individual is of a different sex or age. The following caveats have to be kept in mind during identification: species of the same genus may be similarly coloured; colouration may differ between males and females of the same species; pre-reproductive males often resemble females and usually become darker before entering the reproductive period; the shallow colouration of recently emerged adults turns into their characteristic pattern after several hours, but wing markings may need longer to become fully developed. Descriptions of immature and mature forms, and males and females, are given in the text wherever they are available. Species closely resembling each other are also mentioned in the text.

The availability of aquatic habitats for larval development constrains reproduction in dragonflies, and consequently the rainy season marks the climax of the reproductive period for many species. Adults of some species may be absent during the dry season, either not yet emerged from their larval stage, or occupying alternative habitats. It is therefore possible that not all species present in the region may be observable during a short visit.

Tropical dragonflies

In both their ecology and behaviour, tropical dragonflies deviate in some ways from temperate species. In montane regions isolation processes have favoured speciation, and diversity in the tropics by far exceeds the number of species in temperate regions. In the tropics, manifold niches have enabled the development of specialised life strategies. The larvae of Neotropical Pseudostigmatidae and some other families, for example, inhabit 'phytotelmata' - water-filled cavities like tree holes or plant tanks. The long abdomen of Pseudostigmatidae females is useful for oviposition into such deep structures. The strategy of migrating species such as *Pantala flavescens* may be linked to the unstable and unpredictable availability of breeding waters in drier regions. This circumtropical species often forms swarms of hundreds of thou-

sands of individuals migrating over long distances in front of rain fronts. The eggs are laid in bodies of water that sometimes persist no longer than a month. This becomes possible due to the speed of embryonic and larval development. In tropical montane forests, turbulent and shaded streams harbour a rich dragonfly fauna. In temperate regions, in contrast, relatively few species are adapted to these special conditions.

The dragonfly fauna of Costa Rica is one of the best-studied in Central America, yet it is still not fully explored. In comparison with

Austria (77 species) and Europe (125 species), Costa Rica is very rich in dragonflies, with 268 currently described species. Many of these dragonflies are part of the North and South American fauna, but a small but significant proportion of Costa Rican dragonflies are endemic to the region, which includes Nicaragua and Panama. *Cora semiopaca*, a species present in La Gamba, is endemic to Costa Rica. The Caribbean slope of the Cordillera seems to harbour more species.

Odonatological field trips around La Gamba

Although dragonflies are often seen flying or resting on vegetation beside water, the easiest way to observe them is at their breeding sites, usually streams or ponds. Odonatological field trips therefore concentrate on aquatic habitats, but these habitats are embedded in a matrix of landscapes that heavily influence the quality of breeding sites. Dragonfly distribution is greatly affected by the drastic difference between undisturbed forests and intensively used agricultural areas and their respective water bodies.

Forests

Forests may originally have been the primary habitat of dragonflies in Costa Rica, and the prevailing conditions may have influenced the mixture of species living in them. Swamps and smaller streams can be completely shaded and flow can be very turbulent, which provides well oxygenated water, but with an increased risk of being carried away by the water. Polythoridae like *Cora semiopaca* prefer these conditions. The forest interior, where *Mecistogaster modesta*



A shaded stream in the forest interior

and *Megaloprepus cerulatus* can be found, is dark, and temperatures are lower than in open habitats, constraining the thermal requirements of adults. Many species living in the forest are shade-loving and are therefore not found in open areas. For a species like *Philogenia zeteki*, the dense understorey may additionally provide protection from predators. Such forest species are specialised to these circumstances, whereas many other species would not be able to survive. Forests have been hit hard by human activity, and the remaining islets surrounded by open landscape may be too small or isolated to sustain populations of forest dragonflies. In forests, on the other hand, degraded and open patches like those caused by tree falls or logging, as well as roads, resemble open landscapes and are often used by species like *Uracis imbuta* which are usually found in open habitats.

Cultivated landscapes

Cultivated landscapes are those artificially shaped by human land use. Bodies of water in these environments are usually exposed to the sun, leading to higher temperatures and lower oxygen levels. Pollution by the inflow of agrochemicals or domestic sewage can influence water quality. Embedded in a matrix of relatively uniform

landscapes including plantations, crop fields and pastures, narrow strips of gallery forest often form the last remnants of primary vegetation. In this dramatically altered landscape, the dragonfly fauna is different, and generalist species like many Libellulidae, which are able to live under a wide range of environmental conditions, prevail. On a small spatial scale, species richness can increase in cultivated areas through the colonisation of these habitats by generalists. Mostly, however, generalist species like *Erythrodiplax fusca* are widespread and common and therefore, on a broader scale, overall richness may be reduced.

Forest margins

Aquatic habitats at forest margins can either resemble forests or open landscapes depending on the type and density of gallery vegetation. Running water along forest margins may be suitable for shade-loving species such as *Heteragrion erythrogastrum*. Artificial ponds can be exposed to the sun and may be colonised by generalist species like *Orthemis ferruginea*. In the garden of the Research Station, several small ponds and rivulets provide habitats for generalists, and some common species can frequently be observed there.



Stream with open canopy surrounded by cultivated areas

Zygoptera

Family Polythoridae (polythorids, polytóridos)

They are medium-sized Zygoptera species with dense wing venation, many antenodal crossveins, and short legs. In contrast to members of the Calopterygidae, the bases of

the wings in Polythoridae are petiolate, the wings are relatively narrow, and males lack red colouration at the base. Females are light to dark brown. Polythoridae are shade-loving dragonflies that live beside streams in undisturbed forests. The larvae have lateral gills on the abdomen.

Cora notoxantha

size: 39 mm, abdomen: 31 mm, fore wing: 25 mm

The thorax of the **male** is bright yellow or blue, with a thin black mid-dorsal line in some individuals. Blue coloured individuals may be confused with *Cora marina*, a species

common in Central America, but in that species the abdomen is almost blue dorsally. The eyes are dark and the face is white. This species is known from Costa Rica and Panama.

We found this rare species beside a forest stream



Cora notoxantha male

Cora semiopaca

size: 35 mm, abdomen: 27 mm, fore wing: 27 mm

This stream-dwelling species is endemic to Costa Rica. The **male** has characteristic reflective zones on the wings, and dark bands on the distal parts of the wings. In the dark forest understory, the shimmering blue reflections may attract females that are searching for mating partners and suitable sites for oviposition. The face is white. The **female** in this photograph was not identified to the species level but is likely to be a female of *Cora semiopaca*; most females in the genus look simi-

lar. This stream-dwelling species may be threatened by disturbance due to its small range size.

We found this rare species beside a stream running through a shaded ravine.



Cora semiopaca male



Cora sp. female

Family Calopterygidae (rubyspots, calopterígidos, Prachtlibellen)

Calopterygidae are large Zygoptera with long legs, dense wing venation and many antenodal crossveins (crossveins inserting at the costa between the wing base and the nodus). In contrast to species of the family Polythoridae, the base of wings is not petiolate. **Males** of the Costa Rican species have basal red markings on their wings, a metallic copper sheen on the thorax and a dark

abdomen. **Females** are either similarly coloured, or metallic green with yellow lines on the thorax. Many species look similar and identification usually requires examination of the caudal appendages. Calopterygidae perch on vegetation overhanging the water. They are common along rivers in forests and open landscapes, but it is not clear how many species of this family live around La Gamba. There are probably more than five species.

Hetaerina fuscoguttata

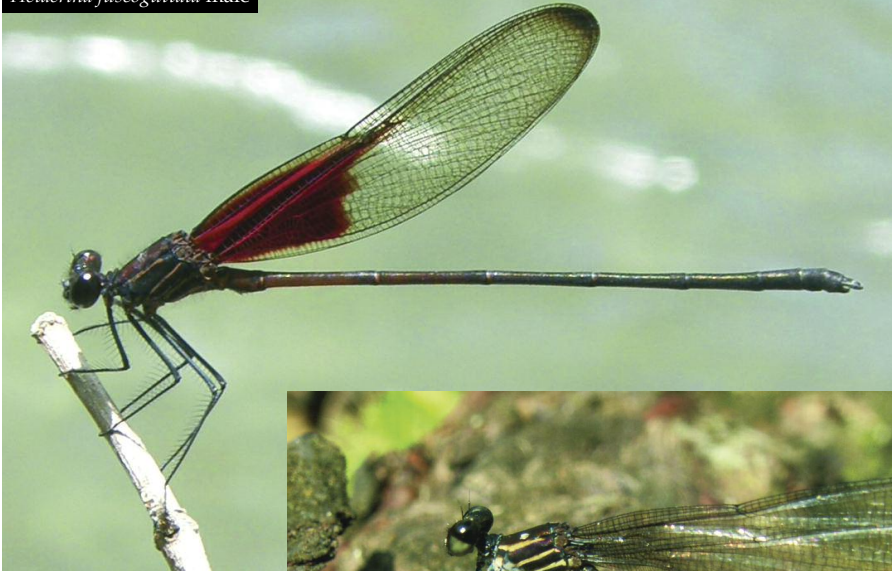
size: male 51 mm, female 41 mm,
fore wing: male 28 mm, female 28 mm

Males are dark red with yellow stripes on the thorax. They resemble males of *Hetaerina occisa*, from which they can be distinguished

by the extent of the red markings on the wing, which usually reach the level of the nodus in *H. fuscoguttata*. The marking at the wing tip is diffuse. **Females** are dark metallic in colour, with yellow stripes on the thorax. Both sexes can be observed along streams where they perch on the riparian vegetation

in large numbers. The species' distribution ranges from Costa Rica to Colombia and Ecuador. We found this common species beside streams in all habitats.

Hetaerina fuscoguttata male



Hetaerina fuscoguttata female

Hetaerina occisa

size: male 44 mm, female: 37 mm

fore wing: 25 mm

Males have a metallic copper colour with yellow stripes on the thorax. They are characterised by their long lower appendages, widened distally.

They may be confused with

Hetaerina fuscoguttata, but the red wing marking does not usually reach the level of the nodus and the dark spot on the tip is discrete.

Females are metallic green with pale areas on the thorax.

They usually have a small white pterostigma, which is absent in some females of the genus. Like *H. fuscoguttata*, this species can be abundant, perching on the bank

vegetation. Males display in short patrol flights and attack intruders or the owners of neighbouring territories. This species is distributed from Mexico to Venezuela.

We found this common species beside streams in forests, along the forest margin and in open areas.

Hetaerina occisa male



Hetaerina occisa female

Family Megapodagrionidae (megapodagrionids, megapodagriónidos)

Megapodagrionidae are medium-sized to large Zygoptera with much diversity in size and colouration. Many species are uniformly dark while others are brightly coloured.

Heteragrion erythrogastrum

size: male 46 mm, fore wing: 23 mm

A Large Zygoptera with eyes dark above. The thorax has pale brown sides and a dark colouration dorsally.

Males have a red abdomen, **females** are light brown coloured.

H. erythrogastrum can be distinguished from other species of the genus by its dark labrum. This species prefers shaded sections of running waters. Males have a red coloured abdomen, however, they may be difficult to detect perching on shaded vegetation. In its typical resting position the male clinches to a leaf and the abdomen hangs beyond the leaf's tip. The wings are held open when resting, a behaviour known for some species of this

Although some species may be abundant at suitable sites, Megapodagrionidae are not often seen and the ecology of many species is poorly known. They live beside streams in relatively undisturbed areas, or dispersed in the forest. The species of both genera usually perch with their wings open.

family and the family Lestidae. This species can be found from Honduras to Ecuador.

We found this common species beside several streams in forests and along forest margins.



Heteragrion erythrogastrum male

Philogenia zeteki

size: 54 mm, fore wing: 34 mm

A large, dark species with a white labrum and a contrasting white spot at the end of the abdomen. This species can be found some distance from watercourses, along forest trails, where it is difficult to see when resting motionless. Both sexes look alike. It is distributed in Costa Rica and Panama.

We found this rare species along forest trails.



Philogenia zeteki male

Family Pseudostigmatidae (helicopter damselflies, pseudostigmatidos)

Species of this predominantly Neotropical family are characterised by their large size: *Megaloprepus caerulatus* has the largest wingspan of any dragonfly or damselfly. The abdomen is long and slender. Larvae inhabit phytotelmata and it is the only family known

Mecistogaster modesta

size: 65 mm, abdomen: 56 mm, fore wing: 40 mm

This is a very large Zygoptera species with an elongated abdomen and white markings on the wing tips. The basic colouration is dark, with three yellow lines on the sides of thorax and two yellow spots on the rear of the head. Both sexes look alike. This species can be confused with *Mecistogaster linearis*,

to show facultative specialisation to prey. Adults prey on spiders, hovering in front of the web and striking the spider in a rapid attack. Light effects created by the marked wing tips give their flight a special aspect, and for this reason they are known as 'helicopter dragonflies'. Pseudostigmatidae are found within the forest where they can sometimes be seen in natural clearings.

which also has white wing tips, but the abdomen of the latter species is longer. Another species in the region, *Megaloprepus caerulatus*, is even larger, with black and white markings on the wing tips. *Mecistogaster modesta* ranges from Mexico to Venezuela.

We found this rare species at light gaps in the forest.



Mecistogaster modesta female

Family Protoneuridae (threadtails, protonéuridos)

The species of this family are small, with a slender and often long abdomen. Some males are red in colour, but they are smaller than *Heteragrion* and do not hold their wings

Neoneura esthera

size: 50 mm, abdomen: 40 mm, fore wing: 30 mm

This is a slender, medium-sized Zygoptera species. The **male's** thorax is red with a thin black mid-dorsal line, and paler sides that can become greenish. The abdomen is red or orange with small black areas on the last segments. This species has dark eyes, and a red

open when resting. They can be found beside streams in slightly disturbed areas. The colouration is different in other genera of the family. *Psaironeura*, which was found beside a stream along the forest margin, is a very small species with red eyes and a slender, dark, metallic-coloured abdomen.

and black pattern behind the eyes. The abdomen is shorter in relation to the wings than in *Protoneura*. **Females** are less brightly coloured, and large areas of the abdomen are black. *Neoneura esthera* is found from Costa Rica to Venezuela.

We found this rare species beside a stream in a cultivated area.



Neoneura esthera male

Protoneura amatoria

size: 37 mm

This is a small Zygoptera species. **Males** have a bright red to orange abdomen with small black markings. The thorax is red with broad black stripes. The eyes are red above and the rear of the head is black. **Females** are

a duller orange. The abdomen is longer in relation to the folded wings than in *Neoneura*. Tandems of this delicate species are inconspicuous as they fly close to the water surface. *Protoneura amatoria* is distributed from Guatemala to Venezuela. We found this rare species beside a stream in a cultivated area



Family Coenagrionidae (pond damselflies, coenagriónidos, Schlanklibellen)

The small and medium-sized species of the family Coenagrionidae, the largest family in the Zygoptera, occupy all types of aquatic habitats. **Males** are often blue with a black pattern on the thorax and abdomen. Some species are a metallic copper colour on the thorax. **Females** are pale rather than blue, and have larger black areas on their abdomen. Other species are mostly red or

Acanthagrion inexpectum

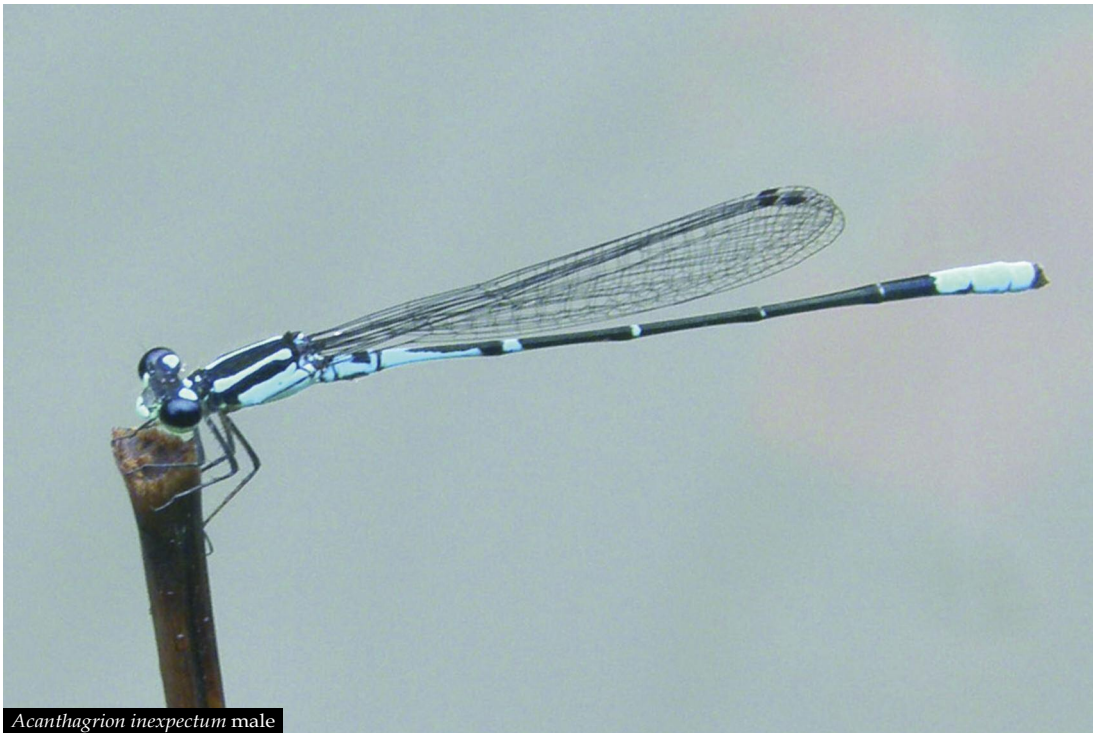
size: 32 mm, abdomen: 26 mm, fore wing: 18 mm

This is a medium-sized Zygoptera species. **Males** are blue with a black pattern, and look very similar to *Argia*. The male has a black mid-dorsal line or stripe on segment 3, which does not reach segment 2. The distal halves

otherwise dark. In contrast to the males, which can often be identified to species level by the characteristic blue and black patterns on the abdomen, females look very alike across most of the Coenagrionidae, and are best identified when seen in tandem with a male during mating. Many species look very similar and are difficult to identify. They rest on or patrol along the riparian vegetation. Females are often seen laying their eggs into plants while still engaged with the male in the tandem position.

of segments 7, 8 and 9 are blue, while the rest of the abdomen is black. **Females** have a black abdomen except for the last two segments, which are pale. The thorax is pale with broad black stripes.

We found this moderately abundant species beside streams in open areas.



Acanthagrion inexpectum male

Argia sp.

size: 33 mm, fore wing: 20 mm

This genus is very rich in species, and unfortunately, the systematics of this group is chaotic. Many species have very similar colouration and are difficult to identify. **Males** of the genus are blue, with black

stripes on the thorax and a black pattern on the abdomen of varying extent. **Females** are pale green, with black stripes on the thorax and an almost entirely black abdomen. Species of the genus *Argia* can be found in forests and open habitats. They are very common and reproduce along streams and beside ponds.



Argia sp. male



Argia sp. female

Argia cupraurea

size: 38 mm, abdomen: 30 mm, fore wing: 22 mm

This is a medium-sized Zygoptera species. In contrast to other species of this genus, **males** of *Argia cupraurea* are easily identified by their red eyes; the other species in the genus with red eyes are distinctly smaller. The dorsum of the thorax is a brilliant metallic copper colour. **Females** have a black

abdomen with a pale basal ring on each segment. The thorax is greenish with two metallic copper stripes dorsally. In the habitats where this species occurs, it is quite easy to detect due to its relatively large size and the male's red eyes. It is distributed from Honduras to Venezuela.

We found this common species beside streams in cultivated areas and along the forest margin.



Argia cupraurea female



Argia cupraurea male

Enallagma novaehispaniae

size: 31 mm, fore wing: 20 mm

This is a small species. **Males** have pale blue colouration on abdominal segments 1, 2 and 3 except the distal part of segment 3, which is black. Segments 8 and 9 are similarly blue except for a distal black ring on segment 8. The rest of the abdomen is black. The thorax

is metallic blue and violet, with three black lines dorsally. **Females** are similar but less brightly coloured, and lack the bright blue area on segment 3. The abdomen is entirely black except for a proximal blue spot on segment 8. This species is widely distributed from North to South America.

We found this rare species beside streams in cultivated areas.



Enallagma novaehispaniae male



Enallagma novaehispaniae male



Enallagma novaehispaniae female

Ischnura capreolus

size: 22 mm, fore wing: 20 mm

This is one of the smallest dragonflies and is therefore easily overlooked. The **male's** thorax is greenish with broad black stripes. The abdomen is black, except for segment 8 and a small distal blue area on segment 7. Young **females** are bright greenish or yellow on the thorax and on the first two abdominal seg-

ments. Older females have broad black lines on the dorsum of the thorax. Abdominal segment 9 is blue, while the rest are black. The species' range extends from Mexico deep into South America.

We found this moderately abundant species beside a stream in a cultivated area and beside ponds between the station and the lodge.

Ischnura capreolus male



Ischnura capreolus young female

Telebasis sp.

size: male 32 mm

This is a medium-sized Zygoptera species. The eyes are red above and green below, while the labrum is red. The greenish thorax is darker dorsally, and the abdomen is uniformly red in both sexes. *Telebasis* is more robustly built than Protoneuridae. Both sexes look very similar.

We found this rare species at a pond in the garden of the station.



Telebasis sp. male

Anisoptera

Family Gomphidae (clubtails, gónfidios, Keiljungfern)

These are typically large Anisoptera which live in undisturbed habitats. Gomphidae differ from other Anisoptera in having widely separated eyes. The last segments of the

abdomen are broad in the males of all Costa Rican Gomphidae. Though not uncommon, species of this family are seldom seen. Males spend most of their time perching on open banks or vegetation, and rarely patrol on the wing. An encounter with one of these species is a rare and fascinating event.

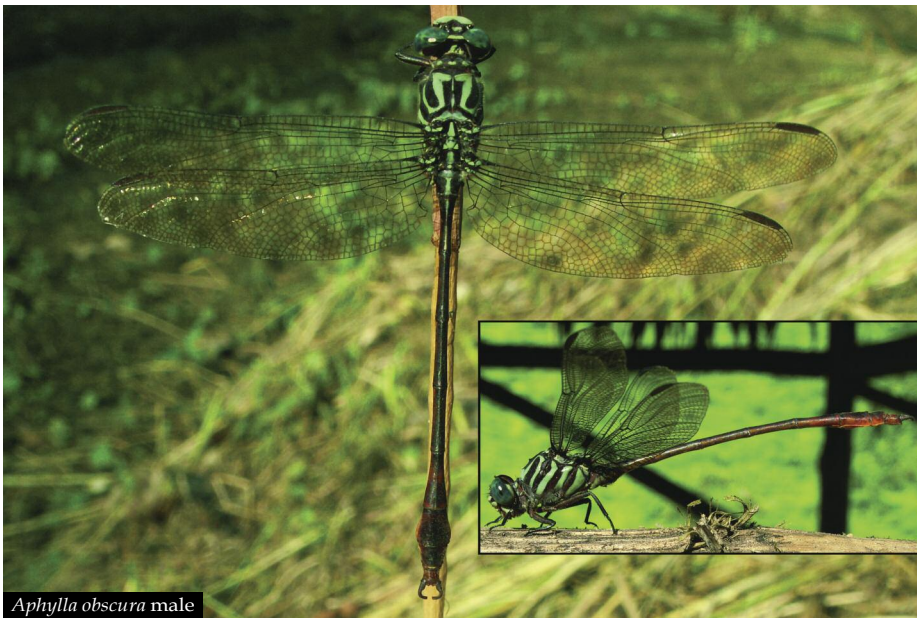
Aphylla obscura (= *A. tenuis*)

size: approximately 65 mm

This is a large Anisoptera species with a robust thorax and a long, slender abdomen. The end of the abdomen is expanded and bears large, hook-shaped upper appendages. The **male's** abdomen is dark

with a slight red tint. The thorax is greenish with broad, contrasting black stripes. The eyes are green. **Females** look similar to males. *Aphylla obscura* occurs in Costa Rica, Panama and Venezuela.

We found this rare species beside a stream along the forest margin



Aphylla obscura male

Family Libellulidae (skimmers, libélulidos, Segellibellen)

This is the largest family in the Anisoptera and its members are very diverse in their morphology. Species range from very small to large in size. The abdomen is relatively short compared to other Anisoptera, and can be cylindrical or flattened in shape; some species have a thin abdomen with the last segments swollen. In some species the pre-

Cannaphila insularis

size: 40 mm

This is a medium-sized Libellulidae species, with a flattened abdomen that tapers towards the end. Young **males** have a dark orange abdomen with a black pattern, becoming larger distally. The thorax is brown with yellow lines. Mature males are dark with blue pruinosity on the proximal

reproductive period is very long, and young (pre-reproductive) males are coloured less conspicuously and often resemble females. Reproductive males become darker and often develop pruinosity (a blue or violet waxy colouration). Libellulidae use many types of habitats and the majority of species are generalists. Some species, however, can be stenotopic forest denizens.

half of the abdomen (segments 3–5), the rest being black. The colour of the eyes turns bright bluish-green. The frons is metallic blue. The base of the hind wings is narrow.

Females resemble young males. *Cannaphila insularis* is distributed in North and Central America.

We found this rare species in light gaps along a forest stream.



Cannaphila insularis young male

Cannaphila vibex

size: 41 mm

This is a medium-sized Libellulidae species, with a flattened, tapering abdomen. Young **males** have yellow lines on the thorax. The abdomen is more orange than in *Cannaphila insularis*. Mature males are dark, with blue pruinosity on the abdomen extending basally to segment 7. Segments 8–10 are black. The

bright mid-dorsal line on the thorax is still present in mature males, while the eyes turn bright blue. The frons is quite a metallic green. The base of the hind wings is narrow. **Females** resemble young males, but become darker with age. This dragonfly can be found from Mexico to Argentina and Brazil.

We found this rare species patrolling natural light gaps along a forest stream.



Cannaphila vibex young male

Dythemis multipunctata

size: 37 mm, abdomen: 25 mm

This is a medium-sized Libellulidae species with a long, slender, cylindrical abdomen. The eyes are bright blue. The frons is dark and the rest of the face is white. There are pale greenish stripes on the thorax. The abdomen is black with proximal, pale paired lines on the first segments and two large spots on segment 7. The sexes are similar in

colouration, but the abdomen of females is stouter and somewhat shorter. Males may be confused with *Micrathyria* or *Nephepeltia*, but this species is distinctly larger and the abdomen is not widened at the end. This species is less abundant than its congener *Dythemis sterilis*. It is widely distributed in Mexico, and Central and South America. We found this common species beside streams along the forest margin and at a pond between the station and the lodge.



Dythemis sterilis

size: 38 mm, fore wing: 30 mm

This is a medium-sized Libellulidae species with a long, slender, cylindrical abdomen. The body is brown with yellow stripes on the abdomen. The eyes are light brown above and greenish below. The wings have a delicate light brown colouration on the base, and a brown tint on the tip. Both sexes are similarly coloured but the abdomen of females is

stouter and slightly shorter. This species often displays the 'obelisk position', holding the abdomen upright against the sun. This minimises the surface exposed to the sun and is a strategy to regulate body temperature. *D. sterilis* can be found from Mexico to South America.

We found this common species beside streams along the forest margin and in cultivated areas, and at ponds between the station and the lodge.



Dythemis sterilis male



Dythemis sterilis male in 'obelisk position'

Erythemis peruviana

size: 43 mm, fore wing: 31 mm

This is a medium-sized Libellulidae species with a long, strongly flattened abdomen. The **male** closely resembles *Libellula herculea* but

can be distinguished by its smaller body and the absence of a pale mid-dorsal stripe and pale sides to the thorax. The species occurs in Mexico and Central America.

We found this moderately abundant species at ponds between the station and the lodge.



Erythemis plebeja

size: 46 mm, fore wing: 31 mm

This is a medium-sized Libellulidae species with a long, slender, cylindrical abdomen. The first three abdominal segments are strongly swollen. **Females** have a light brown thorax. The abdomen is predominantly black with pale yellow markings. A small area on the base of each hind wing is dark. The figure below shows an old individual

that has become very dark. **Males** resemble females but they have a dark thorax. The dark spot at the base of the hind wing is larger, and the abdomen is slightly longer. The upper appendages are white above. In this genus, species can be of very different general appearance. *Erythemis plebeja* is widely distributed in the Americas.

We found this moderately abundant species beside ponds between the station and the lodge.



Erythemis plebeja female

Erythrodiplax feroxida

size: 35 mm

This is a medium-sized Libellulidae species with a flattened abdomen. **Males** are red and have conspicuous deep red markings at the base of each wing. The face is red and the eyes are red to brown above. The thorax is red on the sides, quite brown dorsally, and lacking dark markings. The abdomen is shortened and the tip is black. **Females** are

yellow, darkening with age, with a contrasting black pattern on the abdomen and a dark tint on the wing tips. The females of the genus generally look very similar to the males, and are difficult to distinguish. *E. feroxida* is widely distributed in Mexico, Central America and the Caribbean.

We found this common species beside streams in the forest, in open areas, and beside ponds between the station and the lodge.



Erythrodiplax feroxida male



Erythrodiplax feroxida female

Erythrodiplax funerea

size: 42 mm, fore wing: 30 mm

This is a large Libellulidae species with a long and slightly flattened abdomen. Young **males** have eyes that are brown above and grey below, and a yellow face. The body is yellow with a dark pattern. The characteristic wing pattern is less developed in young males and becomes dark in mature males,

extending from the base of the wing to beyond the nodus. Mature males have a dark body with blue pruinosity, and the eyes are dark brown above. **Females** resemble young males. *E. funerea* is found from North America to Ecuador.

We found this moderately abundant species in the garden of the station and along the road to the lodge.



Erythrodiplax fusca

size: 30 mm, fore wing: 24 mm

This is a medium-sized Libellulidae species with a shortened, flattened abdomen. In **males**, the sides and dorsum of the thorax are red. The face is also red. They are generally smaller than *Erythrodiplax fervida*, and the basal spot on the wings is smaller and less intense. Young males resemble females. Mature males first become bright red, then dark with blue pruinosity on the abdomen. The thorax turns dark brown and the spots

on the wing base also become dark. **Females**, like all females of this genus, are yellow with a dark pattern on the abdomen, and are best identified by their small size compared to their congeners.

This species is widely distributed in North and South America and can be very abundant in secondary habitats.

We found this very abundant species beside ponds between the station and the lodge, beside streams in open areas, and also along roads and in the garden of the station.



Erythrodiplax fusca male



Erythrodiplax fusca female

Erythrodiplax kimminsi

size: 33 mm, fore wing: 24 mm

This is a medium-sized Libellulidae species with a long, flattened abdomen. Mature **males** are unmistakable due to their dark basal wing spots surrounded by white opal bands. The abdomen is blue, pruinose, and

has dark final segments. The sides of the thorax are whitish without dark markings. The frons is metallic blue and the eyes are dark brown above. The species lives in Costa Rica, Panama and South America.

We found this moderately abundant species beside streams and roads in open areas and in the garden of the station.



Erythrodiplax kimminsi male

Libellula herculea

size: 53 mm

This is a large Libellulidae species with a long, flattened and very broad abdomen. The sides of the **male's** thorax are grey and pruinose, and a white stripe crosses the dorsal

side of the thorax. The eyes are dark brown above. This species is larger than *Erythemis peruviana*. Both sexes look very similar. It can be found from Mexico to South America.

We found this moderately abundant species beside ponds between the station and the lodge and in the garden of the station.



Libellula herculea, male (above) and female (below) during copulation

Macrothemis sp.

size: 34 mm, abdomen: 25 mm, fore wing: 28 mm

This is a medium-sized Libellulidae species with a long, slender abdomen. In **males** of this and other species, segments 6–9 are widened and bear bright spots dorsally. Species with widened segments may be mistaken for *Micrathyria*, but the latter species is smaller. The position of pale spots on the

abdomen can be variable in young and old males. In pre-reproductive males, some segments may already be swollen. Species of this family can be very similar in general appearance.

We found different species of this genus beside a stream in the forest along clearings, but also in cultivated areas in moderate abundance.



Macrothemis sp. young male

Macrothemis imitans

size: 38 mm, fore wing: 28 mm

This is a medium-sized Libellulidae species with a long, slender abdomen, with segments 6-9 widened in males. The species of this genus all look very similar. Young **males** have paired pale stripes on the abdomen. On

the dark thorax, two large pale spots are situated dorsally and a broad pale stripe laterally. **Females** are brown with a bright stripe on each side of the thorax. The range of this species extends from North to South America.

We found this moderately abundant species beside streams in open areas



Macrothemis imitans young male



Macrothemis imitans female

Micrathyria pseudeximia

size: 25 mm, abdomen: 16 mm, fore wing: 22 mm

This is a small Libellulidae species with a short and basally slender abdomen. Segments 6–9 are widened in **males** with two bright spots on segment 7. The upper part of the frons is metallic blue, while the rest of the face is white. The eyes are bright green above

and blue below. **Females** have a brown thorax and a dark abdomen. This species is smaller than *Macrothemis*. *Micrathyria pseudeximia* occurs in Central and South America.

We found this moderately abundant species beside ponds between the station and the lodge and in the garden of the station.



Micrathyria pseudeximia male



Micrathyria pseudeximia male

Nephepeltia phryne

size: 20mm, abdomen: 14 mm, fore wing: 19 mm

This is a very small Anisoptera species with a short, slender abdomen. Segments 6-9 are widened in both sexes and bear two bright spots. **Males** have a black abdomen and a greenish-blue thorax, lacking the dark lines seen in *Micrathyria*. They have a spike between their legs, which can only be seen

when the dragonfly is held in the hand. **Females** are yellow with a black pattern. The base of the wings is flavescent. This species resembles *Micrathyria* but is smaller and a faster flier. It is widely distributed from North to South America.

We found this species beside ponds between the station and the lodge and at a stream in an open area.



Nephepeltia phryne male



Nephepeltia phryne female

Orthemis ferruginea

size: 50 mm, fore wing: 41 mm

This is a large species. **Males** are unmistakable by their purple colouration. The abdomen is long and slightly flattened. They can be confused with *Rhodopygia*, but the latter species is bright red and a faster flier. *Orthemis ferruginea* is the more abundant species. **Females** are brown and have a pale

mid-dorsal line on the thorax. Males defend territories beside ponds and at small puddles on roads after rain. Females can even be observed laying their eggs in these puddles. The species is widely distributed in the Americas.

We found this very common species beside ponds between the station and the lodge, by large streams in cultivated areas, and along roads.



Orthemis ferruginea male

Pantala flavescens

size: 49 mm, fore wing: 43 mm

This is a large Libellulidae species with a long, slightly flattened abdomen. The frons is yellow, and the base of the hind wings is expanded and often flavescent, sometimes with dark wing tips. The colouration of the abdomen varies from orange to yellow, with

a dark mid-dorsal line. The superior appendages are long. Both sexes look alike. This species often forms large migrating swarms, as does another migratory species, *Tramea binotata*. *Pantala flavescens* occurs in tropical and subtropical regions all over the world.

We found this moderately abundant species along roads in cultivated areas.



Pantala flavescens female

Perithemis mooma

size: 22 mm, abdomen: 14 mm, fore wing: 19 mm

This species is a small but skilled flier. The abdomen is short and flattened. **Males** are very conspicuous due to their yellow and black colouration and their orange wings. **Females** are dark and the wings are hyaline with two large, yellow or dark spots. The

male's territory may be a small sunny patch beside a pond or a slow-flowing stream. It rests on perches near the water, from which it makes short patrol flights. The species is distributed from Mexico to South America. We found this moderately abundant species at streams along the forest margin, in cultivated areas, and by ponds between the station and the lodge.



Rhodopygia sp.

size: 48 mm, fore wing: 39 mm

This is a large Libellulidae species with a long, slightly flattened abdomen. **Males** are an intensely bright red in colour (see *Orthemis ferruginea*). The thorax is red on the sides and greenish dorsally. The face is red and the eyes dark brown above. The base of the wings is flavescent. **Females** resemble

males, although they are slightly less brightly coloured. Males patrol very quickly along habitat structures and even attack *Orthemis ferruginea* males, probably mistaking them for conspecific rivals.

We found this common species beside ponds between the station and the lodge, beside large streams in cultivated areas, and along roads.



Rhodopygia sp. male

Tramea binotata

size: 47mm, fore wing: 42 mm

This is a large Libellulidae species with a long, slightly flattened abdomen. The base of the hind wings is expanded, and bears dark spots. The superior appendages are very

long. Mature **males** are blue and pruinose; **females** are brown. Like *Pantala flavescens*, this species forms swarms of many individuals migrating over long distances, and is therefore widely distributed.

We found this moderately abundant species along roads in cultivated areas.



Uracis imbuta

size: 33 mm, abdomen: 23 mm, fore wing: 28 mm

This is a medium-sized Libellulidae species with a long, slightly flattened abdomen. **Males** of this species have a long pre-reproductive period. Young males resemble **females** in colouration, being brown with black bars on the abdomen. The eyes are brown above. Reproductive males and older

females become blue and pruinose, the eyes becoming dark brown above and blue below. The face is blue but not metallic in colour. Females and young males are found in great abundance along forest margins and in clearings in the forest. The species occurs from North to South America.

We found this very common species at clearings in the forest and in open areas



Uracis imbuta mature male



Uracis imbuta female

Diversity of dragonflies at La Gamba

The list of dragonflies identified with sufficient certainty in La Gamba comprises 33 species so far, all of them described in this text. A further 11 species have been caught and examined, or photographed, but these have not been identified, although they could be clearly separated into different species by morphological attributes or colouration. These include three species of *Argia*, two species of *Macrothemis*, two species of *Erythrodiplax*, one species of *Psaironeura* and one gomphid (Gomphidae). Of the latter, *Telebasis* sp. and *Rhodopygia* sp. are described in the text. The large *Mecistogaster modesta* is known to live in the forest near La Gamba. Individuals of a further two species of the family Aeshnidae, both large dragonflies, have been seen by the author patrolling over ponds near the station. Due to difficulties in the identification of species forming the

genus *Hetaerina*, it is possible that three additional species are among those *Hetaerina* that live along streams around La Gamba. In total, this increases the number of species potentially occurring and reproducing in the region to 50. The absence of whole families like Lestidae in the surveys carried out so far is unlikely to be the result of a true absence of such groups in the region. This supports our estimate that the total number of species is somewhere around 65, indicating that there is still much to discover. The author will appreciate any information on new records or interesting observations of dragonflies in La Gamba. Further investigations into dragonflies will almost certainly increase the number of species recorded in the region and contribute to a complete list of the dragonflies of La Gamba. We hope that this booklet will stimulate interest and so help to increase our knowledge.

Acknowledgements

My thanks are due to the following people who collected and photographed the species and contributed information about their morphology, behaviour and abundance: Florian Hofhansl, Alexander Kainz, Barbara Post, Valentin Wagner, Nikolaus Wagner.

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References

CORBET, P.S. (1999): Dragonflies: Behavior and Ecology of Odonata. Harley Books, Cornell University Press, 829 pp.

ESQUIVEL, C. (2006): Dragonflies and Damselflies of Middle America and the Caribbean. Primera edición. Instituto Nacional de Biodiversidad (INBio), 320 pp.

FÖRSTER, S. (1999): The Dragonflies of Central America exclusive of Mexico and the West Indies. A guide to their identification. G. Rehfeldt, Wolfenbüttel, 141 pp.

HOFHANSL, F.P. & SCHNEEWEIHS, S. (2008): Banderillas: Effects of deforestation on dragonflies (Insecta, Odonata) in the Pacific lowland of Costa Rica. *Stapfia*, 88, 237-247. In: Weissenhofer A., Huber W., Mayer V., Pamperl S., Weber A. & Aubrecht G. (editors) 2008. Natural and Cultural History of the Golfo Dulce Region, Costa Rica. *Stapfia*, 88, 768 pp.

RAMÍREZ, A., PAULSON, D.R. & ESQUIVEL, C. (2000): Odonata of Costa Rica: Diversity and checklist of species. *Revista De Biología Tropical*, 48, 247-254.

Dragonflies on the web

<http://ghostmoth.eeb.uconn.edu/laselvadragnons/>
Pictures of dragonflies of La Selva, Costa Rica.

<http://www.ups.edu/slatermuseum.xml>
Information about South American dragonflies including photographs of many species.

http://gallery.cs.umb.edu/gallery/main.php?g2_itemId=381112
Pictures of dragonflies from the Monteverde region, Costa Rica.

<http://www.aeshna.com/default.htm>
John Abbot's web site with photographs of Central American dragonflies.

Picture credits*

The „Tropical Reseach Station La Gamba“

Werner Huber: Waterfall on the Quebrada Chorro

Peter Weish: Morning clouds above the forest, Interior of the forest of the NP Piedras Blancas

Damiel Schenz: Students with a huge tree with buttress roots in the forest

The rainforests of the Golfo Dulce region

Werner Huber: The main building of the Tropical Research Station, Students crossing the Rio

Bonito during a field course, The ‘comedor’, The pond in the garden of the station

Florian Etl: Scientists in the air-conditioned laboratory

Introduction

Alexander Kainz: Body of a Zygoptera

Barbara Post: Front view of an Anisoptera

Stefan Schneeweih: A shaded stream in the forest interior, Stream with open canopy surrounded by cultivated areas

Zygoptera

Alexander Kainz: *Acanthagrion inexpectum*, *Argia* sp., *Cora* sp., *Hetaerina fuscoguttata* male

Stefan Schneeweih: *Argia cupraurea*, *Cora notoxantha*, *Cora semiopaca*, *Enallagma novaehispanicae*, *Hetaerina fuscoguttata* female, *Hetaerina occisa*, *Heteragrion erythrogastrum*, *Ischnura capreolus* male, *Mecistogaster modesta*, *Neoneura esthera*, *Philogenia zeteki*, *Protoneura amatoria*, *Telebasis* sp.

Nikolaus & Valentin Wagner: *Ischnura capreolus* female

Anisoptera

Alexander Kainz: *Dythemis sterilis*, *Erythrodiplax fusca* male, *Libellula herculea*, *Micrathyria pseudeximia* male #1, *Nephepeltia phryne* female, *Tramea binotata*

Stefan Schneeweih: *Aphylla obscura*, *Cannaphila insularis*, *Cannaphila vibex*, *Dythemis multipunctata*, *Dythemis sterilis* ‘obelisk position’, *Erythemis peruviana*, *Erythemis plebeja*, *Erythrodiplax feroxida*, *Erythrodiplax kimminsi*, *Libellula herculea* (cover), *Macrothemis imitans* male, *Macrothemis* sp., *Micrathyria pseudeximia* male #2, *Nephepeltia phryne* male, *Orthemis ferruginea*, *Pantala flavescens*, *Perithemis mooma*, *Rhodopygia* sp., *Uracis imbuta*

Nikolaus & Valentin Wagner: *Erythrodiplax funerea*, *Erythrodiplax fusca* female, *Macrothemis imitans* female, *Uracis imbuta* male

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