

Pictorial Handbook on
Dragon and Damselflies
(Odonata : Insecta)
of Mangroves of Sunderbans

**AMIT MITRA
AND
BULGANIN MITRA**



ZOOLOGICAL SURVEY OF INDIA

Pictorial Handbook on
COMMON DRAGON AND DAMSEL FLIES
(ODONATA : INSECTA)
of mangroves of Sundarbans, India

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Kolkata

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**Amit Mitra
and
Bulganin Mitra**

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INTRODUCTION

Dragonflies along with Mayflies represent the most ancient flying insects. Their ancestors first appeared in the Carboniferous period and forms similar to modern genera can be found in deposits of the subsequent Permian period (Campbell and O'Toole, 1987). One of the basic factors leading to such prolonged survival is the after emergence dispersal and other is the extreme efficiency of the basic body design, a design that has proved capable of adapting to the many fundamental changes that have occurred on earth during the past 300 million years (Silsby, 2001).

The Dragon and Damselflies belong to the insect order Odonata and is divided into three suborders : Anisoptera – the dragonflies; Zygoptera – the weakly flying, slender, damselflies; and Anisozygoptera – a combination of both and represented by only two species under a single genus all over the world. However, the present day Odonatologists sometime use the word 'dragonfly' to represent all the three suborders.

Dragonflies are large-sized, predacious, hemimetabolous and amphibiotic insects, which inhabits all kinds of freshwater habitats : be they permanent or temporary. For centuries many species of dragonflies have been able to breed in human built water bodies on farmland but, with the increasing industrialization of farming, farmland becomes increasingly inimical to dragonflies. As a result, dragonflies depend proportionally more on unharmed areas such as gravel pits, ornamental lakes and fishponds and, above all, on waters in protected areas where nature conservation is the primary land use (Silsby, 2001).

Sunderban biosphere reserve, the largest contiguous mangrove area in the world, is one of these thriving grounds of odonata and is situated in the world's largest Delta formed by the rivers Ganges, Brahmaputra and Meghna at 21°30' to 22°15' N latitude and 88°10' to 89°10'E longitude. This tropical humid mangrove habitat covers nearly 10,000 sq.km, of which 40% lies in West Bengal, India and within the scope for the present book and the rest remains in Bangladesh.

One third of the Sunderban is water logged, and the face of this forest is in perpetual flux. At high tides the jungle is afloat and when the water recedes, the forest unveils its myriad facets of precious biosphere. It houses an amazing aqua-terrestrial ecosystem where land and water both play an equal role. The predominance of 'Sundari' tree (*Heritiera fomes*) is the origin for naming the forest as Sunderban, which represents the largest mangal diversity in the world with 81 mangal plant species. It also provides ideal habitat for 35 species of mammals including the threatened Royal Bengal tiger (*Panthera tigris tigris*); a long array of reptile species including the Estuarine Crocodile; 260 different species of birds; few amphibians and

extremely large number of fishes. The entire Eastern India and Bangladesh is dependent on the fishery resources from Sunderban. The core area of the Sunderban National Park has also been designated as a World Heritage Site.

The mangrove forest ecosystems like other wetlands are of major ecological and economic importance. They act as a cleansing system, recycling nutrients and organic matter brought down by rivers and streams. They provide feeding and breeding grounds for many fish and crustaceans. They are a feeding, breeding and roosting habitat for a number of important bird species. They stabilize the land and help to prevent coastal erosion. They provide fodder for domestic animals and are sources of firewood.

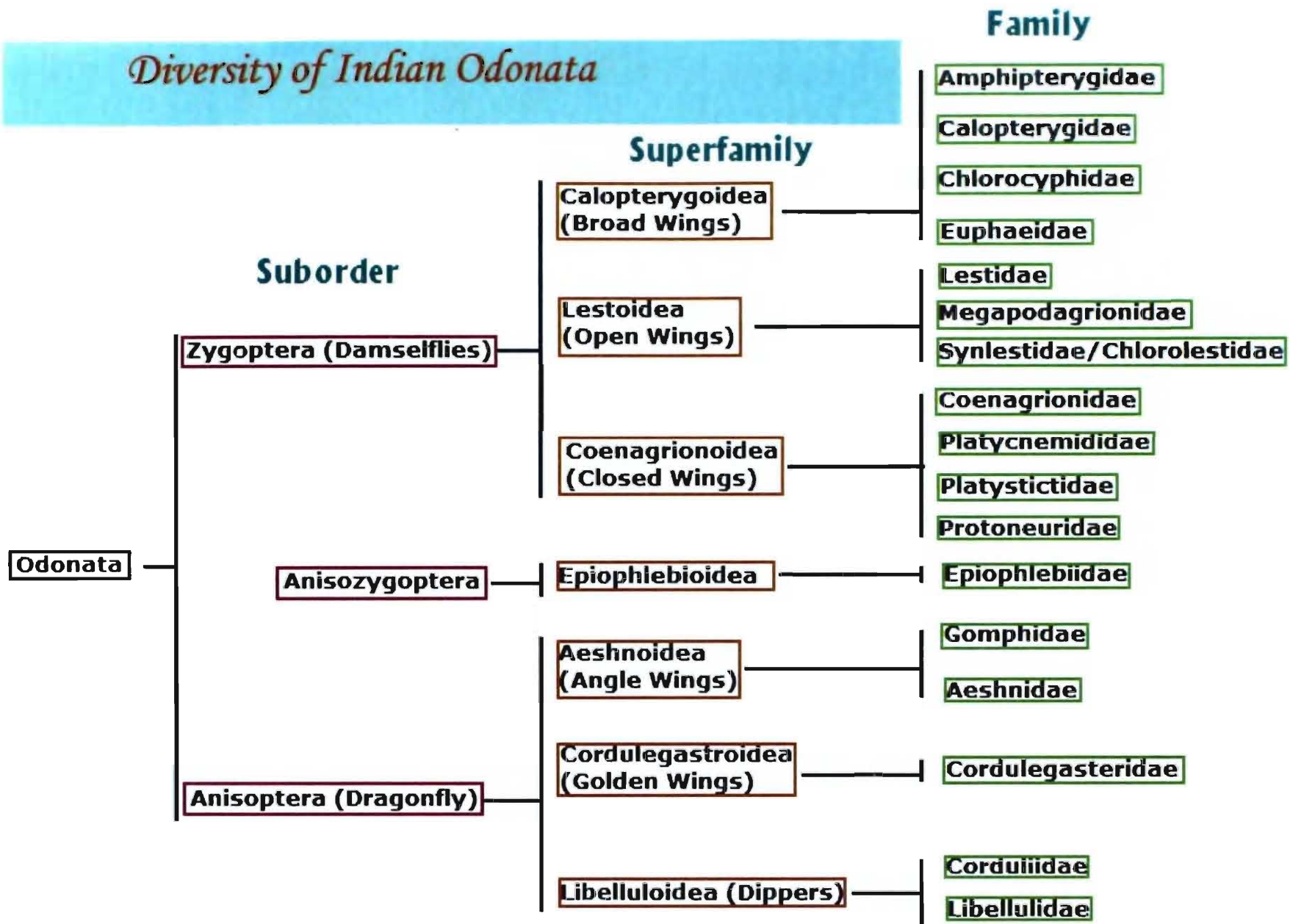
Quite a lot of work has already been done on the entomofauna of different mangrove ecosystem. According to Kathiresan & Bingham (2001), the insects constitute a significant portion of the fauna in many mangrove communities. They may be permanent residents of the mangal or only transient visitors. In either case, they often play important roles in the ecology of the system and contribute to the unique character of these habitats. Surveys of mangrove insects are revealing complex assemblages of species filling a wide variety of niches. For example, Veenakumari *et al.* (1997) found 276 insect species in the mangals of Andaman and Nicobar Islands of India; 197 of these were herbivores, 43 were parasites and 36 were predators. A recent study (http://en.wikipedia.org/wiki/Mangrove_Swallow) have reported the Mangrove Swallow, *Tachycineta albilinea*, a passerine bird that breeds in coastal regions from Mexico through Central America to Panama to thrive primarily on the Dragonflies. Other study (<http://fmel.ifas.ufl.edu/whitep/ch11.htm>) have reflected the efficient use of Dragonfly larvae as the bio-control agents for the mosquitoes breeding in salt marshes along Florida's coast that were the major source of human complaints.

So far no consolidated research work have been conducted on the insect fauna of Sunderban with the contribution by the scientists of Zoological Survey of India, provides an opportunity for the field unknown and students to know the importance of the beautiful dragonflies in the conservation area like Sunderban mangrove ecosystem.

Eight super families, 29 families and some 58 sub-families of these elegant insects for approximately 600 genera and 6000 named species have so far been described all over the world (Silsby, 2001). However, as far as Indian subcontinent is concerned, Prasad & Varshney (1995) have listed 499 species and subspecies of these diurnal fliers under 139 genera, 17 families, seven superfamilies and 3 suborders. The present hand book deals with 26 species and subspecies under 23 genera, 3 families, 3 superfamilies and 2 suborders.

The present specimens/materials have been collected by A.K. Hazra & party, 1983, 1990-2005; A.K. Mondal & party, 1984; A.K. Sanyal & party, 1992-94; Mitra & party, 1992 from different areas and islands of Sunderban.

Diversity of Indian Odonata



GENERAL MORPHOLOGY

Dragonfly imago popularly known as “Helicopter” is the typical example of the class Insecta under the phylum Arthropoda among the Invertebrates. The body is clearly distinguished into the head, thorax and abdomen.

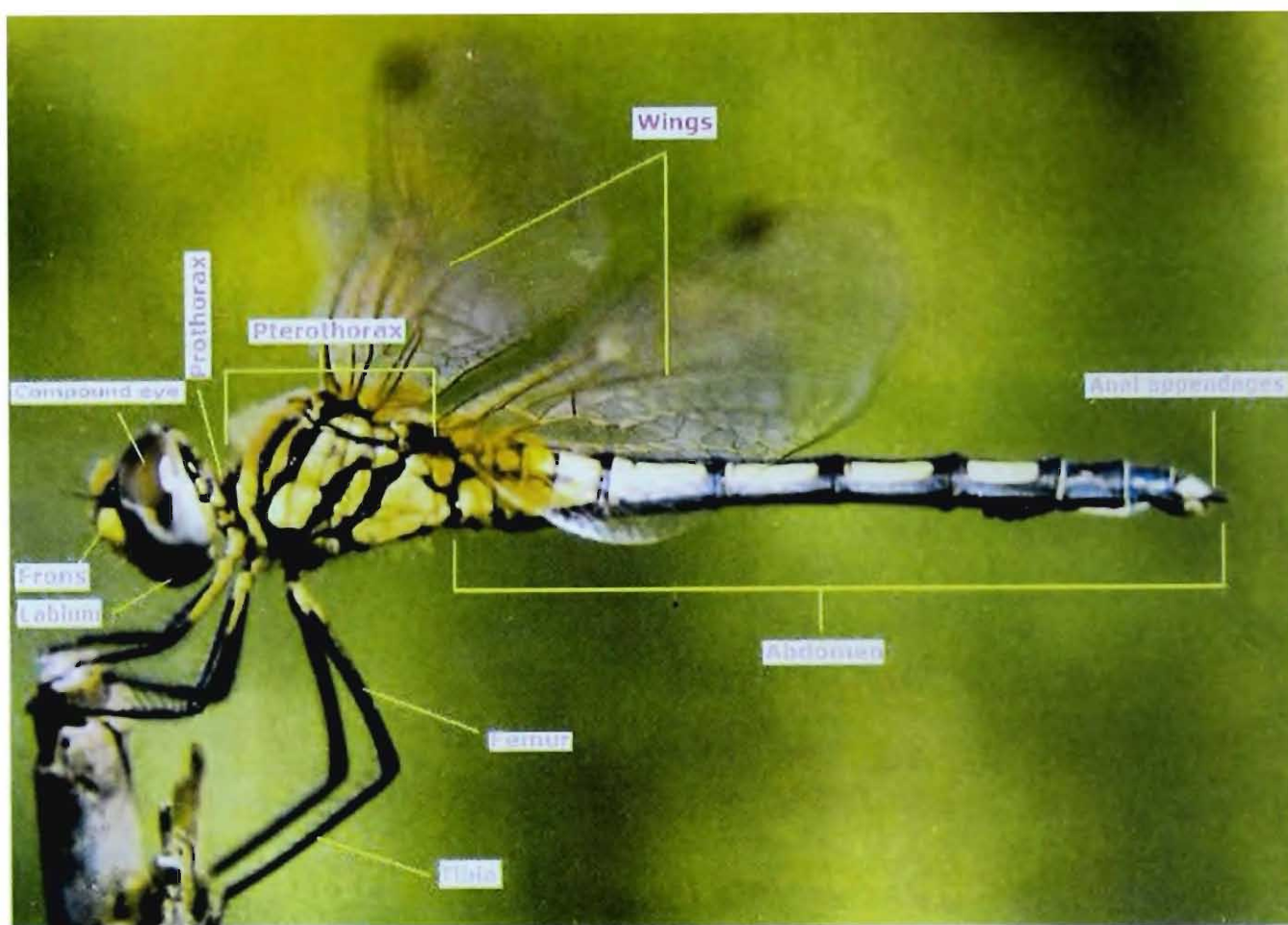


Fig. 1. Body parts of a female Dragonfly

Head Region : The head contains one pair of maxillae, a hypopharynx, a labium, one pair of mandibles, a labrum, a fronto-clypeal area, the vertex region, a pair of large compound eyes comparatively smaller in Zygoptera, a pair of small inconspicuous antennae, three ocelli and the occiput. Each maxilla carries a lobe-like unsegmented palp and a dentate mala. The prementum of the labium is expanded by the development of side pieces or squamae and each squama supports the lateral lobe of its side. Each lobe terminates in an end-hook followed by a movable hook. The mandibles are stout with very powerful teeth (Imms, 1973). The fronto-clypeal area is divided into an upper frons and lower clypeus by the epistomal suture. In Anisoptera, the clypeus is again subdivided into an upper postclypeus and a lower anteclypeus. Occiput, vertex and frons are three distinct sclerites in case of

Anisoptera where as in Zygoptera the sutures of the cranium between these regions are less distinct or absent (Imms, 1973). In Zygoptera, the compound eyes are widely separated and the vertex region is quite well established while in Anisoptera, the compound eyes are broadly confluent on the vertex region. The three ocelli situated between and in front of the compound eyes or sometimes grouped round a small eminence known as vesicle (Fraser, 1933). Two post ocular coloured spots are often visible in the Zygoptera. The exceptionally mobile head is attached to a narrowed membranous region or cervix which is supported on either side by four cervical sclerites.

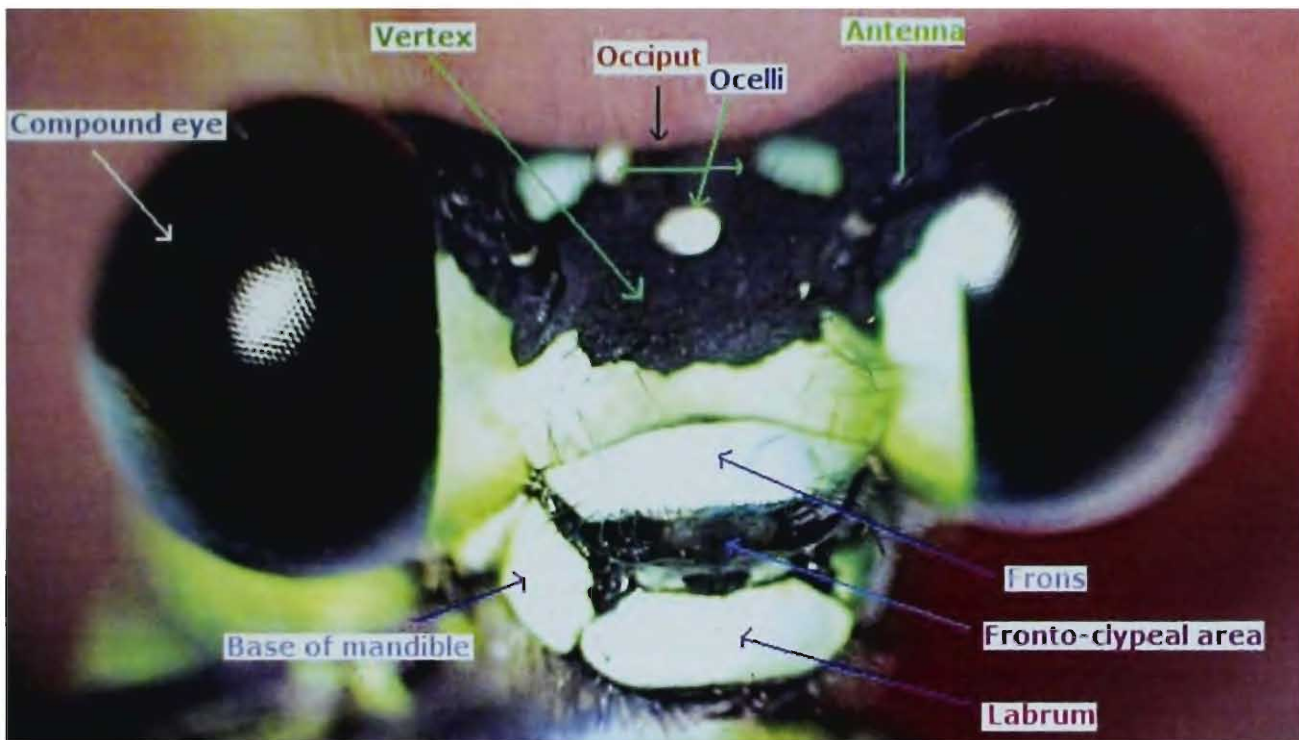


Fig. 2. Head and Eyes of Odonata

The Thorax : The thorax is divided into a greatly reduced prothorax and a fused meso and metathorax collectively called pterothorax or synthorax (Fraser, 1933). The prothorax possesses three distinct lobes. The Prosternum is greatly reduced and the proepimeron and proepisternum of the pleura I gives origin to the coxa 1 followed by the pair of prothoracic legs. The synthorax posses last two pairs of thoracic legs and two pairs of wings. The mesepisterna extends dorsally to meet in front of the mesotergum and form the dorsal carina; by this means the terga are pushed backwards and lie between the wing bases. On the other hand, the metepimeron extends downward and backward to fuse ventrally behind the metasternum; by this means the sterna are pushed forwards along with the legs which lie close behind the mouth to hold the prey.

The legs are mainly used for clinging and catching the prey. They are long and slender consisting of a short and robust coxae; two segmented trochanters, long

spined femora, spined tibiae (sometimes keeled) and three segmented tarsi. The terminal tarsal segment bears a pair of claws which sometime possess hooks.

The wings during rest remain folded in Zygoptera whereas in Anisoptera they remains open. They have a great taxonomic value in respect of their modified venation.

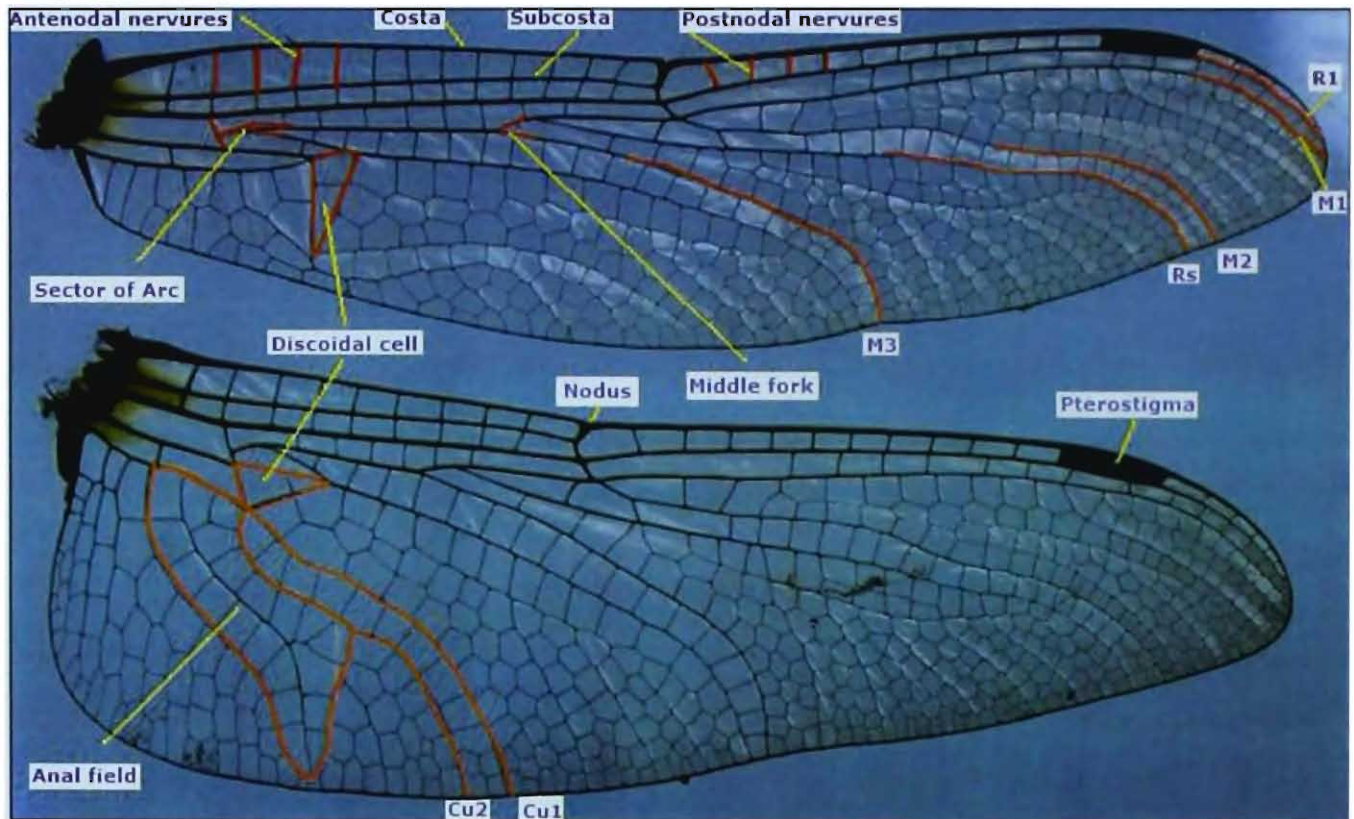


Fig. 3. Anisopteran wing

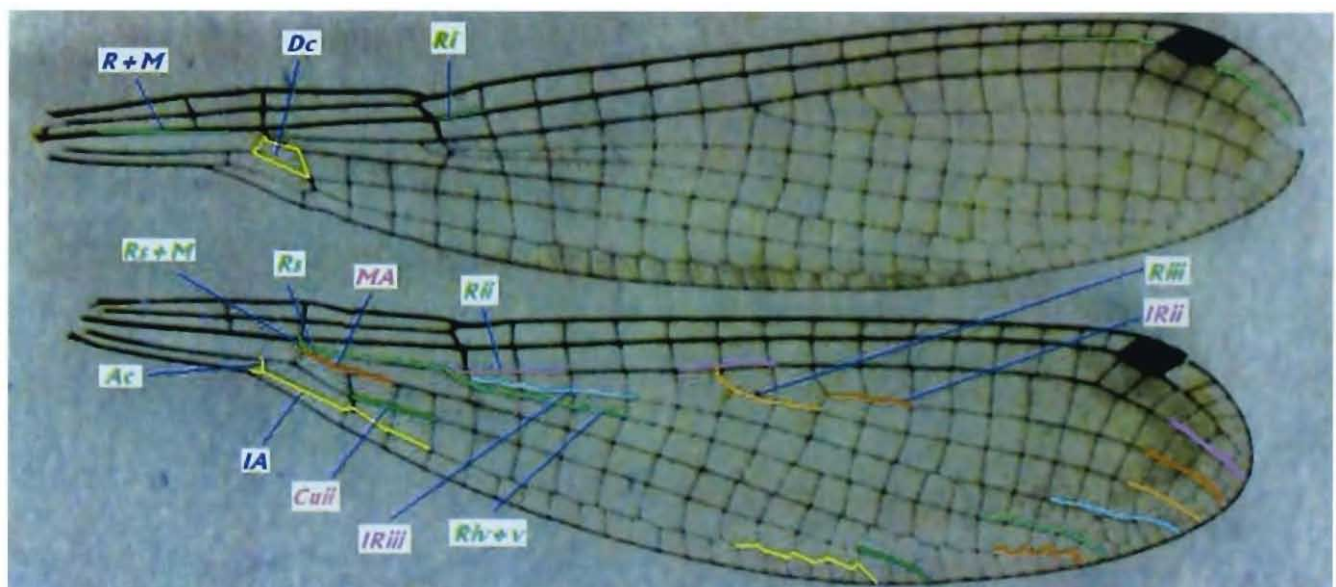


Fig. 4. Zygopteran wing

Five main veins that originate from the base of the wings are Costa, Subcosta (*Sc*), a fused Radius and Median (*R + M*), Cubitus and the single anal vein (*IA*). Numerous cross veins divides the wing into several cells. The costa runs along the anterior margin of the wing. The subcosta ends at the thickened cross-vein that constitutes the node at about middle of the wing. The *R+M* after a short run divides into *R1* (first radius) and a backwardly bent stalk of *Rs+M* which together with the cross-vein behind it, forms arculus (*arc*). Towards the apex of the wing, a thickening of wing membrane between costa and *R1* forms the pterostigma. Near the base of the wing, just beneath *arc* (little distal to or at), there is a conspicuous discoidal cell. It is quadrilateral in *Zygoptera* whereas in *Anisoptera*, it is divided by a cross-vein into the triangle and the supratriangle or hypertriangle-both of which may be again subdivided by thin cross-veins. The space between the arc and the wing base margined by *R + M* and *Cu* is known as median space. Just behind it the space between Discoidal cell and the wing base is known as cubital space. *Rs* is divided into three branches between which intercalary veins may occur. Media is represented by anterior media (*MA*) and the cubitus only by its posterior branch (*Cu2*). The space between *MA* and *Cu2*, starting after discoidal cell, runs to the hind margin of wing is known as discoidal field. The anal vein (*IA*) arises independently and runs almost parallel to *Cu2* (Fraser, 1933). The basal cross vein between *IA* and *Cu2* is known as anal crossing (*Ac*).

The Abdomen : It comprises ten complete segments, parts of 11th segment and the telson. A pair of superior anal appendages is present just behind the tenth abdominal segment and are well developed in males but reduced or vestigial in females. The 11th segment possesses an epiproct (tergite) and two paraprocts (divided sternite). The epiproct is produced into the median inferior anal appendages in *Anisoptera* males but otherwise rudimentary. The paraprocts form the paired inferior anal appendages of male *Zygoptera* but are absent or vestigial in *Anisoptera* (Imms, 1973). The telson is represented by a median dorsal lamina supra-analis and paired latero-ventral lamina infra-analis surrounding the anus.

The male secondary copulatory organ is situated on the ventral surface of segment 2 and comprises of the lamina, a hood like structure; the hamules or hooks; the penis and the lobe. The



Fig. 5. Body parts of a male Damselfly

true genital aperture opens on the 9th segment from which sperm transfer to the secondary copulatory organ occurs before mating.

In all the Zygoptera and some of the Anisoptera (Aeshnidae, Neopetaliidae and Petaluridae), the female copulatory organ consists of a robust ovipositor on the under surface of segment 9, enclosed by a pair of vulvar scales or plates furnished with styles. They oviposit endophytically inserting their long and cylindrical eggs into the holes made by long ovipositor on the emergent stems of the aquatic vegetation either little above or under-water. While, ovipositors are rudimentary in other members of the order and they oviposit exophytically *i.e.*, they simply dips their abdomen and lay their broad and elliptical eggs on open water surfaces. Rarely do they also deposit their eggs into mud at the edge of aquatic body.



Fig. 6. Endophytic oviposition in *Ischnura a. aurora*

High degree of compatibility between male and female genitalia, and the extreme variation of the male secondary copulatory organ on the other hand reduces the chance of interspecies copulation. This reproductive isolation is responsible for the propagation and survival of the fittest species.

The Odonata larvae are opportunistic hunters and are of two different types. In Anisopteran larvae, the abdomen terminates in five spine-like appendages – one median dorsal epiproct (EP), a pair of ventro-lateral paraprocts (PR) and a small pair of dorso-lateral cerci (C). The larvae are shorter and stoutly built in comparison to Zygoptera. In case of the later, the abdomen terminates in three caudal lamellae which act as gills for aquatic respiration.

The members of both suborders possess chewing type of mouthparts beneath the prognathous head, a pair of 4 to 7 (Fraser, 1933) segmented antennae and a pair of compound eyes. The main difference between the head of the nymph and that of the adult is found in the labium. In the nymph this organ is modified for prehensile purposes and is known as the “mask” as it conceals the remaining mouthparts



Fig. 7. Exuviae of *Anax*. sp

(Butler, 1904). The terminology adopted in the present work for larval mouthparts is that of Corbet (1953).

The three thoracic segments are well differentiated and of nearly equal size. The legs are similar to those of adults. Distal end of the tibiae and tarsi are beset with a number of setae of different shape. Terminology adopted in the present work for larval legs is that of Mac Neill (1967).

In suborder Anisoptera, the abdomen is generally triangular in outline, with one median-dorsal and two lateral ridges, the ventral side being normally flattened. The hook-like or spine-like projections on the mid-dorsal aspect in Anisoptera are called mid-dorsal spines and those on the lateral sides are called lateral spines. The abdomen may be cylindrical (as in most Zygoptera) or flat (As in Gomphids).

The sex can be distinguished even in some early larval instars. In Zygoptera the male gonapophyses are relatively small consisting of two triangular processes on the ventral surface of the 9th abdominal segment, while the female gonapophyses are conspicuous and extend ventrally on the 9th and 10th segment. In the case of Anisoptera, the female larvae of the family Cordulegasteridae and Aeshnidae have conspicuous gonapophyses more or less similar to that of the Zygoptera, whereas in the family Libellulidae, the male larvae possess a male projection situated dorsally at the base of the epiproct.

HABIT, HABITAT AND BEHAVIOURAL PATTERNS

Different types of behavioural patterns have been observed in the life cycle of Odonates. The adult life is dominated by two main behaviours, i.e., feeding and reproduction. The total life span is well marked into two periods, *viz.*, pre-reproductive and reproductive.

Pre-reproductive period is the period in between emergence and reproduction. The main behaviour of a dragonfly after emergence is dispersal and voracious feeding to help the teneral adults in becoming fully mature adult within a few days. Hence, the pre-reproductive period is also called maturation period.

It does not mean that in the reproductive period, the dragonfly remains on fast. But together with the feeding behaviour the most spectacular phenomenon of this period are the different types of reproductive behaviour, which comprise territoriality, pre-copulatory tandem formation, copulatory wheel formation, post copulatory flight (mostly in Zygoptera) and oviposition.

Males of Odonates, mostly, are strong territorial insects. Generally the male arrive the rendezvous well before the females and perch on some twigs or on stones near the aquatic body and protect a well defined territory around. The radius of the

territory generally depends on the eye size of the particular species. Upon encroachment within their territory by a conspecific male the resident males display aggressive wing-flapping or abdomen raising. Often it ends up with a long chase or physical fight. If the intruder is a larger species, the resident leaves the perch and waits until the intruder leave the territory. Otherwise they search out a new perch. The smaller trespasser gets a fatal prosecution. Only the conspecific females are welcome within the territory and the resident male leaves the perch and quickly tries to make a tandem link (Pre-copulatory tandem). The chase continues until the male catch hold of the female's prothorax with his anal appendages or before the female manages to fly away. Off course hawkers are not quite making their territory rather keeps on hovering across the wetland in search of their food and mate.



Fig. 8. The copularity wheel



Fig. 9. Intramale sperm Translocation

After the formation of precopulatory tandem, quickly the intramale sperm translocation occurs as has been discussed earlier. After this, the spectacular copulatory wheel (see cover page) is formed when the female curls her abdomen to get the vulvar region fixed with the pseudopenis under the second

abdominal segment of the males. Interestingly, in odonates, the male intromittent organ after penetration, scoops out the older stock of sperms from the spermatheca and injects the new stock, thus, avoiding the mixing of fertilized ova by the sperms of different males, ensuring a clean progeny from a single male. This well documented 'Sperm Competition' may well be another cause for their survival *ab initio*.

In most Anisopterans the female lays fertilized eggs immediately after the wheel breaks and males guard the females hovering upon the site of oviposition and protect it from other conspecific males. Few other Anisopterans and most Zygopterans, form the postcopulatory tandem. In some species the tandem find out a good spot for oviposition

before separation and then the male guarding happens as usual. In other cases, the tandem stays until the female totally submerges under water, while ovipositing. The males then perch near the place and keep a close vigil over the spot. During this period the female is vulnerable to the attack of insectivorous fishes, aquatic birds, amphibians and some reptiles. If the female manages to come out of water, the male again chases her to bind in tandem link. Mostly the females fly away amidst the nearby bushes to take rest after the tiresome exercise. The oviposition is either exophytic or endophytic as has been discussed earlier.

The dragonfly larvae on the other hand show the crucial emergence behaviour, which is actually the transitional phase between aquatic and aerial life. The full fed last instars crawl out of the water climbing on some aquatic plants, partially emerged stones or the nearby vegetation. This is another vulnerable period for the dragonflies. This time they are voraciously eaten up by lizards, amphibians and insectivorous wetland birds.

The time span for each behavioural pattern varies in different species.

Besides the well known rendezvous (around freshwater), adults can also be found away from water for roosting, maturation and feeding. They are often seen to feed on insects along the roadsides, open areas in the forest and in the dry fields. Mostly they are active during the day and



Fig. 11. Emergence of *Neurothemis fulvia* in laboratory



Fig. 10. In-tandem oviposition

prefer sunny weather. Other species are crepuscular and only active in twilight and spend the day hiding amidst the vegetation. There are even species that are most active during rain. Dragonflies show a seasonal pattern and in order to get a good impression of the dragonfly fauna of an area it is necessary to visit a broad range of habitats during different times of the day and different periods in the year.

ECONOMIC IMPORTANCE

- Dragonflies are really the deadly dragons for different flies like Mayflies, Stoneflies, Aphids, Termites, noxious Dipterans like mosquito, some Lepidoptera, including some pests and even for small Hymenopterans. They are often being incorporated in biological control programmes as they consume large number of harmful insects of crops, orchards and forests.
- Their larvae act as a natural bio-control agent for the mosquito larvae and thus control several epidemic diseases like malaria, dengue, filaria, etc.
- Their larvae are good bio-indicators of freshwater pollution.
- Dragonfly larvae are ecologically significant being present at the apex of the invertebrate food chain in a freshwater ecosystem. On the other hand they themselves form an important food source for the insectivorous freshwater fishes and waterfowls. Thus they have regulatory impact in the management of the aquatic ecosystem.

SYSTEMATIC LIST

Order ODONATA

Suborder ZYGOPTERA

Superfamily COENAGRIONOIDEA (Closed wings)

Family COENAGRIONIDAE (Pond damselflies)

Subfamily PSEUDAGRIONINAE

Genus *Ceriagrion* Selys, 1876

1. *Ceriagrion cerinorubellum* (Brauer, 1865)

2. *C. coromandelianum* (Fabricius, 1798)

Genus *Pseudagrion* Selys, 1876

3. *Pseudagrion australasiae* Selys, 1876

4. *P. decorum* (Rambur, 1842)

Subfamily COENAGRIONINAE

Genus *Cercion* Navas, 19075. *Cercion malayanum* (Selys, 1870)

Subfamily ISCHNURINAE

Genus *Ischnura* Charpentier, 18406. *Ischnura senegalensis* (Rambur, 1842)7. *I. aurora aurora* (Brauer, 1865)

Subfamily AGRIOCNEMIDINAE

Genus *Agriocnemis* Selys, 18778. *Agriocnemis pygmaea* (Rambur, 1842)

Subfamily ARGIINAE

Genus *Onychargia* Selys, 18659. *Onychargia atrocyana* Selys, 1865

Suborder ANISOPTERA

Superfamily AESHNOIDEA (Angle wings)

Family GOMPHIDAE (Clubtails)

Subfamily LINDENIINAE

Genus *Ictinogomphus* Cowley, 193410. *Ictinogomphus rapax* (Rambur, 1842)

Superfamily LIBELLULOIDEA (Dippers)

Family LIBELLULIDAE (Perchers)

Subfamily BRACHYDIPLACTINAE

Genus *Brachydiplax* Brauer, 186811. *Brachydiplax sobrina* (Rambur, 1842)

Subfamily LIBELLULINAE

Genus *Lathrecista* Kirby, 188912. *Lathrecista asiatica asiatica* (Fabricius, 1798)Genus *Orthetrum* Newman, 183313. *Orthetrum sabina sabina* (Drury, 1770)

Subfamily SYMPETRINAE

Genus *Acisoma* Rambur, 1842

- 14.
- Acisoma panorpoides panorpoides*
- Rambur, 1842

Genus *Brachythemis* Brauer, 1868

- 15.
- Brachythemis contaminata*
- (Fabricius, 1793)

Genus *Bradinopyga* Kirby, 1893

- 16.
- Bradinopyga geminata*
- (Rambur, 1842)

Genus *Crocothemis* Brauer, 1868

- 17.
- Crocothemis servilia servilia*
- (Drury, 1770)

Genus *Diplacodes* Kirby, 1889

- 18.
- Diplacodes trivialis*
- (Rambur, 1842)

Genus *Neurothemis* Brauer, 1867

- 19.
- Neurothemis tullia tullia*
- (Drury, 1773)

Subfamily TRITHEMISTINAE

Genus *Trithemis* Brauer, 1868

- 20.
- Trithemis pallidinervis*
- (Kirby, 1889)

Subfamily TRAMEINAE

Genus *Rhyothemis* Hagen, 1867

- 21.
- Rhyothemis variegata variegata*
- (Linnaeus, 1763)

Genus *Pantala* Hagen, 1861

- 22.
- Pantala flavescens*
- (Fabricius, 1798)

Genus *Tramea* Hagen, 1861

- 23.
- Tramea virginia*
- (Rambur, 1842)

Genus *Tholymis* Hagen, 1861

- 24.
- Tholymis tillarga*
- (Fabricius, 1798)

Subfamily UROTHEMISTINAE

Genus *Macrodiplax* Brauer, 1868

- 25.
- Macrodiplax cora*
- (Brauer, 1867)

Genus *Urothemis* Brauer, 1868

- 26.
- Urothemis signata signata*
- (Rambur, 1842)

Note : All the scientific and common names of the different taxa are as per Fraser (1933, 34, 36), Prasad and Varshney (1995), Silsby (2001) and Mitra (2006).

FIELD IDENTIFICATION OF MANGROVE INHABITING DRAGON AND DAMSELFLIES OF SUNDERBAN

Present chapter is the pictorial guide of 26 species and subspecies of mangrove inhabiting dragonflies, belonging to 23 genera under 12 subfamilies, three families and three superfamilies (see check-list), those are found in and around the Indian limit of Sundarban. Common names of the family under the superfamilies have been used as groups under which each species have been discussed. Common names for different species have also been put forward.

CLOSED WING POND DAMSELFLIES

Superfamily COENAGRIONOIDEA

- The discoidal cell is sharply pointed and vein *IRiii* is at, while vein *Riv* is very near to, the subnodus.
- Genital hamules of male quadrate.

Family COENAGRIONIDAE

- Cells of the wing mostly five sided.
- *Dc* always has an acute distal angle.

Subfamily PSEUDAGRIONINAE

- Wings are not particularly petiolate.
- Vein *IA* leaves the wing border at or very near *Ac*.
- The arculus and distal antenodal nervure lie about midway between the base of the wing and the nodus (not unusual also in other subfamilies but here always the case).
- The pterostigma is small, subtending one cell or less.

Genus *Ceriagrion* Selys, 1876

- Prominent ridge on frons.
- Absence of post-ocular coloured spots.

1. *Ceriagrion cerinorubellum* (Brauer, 1865)
(Fig. 12)



Fig. 12. *Ceriagrion cerinorubellum* (Brauer, 1865)

Size : *Male* : Abdomen : 31-33 mm. Hindwing : 20-21 mm.

Female : Abdomen : 31-35 mm. Hindwing : 20-21 mm.

Field diagnosis : *Male* : *Head* : Frons above and vertex dark reddish-brown; Occiput bright ochreous changing to brick red in old specimens. Eyes dark olivaceous above changing to bluish-green in old adults, paler below.

Thorax : Pro- and ptero-thorax green, changing to blue on the sides, yellow beneath.

Wings : Hyaline. Pterostigma amber-tinted, paler around the circumference and framed in reddish-brown nervure, covering one cell.

Abdomen : This slender close-winged damselfly can easily be separated from the other species of the genus by brick red abdomen at base and anal ends. Remaining segments in between are black on dorsum.

Female : Quite similar to the males in colouration only except the dorsum of thorax is suffused with golden brown and anal segments of abdomen are dull brownish-red.

Habits and Habitat preference : Adults are common in the agricultural fields and in the marshy areas near ponds, ditches and irrigation channels. These weakly flying insects are quite cryptic in finding their perching ground. In tandem oviposition takes place endophytically among the floating algae and other submerged vegetation.

Flight period : May–July.

Distribution : Found in Bangladesh, China, Indonesia, India, Sri Lanka, Myanmar, Malaysia, Philippines, Peninsular Malaysia, Thailand and Viet Nam.

2. *Ceriagrion coromandelianum* (Fabricius, 1798)
(Fig. 13)



Fig. 13. *Ceriagrion coromandelianum* (Fabricius, 1798)

Size : *Male* : Abdomen : 28-30 mm. Hindwing : 18-20 mm.

Female : Abdomen : 29-32 mm. Hindwing : 20 mm.

Field diagnosis : *Male* : *Head* : Frons bright citron yellow; vertex olivaceous; occiput ochreous. Eyes olivaceous above, pale greenish yellow below.

Thorax : Pro- and ptero- thorax uniformly olive green, laterally greenish-yellow. Legs pale yellow with short black spine.

Wings : Hyaline. Pterostigma golden yellow, framed in brown nervure, covering one cell.

Abdomen : Uniform bright citron-yellow, without markings.

Female : Larger and paler than the males. Pro- and Ptero- thorax golden olivaceous brown, paler at the sides and beneath, here usually thinly pruinose. Abdomen uniformly olivaceous with an ochreous tint on dorsum.

Habits and Habitat preference : Occurs sympatrically with the above species of the genus. Commonly available on both permanent and temporary water-bodies. Adults are weak fliers; still the males show aggressive territoriality. The fate of the smaller species, like *Ischnura a. aurora*, entering the territory may also be fatal. Endophytic oviposition occurs in tandem.

Flight period : Almost throughout the year.

Distribution : Found in India, Sri Lanka, Myanmar and Pakistan.



Fig. 14. Fate of an intruder

Genus *Pseudagrion* Selys, 1876

- No ridge on frons.
- Post-ocular coloured spots present.
- Pterostigma in fore- and hind- wings of same size; longer than broad.
- 10-12 postnodals in fore-wings.
- Females devoid of an apical, ventral spine on 8th abdominal segment.

3. *Pseudagrion australasiae* Selys, 1876
(Fig. 15)



Fig. 15. *Pseudagrion australasiae* Selys, 1876

Size : Male : Abdomen : 30-32.5 mm. Hindwing : 20-21 mm.

Female : Abdomen : 29 mm. Hindwing : 20 mm.

Field diagnosis : Male : *Head* : Frons pale greenish-blue, unmarked; vertex greenish-blue, traversed by a broad black band from eye to eye at level of ocellar space; large blue postocular spots bordered behind with black. Eyes azure blue above, pale blue below.

Thorax : Prothorax pale blue, a black crown enclosing three blue spots on dorsum of middle lobe. Pterothorax azure blue, humeral stripes black, a broad black band on mid-dorsum, laterally a small spot in the middle of mesepimeron and another at the upper end of postero-lateral suture. Legs pale blue, femora black on extensor surfaces.

Wings : Hyaline. Pterostigma pale yellow, covering less than one cell.

Abdomen : Pale azure blue marked with black. Segments 8 and 9 entirely blue except an apical line of black spines. The elongate vase-shaped black spot on segment 2, extending from base to apex; the X mark on segment 10 and the bifid superior anal appendages shorter than segment 10, are sufficient enough to distinguish the species in field.

Female : Quite similar to, but paler than the males. Pale blue dorsum of pterothorax tinted with ferruginous, sides pale greenish-blue. Pterostigma golden yellow. Abdominal black dorsal marking on segment 2 broader than males; segment 10 blue, unmarked.

Habits and Habitat preference : Territorial males are generally found perching on the overhanging vegetation around freshwater as well as brackish-water wetlands.

Flight period : May–August.

Distribution : Found in Hainan, Peninsular Malaysia, Thailand, Indonesia, India, Myanmar and Bangladesh.

4. *Pseudagrion decorum* (Rambur, 1842)
(Fig. 16)



Fig. 16. *Pseudagrion decorum* (Rambur, 1842)

Size : *Male* : Abdomen : 28-30 mm. Hindwing : 18-20 mm.

Female : Abdomen : 31 mm. Hindwing : 20 mm.

Field diagnosis : **Male** : *Head* : Face, frons and vertex pale bluish-green; large triangular azure blue postocular spots confluent by a narrow bluish-green bridge. Eyes pale blue above, bluish-green below.

Thorax : Prothorax pale blue. Pterothorax bluish-green on dorsum to slightly beyond level of humeral suture; laterally pale azure blue; mid dorsal carina very finely black, and two similar parallel black lines running close to it, one on each side; humeral stripes narrow, black, laterally a small spot at the upper end of postero-lateral suture. Legs bluish-white.

Wings : Hyaline. Pterostigma covering less than one cell.

Abdomen : Pale azure blue marked with black on dorsum. Segments 8 to 10 entirely azure blue except an apical line of black spines. The elongate arrow-head black spot on segment 2; the light blue ground colour with limited thoracic black markings are sufficient enough to distinguish the species in field. Anal appendages bifid.

Female : Display strong sexual dimorphism. Head and prothorax more greenish than the greenish-blue of males. Pterothorax light greenish-blue, with humeral sutures and dorsal black markings bordered with golden yellow. Pterostigma pale golden yellow. Abdomen pale blue, with a greenish tinge at base and terminal segments. Dorsum more or less striped black on all segments.

Habits and Habitat preference : Adults fly low over the water surfaces along marshy water channels and side pools around. Males show strong territoriality. Upon encroachment by a conspecific male, the resident male shows an aggressive flapping of wings and raising of abdomen until the intruder left the area. Endophytic oviposition occurs in tandem. During oviposition, when the female is completely under water, the male hovers on top and display aggressive behaviour to the conspecific males, if any.

Flight period : Late February–October.

Distribution : Found in India, Sri Lanka, Pakistan, Myanmar and Bangladesh.

Subfamily COENAGRIONINAE

- Wings are not too petiolate.
- Discoidal cell is short and pointed.
- Vein *IA* leaves the wing border before *Ac*.
- The arculus is situated distal to the level of distal antenodal nervure.

Genus *Cercion* Navas, 1907

- No prominent ridge on frons.
- Basal side of discoidal cell in fore wing shorter than the costal side.
- Pterostigma of same colour and shape in fore-wings of males.
- Postocular coloured spots present.

5. *Cercion malayanum* (Selys, 1876)

Size : *Male* : Abdomen : 22 mm. Hindwing : 15 mm.

Female : Abdomen : 20 mm. Hindwing : 15 mm.

Field diagnosis : **Male** : *Head* : Face and frons pale azure blue; vertex and occiput black; large oval bluish-green postocular spots confluent by a narrow bluish-green line. Eyes olivaceous, paler below.

Thorax : Prothorax black marked with azure blue. Pterothorax bronzed black on dorsum; humeral suture broad, greenish-yellow; laterally bluish-green, with a short black streak on the upper part of each lateral suture. Legs bluish-white.

Wings : Hyaline. Pterostigma yellowish-white framed in thick black nervures, covering less than one cell.

Abdomen : Pale blue marked with black on dorsum. Creamy yellow beneath. Segments 8 and 9 entirely azure blue; segment 10 blue, with a narrow dorsal black band. Superior anal appendages slightly shorter than segment 10, broadly conical and slightly notched at the apex; inferiors nearly as long as superiors.

Female : Ground colour more greenish-yellow than blue. Dorsum more or less striped black on all segments; segment 10 blue only at apical border. A robust ventral spine is present at the apex of segment 8.

Habits and Habitat preference : Adults are very shy insects and weakly fly along marshy water channels.

Flight period : Late February – April.

Distribution : Found in Thailand, Indonesia, India, Sri Lanka and Philippines.

Subfamily ISCHNURINAE

- Wings are more petiolate than Coenagrioninae, to about the level of *Ac*.
- The pterostigma in males often differs a little in fore-wing and hind-wing.
- Vein *IA* leaves the wing border before *Ac*.
- The arculus is situated at the level of distal antenodal nervure.
- Females have a unique vulvar spine on abdominal segment VIII.

Genus *Ischnura* Charpentier, 1840

- Slender damselflies of small size.
- Discoidal cell acutely pointed with costal side in fore wing about half the length of posterior side and that of hind wing about two-third the length of posterior side.
- Postocular coloured spots always present in adults.
- Tubercles on apical border of segment 10 of male closely apposed.

6. *Ischnura senegalensis* (Rambur, 1842)
(Fig. 17)



Fig. 17. *Ischnura senegalensis* (Rambur, 1842)

Size : Male : Abdomen : 21-23 mm. Hindwing : 13-15 mm.

Female : Abdomen : 20-24 mm. Hindwing : 14-16 mm.

Field diagnosis : Male : Head : Face pale blue to green and frons pale azure blue; postclypeus steely blue-black; vertex and occiput black; small round bluish-green postocular spots on each side. Eyes black on the upper one third and greenish below.

Thorax : Prothorax black marked with pale blue and green. Pterothorax bronzed black on dorsum; humeral suture broad, bronzed black; sides and narrow antehumeral stripes pale green; beneath pale yellow. Legs black with some narrow pale green tinge.

Wings : Hyaline. Pterostigma black, diamond shaped in fore wing with outer angle and costal border narrowly white, tinted with blue on the upper surface, covering less than one cell; that of hind wing smaller than the fore wing and pale brown throughout.

Abdomen : Black. Segment 1 broadly marked with azure blue; segment 2 with a metallic reflection of bluish black on dorsum, sides and beneath non-metallic pale green; segments 3 to 7 citron-yellow at the sides; segment 8 entirely and the basal one third along with the sides of segment 9 azure blue; segment 10 black, sides yellow. Anal appendages black and yellow.

Female : Polychromatic. There are at least three forms. Hence males are the best for field identification.

Habits and Habitat preference : Adults are common around marshy areas, ponds, ditches etc.

Flight period : April-September.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Bangladesh and greater part of African continent.

7. *Ischnura aurora aurora* (Brauer, 1865)
(Fig. 18)



Fig. 18. *Ischnura aurora aurora* (Brauer, 1865)

Size : Male : Abdomen : 16-20 mm. Hindwing : 10-12 mm

Female : Abdomen : 18-20 mm. Hindwing : 14-15 mm

Field diagnosis : Male : *Head* : Face citron yellow to pale olive green and frons pale grass-green; postclypeus, vertex and occiput bronzed black; the posterior border of occiput pale greenish-yellow; small round azure blue postocular spots on each side. Eyes olive-green, dark above with a small semilunar spot of black (dark brown in teneral ones) bordering the eye, pale beneath.

Thorax : Prothorax bronzed black on dorsum, the sides and anterior lobe blue. Pterothorax bronzed black on dorsum; humeral suture broad, bronzed black; sides and narrow antehumeral stripes grass-green; a small streak of black on upper part of postero-lateral suture, beneath white. Legs pale citron-yellow.

Wings : Hyaline. Pterostigma in fore wing rose-red for proximal half and hyaline for the distal half, kite-shaped, slightly broader than long; that of hind wing almost half the length than in the fore wing and pale grey throughout.

Abdomen : Segments 1 to 6 bright citron-yellow, with a black stripe on the dorsum of segment 1; at the base of the segment 2 dorsum; apical border of segment 6. Segment 7 broadly bronzed black. Segments 8 to 10 azure blue, the 10th with a black quadrate on dorsum. The bifid dorsal apical tubercle white at borders. Superior anal appendages triangular and as long as segment 10; inferiors broad at base and slightly shorter than the superiors.

Female : More stout, but paler than males. Postocular spots are smaller than males. Abdomen with a broad black dorsal stripe extending the whole length.



Fig. 19. An unusual attempt by a male for capturing female

Habits and Habitat preference : Adults occur in the agricultural fields, along the weedy banks of rivers and ponds. The endophytic oviposition is not in-tandem. The larvae inhabit the marshy ponds and water channels along the agricultural fields.

Flight period : Almost through out the year.

Distribution : Found in Hainan, Taiwan, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Bangladesh and Bhutan.

Subfamily AGRIOCNEMIDINAE

- Very small damselflies.
- Arculus is well distal of the second antenodal.

Genus *Agriocnemis* Selys, 1877

- Abdomen less than 20 mm in length.
- 6 to 8 postnodals in fore wings.
- The junction of *ab* and *IA* markedly angulated.

8. *Agriocnemis pygmaea* (Rambur, 1842)
(Fig. 20)

Size : *Male* : Abdomen : 16-17 mm. Hindwing : 9.5-10 mm.

Female : Abdomen : 18 mm. Hindwing : 11-12 mm.

Field diagnosis : *Male* : *Head* : Labrum metallic blue; anteclypeus, bases of mandibles, genae, and frons pale green; postclypeus, vertex and occiput black; small rounded pale green postocular spots. Eyes black above, pale green on sides and beneath.



Fig. 20. *Agriocnemis pygmaea* (Rambur, 1842)

Thorax : Prothorax black marked with pale green. Pterothorax black on dorsum; humeral suture black, broad; antehumeral stripe narrow, pale green; sides pale green. Legs yellow, extensor surface of femora black.

Wings : Hyaline. Pterostigma pale yellow in the fore-wings, black in the hind; that of hind-wing slightly shorter than in the fore.

Abdomen : Ground colour pale-greenish yellow, dorsum of segments 1 to 8 with varied black, apical region of segment 8, the whole of segments 9 and 10 brick-red. Anal appendages brick-red, superiors slightly longer than inferiors.

Female : Polychromatic. Hence males are the best for field identification.

Habits and Habitat preference : Their population is larger along the irrigation channels and marshy streams than the stagnant water-bodies. Larvae commonly occur among the aquatic weeds and algae around.

Flight period : Late February-September.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar and Bangladesh.

Subfamily ARGIIINAE

- Two antenodal nervures converge posteriorly.

Genus *Onychargia* Selys, 1865

- Arculus at the level of second antenodal.
- Pterostigma of same colour and shape in fore and hind wings of males and females.
- *ab* arising well proximal to the level of *ac* and even the first antenodal nervure.
- Postocular coloured spots absent.
- Females without a ventral apical spine on segment 8.

9. *Onychargia atrocyana* Selys, 1865
(Fig. 21)

Size : Male : Abdomen : 22-24 mm. Hindwing : 17 mm.

Female : Abdomen : 23 mm. Hindwing : 18 mm.

Field diagnosis : Male : *Head* : Face, frons, vertex and occiput black; a narrow stripe of citron-yellow extending from eye to eye through interocellar space. In subadults genae, base of mandibles and labrum citron yellow. Eyes black above, brown to pale yellow beneath.

Thorax : Prothorax and pterothorax velvety black, the latter with a deep purplish reflex on dorsum; humeral suture broad, the narrow antehumeral stripes and the sides citron-yellow to bluish-green depending on the age of the specimen. A broad oblique black stripe is present over the postero-lateral suture. Legs black with some fine yellow lines on posterior femora.

Wings : Hyaline. Pterostigma olivaceous yellow, covering slightly less than one cell.

Abdomen : Black, with citron-yellow markings on the sides of segment 1, a lateral stripe on segment 2, and a less evident one on segment 3; segments 3 to 6 with narrow bluish basal rings broadly interrupted on dorsum. Anal appendages black; superiors shorter than segment 10.



Fig. 21. *Onychargia atrocyana* Selys, 1865

Female : Quite same as subadult male except a few differences : postclypeus bright yellow laterally; prothorax with a small subdorsal and a very large lateral spot citron-yellow; the additional yellow spots of the abdomen, one on the pleural surface of segment 8 and other on the sides of the vulvar scales.

Habits and Habitat preference : Adults are shy insects and weakly fly along marshy water channels.

Flight period : Late April–July.

Distribution : Found in Hong Kong, Peninsular Malaysia, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Myanmar and Bangladesh.

ANGLE WING CLUB-TAILS

Superfamily AESHNOIDEA

- Eyes widely separated or broadly confluent on vertex.
- Discoidal cell approximately of same size and shape in fore- and hind-wings and situated equidistant from the arculus.
- The two robust primary antenodals does not coincide with costal and subcostal antenodal nervures.
- Middle lobe of labium large and fissured.

Family GOMPHIDAE

- Eyes seperated.
- Females have a reduced ovipositor in which the terebra, even if well developed (usually they are vestigial) do not enclose the usual complement of valves.
- Last segments of abdomen at times enlarged.

Subfamily LINDENIINAE

- Secondary branch of IR2 very distinct and more parallel to it, therefore IR2 appears to be dichotomously forked distal of the lestine oblique vein.
- Discoidal cell divided in more than two cells in both pairs of wings.
- At least in forewings the basal part of the subdiscoidal cell is traversed by supplementary cubito-anal-crossveins.
- Hypertriangle divided by at least two or more crossveins.

Genus *Ictinogomphus* Cowley, 1934

- Segment 8 of abdomen widely dialated and with wing-like projections.
- Superior anal appendages acute at apex.

10. *Ictinogomphus rapax* (Rambur, 1842)
(Fig. 22)

Size : *Male* : Abdomen + Appendages : 52 mm. Hindwing : 40 mm.

Female : Abdomen + Appendages : 50 mm. Hindwing : 42-44 mm.

Field diagnosis : *Male* : *Head* : Face and frons greenish-yellow with occasional black stripes; postclypeus black, with a large lateral yellow spot on either side; vertex black; occiput greenish-yellow, fringed with short yellow hairs. Eyes bluish-grey.

Thorax : Prothorax and pterothorax black marked with yellow. Yellow on the latter is distributed as follows :- a complete mesothoracic collar, oblique dorsal spots, a large central spot on alar sinus, spots on tergum, humeral stripes and most of the lateral areas except the two prominent black bands. Posterior border of thorax margined with black. Legs largely black with some yellow on flexor surface of anterior femora. Coxae and trochanters yellow.

Wings : Slightly enfumed in mature adults. Pterostigma black, braced, long, covering 5 to 6 cells.

Abdomen : Black marked with alternating bands of yellow. The black band between segment 7th and 8th is very narrow. The leaf-like ventral expansions on segment 8 are black. Anal appendages black, as long as the two last segments.

Female : Similar to males; but more yellow. Occiput raised, a robust spine at it's middle. Wings with dark brown basal markings extending as far as first antenodal nervure. Anal appendages short, conical, black.

Habits and Habitat preference : Adults are common around the semi-saline ponds. They have a peculiar sitting posture on the emergent twigs in and around the water-body, with the head down, facing the water surface and abdomen up. An extreme of this



Fig. 22. *Ictinogomphus rapax* (Rambur, 1842)

posture can be seen as photographed. Occasionally or upon disturbance, they hover along the water-body and mostly come back to the same perch.

Flight period : April–September.

Distribution : Found in Peninsular Malaysia, Viet Nam, Thailand, India, Sri Lanka, Myanmar and Bangladesh.

DIPPERS AND PERCHERS

Superfamily LIBELLULOIDEA

- Eyes confluent on vertex.
- Discoidal cells of fore and hind wing differs in size, and position.
- Costal and subcostal antenodal nervures mostly coincide.

Family LIBELLULIDAE

- Tibiae of males without keels.
- Base of hindwing rounded in both sexes.
- Oreillets absent at the baso-lateral sides of 2nd abdominal segment.
- Sectors of arculus arising from a common stalk.
- The primary antenodal nervures absent.

Subfamily BRACHYDIPLACTINAE

- Smaller species.
- Rests with the body pointing up and the wings pointing down.

Genus *Brachydiplax* Brauer, 1868

- Base of discoidal cell in hind wing at level of arculus or a shade distal.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 2 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing complete.
- Lobe of prothorax large and fringed with long hairs.
- Frons metallic above.

11. *Brachydiplax sobrina* (Rambur, 1842)
(Fig. 23)

Size : Male : Abdomen : 20-24 mm. Hindwing : 25-28 mm.

Female : Abdomen : 16-22 mm. Hindwing : 22-26 mm.

Field diagnosis : Male : Head : Face and frons creamy-white, the latter metallic blue above; occiput dark brown with a bright yellow geminate spot behind. Eyes dark brown, with a ventro-lateral interruption of bluish-white.

Thorax : Prothorax dark brown. Pterothorax olivaceous brown, with black markings more or less obscured by a thin pruinescence, denser on dorsum; three yellow stripes on each side more or less covered by the pruinescence. Legs black, anterior femora yellow on inner side.

Wings : Hyaline, uncoloured. Pterostigma yellowish framed in thick black nervures, covering one and half cells.

Abdomen : Black, pruinose blue in old adults, more prominently up to 6th abdominal segment. Lateral yellow spots of 7th segment is usually visible in older adults. Anal appendages black.

Female : The yellow ground colour and black thoracic stripes are visible in the absence of pruinescence.

Habits and Habitat preference : Adults are found hawking among the vegetation near the side pools and slow running marshy streams during May to September. Exophytic oviposition occurs singly by the female in some small weedy side pools. Larvae are found in the same habitat.

Flight period : April–July.

Distribution : Found in Thailand, India, Sri Lanka, Myanmar and Bangladesh.



Fig. 23. *Brachydiplax sobrina* (Rambur, 1842)

Subfamily LIBELLULINAE

- Reduced cubito-anal field in the hindwing.
- Arculus distal of the second antenodal nervure.
- Mature males with bluish pruinescence in the ground plan (rather doubtful character).

Genus *Lathrecista* Kirby, 1889

- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders parallel at wing margin.
- Genital hamules small and inconspicuous.
- Cells at the base of hind wing are not closely packed in straight rows.
- Unicolour pterostigma equal in size for fore and hind wings.
- One row of cells between *IRiii* and *Rspl* (Rarely two rows at the middle).
- Only 1 cubital nervure in all wings.
- Arculus in between second and third antenodals.

12. *Lathrecista asiatica asiatica* (Fabricius, 1798)
(Fig. 24)



Fig. 24. *Lathrecista asiatica asiatica* (Fabricius, 1798)

Size : Male : Abdomen : 27-32 mm. Hindwing : 33-37 mm.

Female : Abdomen : 27-32 mm. Hindwing : 34-36 mm.

Field diagnosis : Male : *Head* : Face and lower border of frons and sides broadly creamy-yellow, upper surface of frons steely black; vesicle and occiput black with a geminate yellow spot on the posterior border of latter. Eyes brownish above, bluish-grey with black spots below.

Thorax : Prothorax blackish brown with anterior lobe yellowish. Pterothorax dark coppery-brown on dorsum, bright yellow laterally with black sutures. Legs blackish-brown with some yellow on anterior femora.

Wings : Hyaline with the apices enfumed blackish-brown. Pterostigma reddish-brown, covering about 4 cells.

Abdomen : Blood red with segments 9 and 10 purely black. Anal appendages black.

Female : Similar to male except the colour of the abdomen, which is rich olivaceous-brown instead of red.

Habits and Habitat preference : Adults are rapid fliers and found in the dirty forest pools, marshy ponds amidst the bamboo jungles.

Flight period : May-August.

Distribution : Found in Taiwan, Peninsular Malaysia, Thailand, Indonesia, India, Sri Lanka, Philippines and Myanmar.

Genus *Orthetrum* Newman, 1833

- Base of discoidal cell in hind wing at level of arculus or a shade distal.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 2 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing complete.
- Lobe of prothorax large and fringed with long hairs.
- Frons non-metallic above.
- Never less than 12 antenodal nervures in fore wing.

13. *Orthetrum sabina sabina* (Drury, 1770)
(Fig. 25)

Size : *Male* : Abdomen : 30-36 mm. Hindwing : 30-36 mm.

Female : Abdomen : 32-35 mm. Hindwing : 31-35 mm.

Field diagnosis : *Male* : *Head* : Face and frons yellowish, becoming brighter citron-yellow on upper surface of latter; vesicles black tipped with yellow; occiput black. Eyes greenish during life.



Fig. 25. *Orthetrum sabina sabina* (Drury, 1770) (Female)

Abdomen : Greenish-yellow with alternate black bands, never pruinosed. Segments 1 to 3 enormously swollen and then abruptly slimmed and compressed laterally to the end. Segments 7 to 9 and the base of segment 10 broadly black. Anal appendages creamy-white in colour.

Female : Similar to males in colouration.

Habits and Habitat preference : Adults are quite common around the perennial and seasonal monsoon ponds, agricultural fields and the irrigation channels. They oviposit exophytically within different types of algal growth in the same habitat.

Flight period : Almost throughout the year.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Russian Federation, Kazakhstan and Bhutan.

Thorax : Prothorax bright yellow marked with blackish-brown on anterior and middle lobes. Pterothorax greenish-yellow marked with black. Legs black.

Wings : Hyaline, enfumed in very old adults. Pterostigma black with middle ochreous, covering 2 cells.



Fig. 26. *Orthetrum sabina sabina* (Drury, 1770)
(Male)

Subfamily SYMPETRINAE

- Dragonflies of small to medium size.
- Supplementary crossveins in the cubito-anal space and the bridge-space present.

Genus *Acisoma* Rambur, 1842

- Base of discoidal cell in hind wing at level of arculus or a shade distal.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 2 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing complete.
- Lobe of prothorax large and fringed with long hairs.
- Frons non-metallic above.
- Only 6 antenodal nervures in fore wing.
- Abdominal segments 1 to 6 dilated, 7 to 10 slim and cylindrical.

14. *Acisoma panorpoides panorpoides* Rambur, 1842
(Fig. 27)

Size : *Male* : Abdomen : 15-18 mm. Hindwing : 16-21 mm.

Female : Abdomen : 15-18 mm. Hindwing : 17-22 mm.

Field diagnosis : *Male* : **Head** : Face and frons pale azure blue, the latter bordered with black at base; vertex and occiput black, the latter with a geminate yellow spot behind. Eyes are sky-blue during life.

Thorax : Prothorax black marked with yellow.



Fig. 27. *Acisoma panorpoides panorpoides* Rambur, 1842

Pterothorax azure-blue with different patterns of black, sutures finely black. Legs black with yellow striped femora.

Wings : Hyaline. Pterostigma pale yellowish framed in thick black nervures, covering more than one cell.

Abdomen : Azure blue, marked with black. Segments 8 to 10 entirely black. Anal appendages dirty white above, blackish beneath.

Female : Similar to the male in colour and markings.

Habits and Habitat preference : Adults perch on the grasses and other vegetation around small stagnant pools and semi-saline ponds. They oviposit exophytically in the marshy stagnant water. Larvae occur also in the same habitat where oviposition takes place.

Flight period : April–August.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar and Bhutan.

Genus *Brachythemis* Brauer, 1868

- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders parallel at wing margin.
- Genital hamules small and inconspicuous.
- Cells at the base of hind wing are not closely packed in straight rows.
- Unicolour pterostigma equal in size for fore and hind wings.
- One row of cells between *IRiii* and *Rspl* (Rarely two rows at the middle).
- Only 1 cubital nervure in all wings.
- Wings with broad reddish-yellow medial fascia.
- Face and abdomen never red.
- Only 6½ to 7½ antenodals in fore-wings.

15. *Brachythemis contaminata* (Fabricius, 1793)
(Fig. 28)

Size : Male : Abdomen : 18-21 mm. Hindwing : 20-23 mm.

Female : Abdomen : 18-20 mm. Hindwing : 22-25 mm.

Field diagnosis : Male : *Head* : Face and frons olive-yellow; occiput brown. Eyes brownish above, olivaceous below.

Thorax : Ochreous with some reddish-brown stripes. Pterothorax olive-brown with an obscure reddish-brown humeral stripe and two brownish stripes on each side. Legs ochreous with black stripe on femora.

Wings : Hyaline with amber tinted fascia. Pterostigma rust red.

Abdomen : Reddish-ochreous, marked with obscure dorsal and sub-dorsal brown stripes; Segment 8 and occasionally 9 may have some black on dorsum. Anal appendages ferruginous.

Female : Face yellowish-white. Eyes pale brown above. Pterothorax pale greenish-yellow. Bright amber fascia on wings is absent. Pterostigma bright ochreous. Abdomen pale olive-brown with a black mid dorsal line extending from segment 2 to end. Anal appendages yellow.



Fig. 28. *Brachythemis contaminata* (Fabricius, 1793)

Habits and Habitat preference : Adults fly conspicuously over the water surface or perch on the adjacent vegetation around the agricultural fields, fresh water and semi-saline ponds, fish ponds and tanks. Females usually oviposit exophytically at afternoon on the surface water. Larvae occur among the aquatic weeds or on submerged parts of aquatic plants.

Flight period : Late February–August.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Cambodia, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Bangladesh and Bhutan.

Genus *Bradinopyga* Kirby, 1893

- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders parallel at wing margin.
- Genital hamules small and inconspicuous.
- Cells at the base of hind wing are not closely packed in straight rows.
- Bicolour pterostigma equal in size for fore and hind wings.
- Two rows of cells between *IRiii* and *Rspl*.

16. *Bradinopyga geminata* (Rambur, 1842)
(Fig. 29)

Size : *Male* : Abdomen : 26-29 mm. Hindwing : 33-36 mm.

Female : Abdomen : 26-29 mm. Hindwing : 32-36 mm.

Field diagnosis : *Male* : *Head* : Face and frons olivaceous; vertex and occiput brown. Eyes brown above, pale greyish beneath.

Thorax : Prothorax and pterothorax dirty pale yellow, marbled and peppered with black in an irregular manner. Legs greyish, thinly pruinosed.

Wings : Hyaline. Pterostigma black at the centre, pure white in both the ends, between thick black nervures.

Abdomen : Black marbled with yellow. Anal appendages creamy-white.

Female : Exactly similar to male in colour and shape.

Habits and Habitat preference : Adults are well camouflaging and found perched within the granite stones, on concrete roads and around



Fig. 29. *Bradinopyga geminata* (Rambur, 1842)

small cemented tanks especially around the construction sites. With their body colour, they are quite invisible in the above habitats and are correctly called the granite ghosts. They breed in cemented water tanks, rainy hollows in the rock, and even in the dirty waters of seasonal ditches along the roads.

Flight period : Almost throughout the year except very colder months.

Distribution : Found in Thailand, India and Sri Lanka.

Genus *Crocothemis* Brauer, 1868

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders widely divergent at wing margin.
- Genital hamules small and inconspicuous.
- Cells at the base of hind wing are not closely packed in straight rows.
- Unicolour pterostigma equal in size for fore and hind wings.
- One row of cells between *IRiii* and *Rspl* (Rarely two rows at the middle).
- Only 1 cubital nervure in all wings.
- Face, frons and abdomen red.
- Only 9½ to 10½ antenodals in fore-wings.

17. *Crocothemis servilia servilia* (Drury, 1770)
(Fig. 30)

Size : *Male* : Abdomen : 24-35 mm. Hindwing : 27-39 mm.

Female : Abdomen : 21-32 mm. Hindwing : 28-37 mm.

Field diagnosis : **Male** : *Head* : Labium ferruginous, labrum blood-red. Face and frons bright blood-red, vesicle red and occiput bright orange. Eyes blood-red, bluish at the postero-lateral extremity, paler below.



Fig. 30. *Crocothemis servilia servilia* (Drury, 1770)

Thorax : Prothorax ferruginous, with a spot on middle of the anterior lobe; borders of the posterior lobe brighter rust-red; transverse ridged on middle lobe incorporated with a ruff of stiff reddish hair. Pterothorax blood-red. *Legs* ochreous. Fig.31.

Wings : Hyaline. Bases of all marked with rich amber-yellow. Pterostigma dark ochreous between black nervures.

Abdomen : Blood red with mid-dorsal carina of segments 8 & 9 blackish.

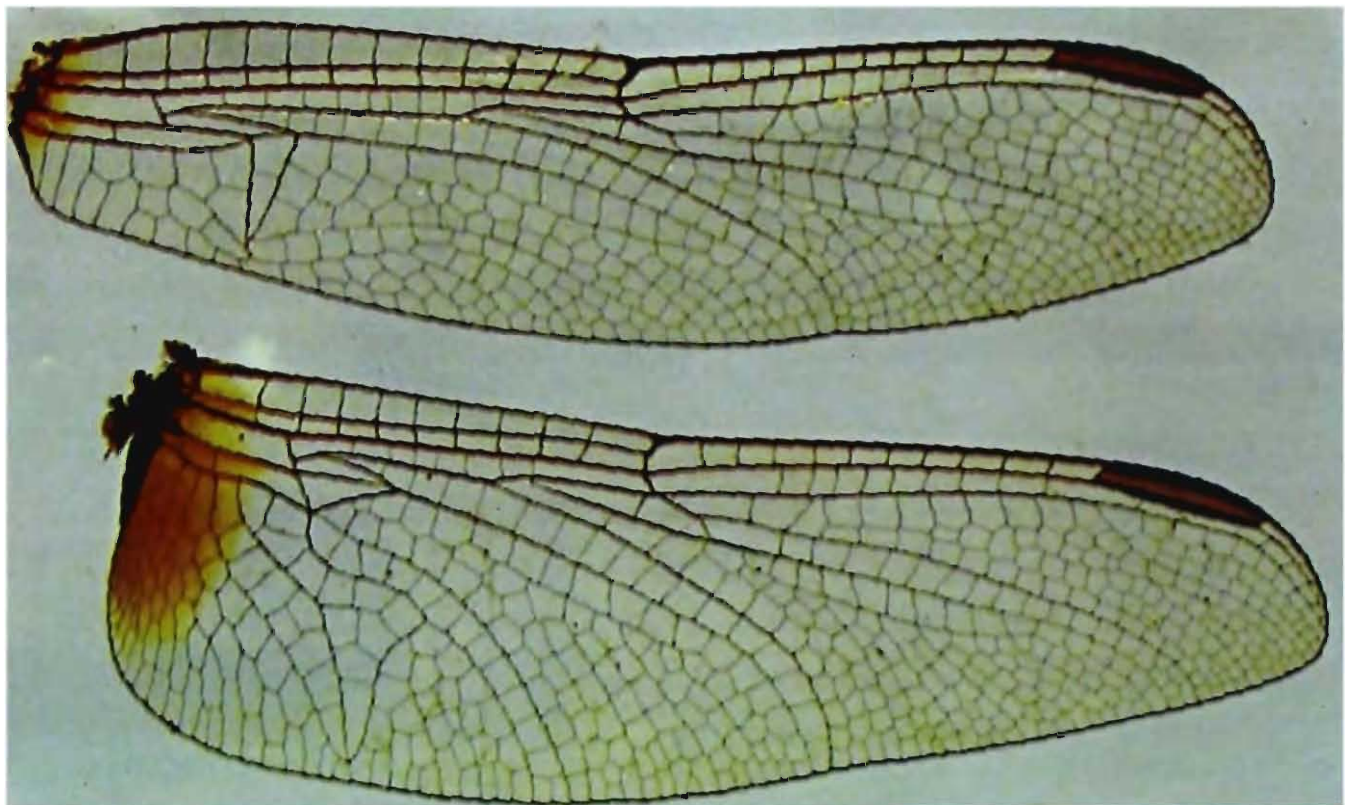


Fig. 31. Male wings of *Crocothemis servilia servilia*

Female : Differs from the male in the colour of labium, labrum, face frons, vesicle, occiput, eyes, pro- and pterothorax and abdomen, which tends to be rather yellowish than the bright red of males.

Habits and Habitat preference : No particular habitat preference has been observed in the case of the adults and they are found around most of the aquatic habitats viz., around saline and semi-saline water-bodies, in the nearby agricultural fields and irrigation channels, small fresh water ponds, ditches and even along the temporary water-bodies.

Flight period : Almost throughout the year except the extreme winter months.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Bangladesh and Bhutan.

Genus *Diplacodes* Kirby, 1889

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing mostly beginning with 3 rows of cells and then continued as 2 rows up to somewhat middle of the wing.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax large and fringed with long hairs.
- *Cuii* widely separated from the posterior angle of discoidal cell in hind-wing.
- Discoidal field in fore-wing with borders widely divergent at wing margin.
- *Dc* in hind-wing entire.
- Costal border of fore-wing straight.
- Frons non-metallic above.

18. *Diplacodes trivialis* (Rambur, 1842)
(Fig. 32)

Size : *Male* : Abdomen : 19-22 mm. Hindwing : 21-23 mm.

Female : Abdomen : 18-20 mm. Hindwing : 21-24 mm.

Remarks : Only except the little higher range of hind wing (21 – 25mm) in the present males, the other details are same as the earlier description of Fraser (1936).

Field diagnosis : Male : Head : Labium, labrum, and bases of mandibles creamy-yellow; face, frons, and vesicle palest azure-blue, with a fine black line at base of frons. Eyes reddish-brown above, pale bluish below.

Thorax : Prothorax pale brown, with a mid-dorsal yellow stripe extending full length of dorsum. Pterothorax greenish-yellow with sutures finely black in young specimens; uniform pruinose blue in adults. **Legs** black marked with yellow in adults.



Fig. 32. *Diplacodes trivialis* (Rambur, 1842)

Wings : Hyaline. Pterostigma short, dark reddish-brown between black nervures.

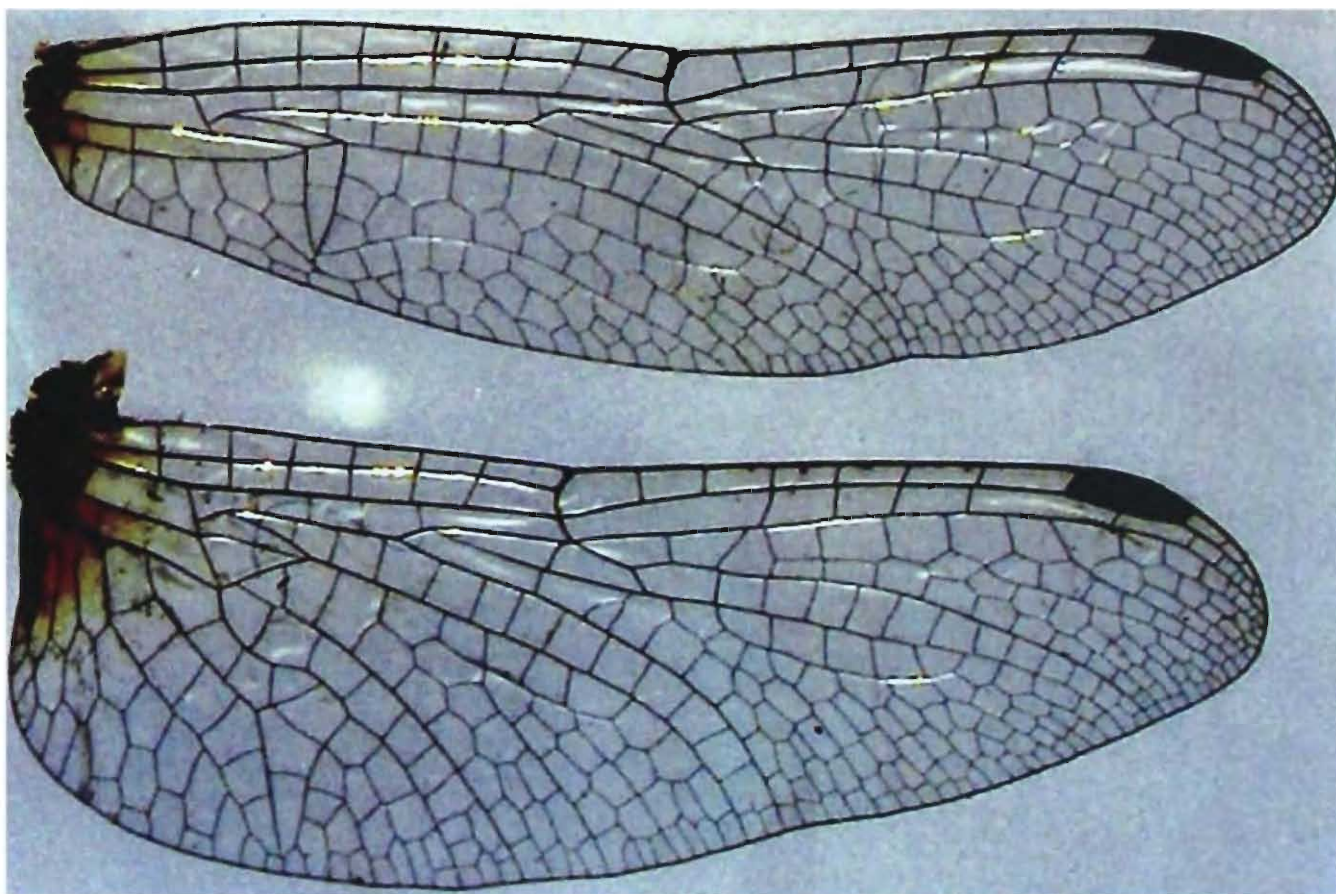


Fig. 33. Male wings of *Diplacodes trivialis* (Rambur, 1842)

Abdomen : Segments 1 to 3 greenish-yellow, with the sutures finely black and mid-dorsal and subdorsal black stripes extending from jugal suture on segment 2 and expanding broadly at apical borders of segments 2 and 3; all these markings more or less obscured by blue pruinescence in adults; remaining segments black, pruinose densely in old adults, but with subdorsal yellow stripes on segments 4 to 7, extending from base to apex of segments 4 to 6 and nearly to apex on 7 in subadults. *Anal appendages* bright yellow.

Female : Resembles the subadults or teneral male in colour and markings, but the abdominal markings broader and continued on to segments 8 to 10, the latter entirely yellow as well as anal appendages, whilst the spots on segments 8 and 9 are of variable length. Vulvar scales broad but short, scoop-shaped.

Habits and Habitat preference : The species occurs in the agricultural fields, near the slow-running marshy streams, semi-saline water-bodies, but mostly seen on the roads, little away from these actual habitats, camouflaging quite well amidst the soil and difficult to locate.

Flight period : Late April–August.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar and Bhutan.

Genus *Neurothemis* Brauer, 1867

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders mostly parallel and slightly divergent at wing margin.
- Genital hamules small and inconspicuous.
- Cells at the base of hind wing are not closely packed in straight rows.
- Unicolour pterostigma equal in size for fore and hind wings.
- One row of cells between *IRiii* and *Rspl* (Rarely two rows at the middle).
- More than one cubital nervure in all wings.
- Wings partly coloured.

19. *Neurothemis tullia tullia* (Drury, 1773)
(Fig. 34)

Size : Male : Abdomen : 16-20 mm. Hindwing : 19-23 mm

Female : Abdomen : 16-19 mm. Hindwing : 20-23 mm

Field diagnosis : Male : *Head* : Labrum, face, frons, vesicle and occiput black. Eyes blackish-brown above, violaceous below.

Thorax : Prothorax and pterothorax black, mid-dorsal carina of the later finely yellow. Legs black, tibiae yellow on extensor surfaces.

Wings : Hyaline for apical half and steely bluish-black for the basal half. Black basal area of wings edged outwardly with an opalescent white band and is sufficient enough to distinguish the species in the field. Pterostigma dull ochreous framed in thick black nervures.



Fig. 34. *Neurothemis tullia tullia* (Drury, 1773)

Abdomen : Black. A broad mid-dorsal interrupted creamy-white stripe on segments 1 to 8, broad at base of segments, tapering to apical end and becoming lost on segment 7 or 8. Anal appendages creamy white tipped with black.

Female : Exhibits strong sexual dimorphism. Olivaceous occiput bears a bright citron-yellow geminate spot behind. Eyes pale brown above, pale olivaceous laterally and beneath. Pro- and pterothorax greenish-yellow. Bases of wings bright amber-yellow up to the node or little distal. Blackish-brown subcostal line broadening into a irregular same colour spot near node. Apices broadly opaque blackish-brown up to the middle or inner end of pterostigma. Pale yellow between these two opaque area. Abdomen bright yellow with a broad black stripe extending from segment 1 to the end. Short, conical anal appendages are bright yellow in colour.

Habits and Habitat preference : These weak fliers flutter near swampy or weedy freshwater or semi-saline ponds.

Flight period : May–August.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Thailand, India, Sri Lanka, Myanmar and Bangladesh.

Subfamily TRITHEMISTINAE

- Medium sized dragonflies.
- Resting with the body pointing up and the wings pointing down.
- Nodus shifted distally, thus apical part of wing shortened.

Genus *Trithemis* Brauer, 1868

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders converging strongly at wing margin.
- Discoidal cell in fore wing broader, its costal side is about one-half the length of basal.
- No supplementary nervure *IRii* present between *Rii* and *Riii*.

20. *Trithemis pallidinervis* (Kirby, 1889)
(Fig. 35)

Size : *Male* : Abdomen : 28-32 mm.
Hindwing : 30-36 mm.

Female : Abdomen : 26-28 mm.
Hindwing : 30-32 mm.

Field diagnosis : *Male* : *Head* : Labrum black, with two large basal citron-yellow spots. Face and frons yellow; upper surface of frons and vesicle metallic purple; occiput yellow. Eyes reddish-brown above, paler laterally and bluish-grey below.

Thorax : Prothorax black marked with some yellow spots. Pterothorax



Fig. 35. *Trithemis pallidinervis* (Kirby, 1889)

olivaceous-brown on dorsum, which is thickly coated with greyish hairs; three black stripes on each side. Legs very long and spidery, black, anterior pair of femora bright yellow for basal half.

Wings : Hyaline with reddish reticulation and bright amber-yellow basal fascia at the extreme base. Pterostigma bicolourous, black with creamy-white ends.

Abdomen : Black, marked with bright yellow. Segments 9 and 10 entirely black. Anal appendages yellow at base, black for the apical half.

Female : Closely resemble males but little paler than the later. Unlike males, the segment 10 yellow dorsally.

Habits and Habitat preference : Adults occur sympatrically along the marshy lakes and freshwater as well as brackish-water ponds.

Flight period : April–July.

Distribution : Found in Taiwan, Peninsular Malaysia, Cambodia, Thailand, Indonesia, India, Sri Lanka, Philippines and Myanmar.

Subfamily TRAMEINAE

- Medium sized dragonflies.
- Body short and wings longer.
- Rspl and Mspl distinct like a primary longitudinal vein and with 2-3 row of cells in between.
- Anal field strongly broadened in hind-wing, with numerous small cells basal of the anal loop, correlated with a characteristic triangular shape of hind-wings.

Genus *Rhyothemis* Hagen, 1867

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 to 5 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.

- Sectors of arculus in fore-wing separated and diverging at origin.
- Body dark metallic.
- Frons metallic above.
- Wings generally broadly coloured with black and golden-amber.

21. *Rhyothemis variegata variegata* (Linnaeus, 1763)
(Fig. 36)

Size : Male : Abdomen : 23-25 mm. Hindwing : 33-36 mm.

Female : Abdomen : 20-22 mm. Hindwing : 28-37 mm.

Field diagnosis : Male : Head
: Labium pale yellow, labrum black and clypeus creamy yellow. Frons dull yellow at the lower border and metallic blue for the remaining portion along with vesicles; Eyes dark reddish-brown above.

Thorax : Prothorax black. Pterothorax dull metallic green. Legs black.



Fig. 36. *Rhyothemis variegata variegata* (Linnaeus, 1763)
(Male)

Wings : Save for the other characters, the species can easily be identified in the field only by the colourful wings that show strong sexual dimorphism. The male with whole of wing tinted amber-yellow, fore wing with blackish brown spots at node, discoidal cell and at apex. The spots of hind-wing are similar to that of fore-wing with additional spots at middle of *Riii* and two broad longitudinal basal bands; one along the cubital space and another at the anal loop area.

Abdomen : Entirely black. Anal appendages long and slim.

Female : Head, thorax and abdomen similar to that of males. Wings broader and shorter than males and differ widely in colouration. Fore-wing hyaline from node to apex and amber-yellow from base to node, basal half with broad black markings. Hind-wing hyaline only at apex and rest amber-yellow with broad black irregular markings extending as far as pterostigma.



Fig. 37. *Rhyothemis variegata variegata*
(Linnaeus, 1763) (Female)

Habits and Habitat preference : Adults weakly flutter along marshy ponds and weedy water tanks.

Flight period : Late April – July.

Distribution : Found in Viet Nam, Thailand, India, Sri Lanka and Myanmar.

Genus *Pantala* Hagen, 1861

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders converging strongly at wing margin.
- Discoidal cell in fore wing very narrow, its costal side is about one-third the length of basal.
- A conspicuous supplementary nervure *IRii* present between *Rii* and *Riii*.

22. *Pantala flavescens* (Fabricius, 1798)
(Fig. 38)

Size : *Male* : Abdomen : 27-35 mm. Hindwing : 37-40 mm.

Female : Abdomen : 29-33 mm. Hindwing : 39-41 mm.

Field diagnosis : *Male* : *Head* : Labium variably pale brown or yellowish, with middle lobe and apposed borders of lateral lobes dark brown; labrum bright ochreous broadly bordered with black; anteclypeus pale olivaceous-yellow; postclypeus and frons bright golden-yellow or orange, often suffused with reddish in front; vesicle bright ochreous. Eyes reddish-brown above, bluish laterally and beneath.

Thorax : Prothorax rich ochreous, with a transverse belt of dark reddish-brown between anterior and middle lobes; Pterothorax olivaceous or ferruginous, coated thickly with yellowish downy hair. *Legs* black, bases and extensor surface of all femora yellowish.

Wings : Hyaline. Base of hind wing pale golden-yellow as far distal as anal loop and with a narrow apical brown spot limited to posterior border of wing; pterostigma reddish-brown, and unequal in fore and hind wings.

Abdomen : Bright ochreous, dorsum tinted with bright brick-red, sides of segments 1 to 4 pale yellow; segments 8 to 10 with sharply-defined black mid-dorsal pyriform spots with narrow end of spots at base of segments; vestiges of these spots at apical end of segments 6 and 7 in some specimens. Anal appendages ochreous, changing to black towards apex.

Female : Quite similar to male, from which it differs in the following points :- Eyes olivaceous-brown above; face vivid chrome-yellow without any reddish tinting.



Fig. 38. *Pantala flavescens* (Fabricius, 1798)

Habits and Habitat preference : Adults are common invariably everywhere, over the paddy fields, irrigation channels, ponds, small pools of water, lakes and even high on roads during the rainy seasons. Oviposition occurs in tandem in these fields.

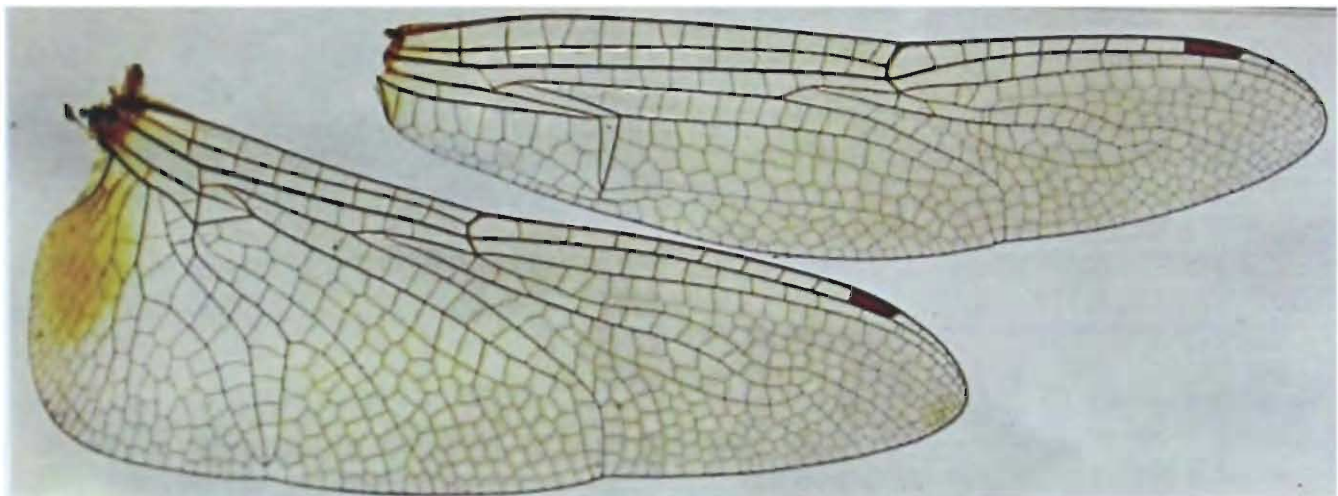


Fig. 39. Male wings of *Pantala flavescens*

Pantala flavescens is believed to be the only migratory odonata that migrates with monsoon winds. I have recorded unusual time of oviposition from Dehradun valley, which ascertains the presence of local population.

Flight period : May–August.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar, Bangladesh, Asian Russia, Russian Federation, Kazakhstan and Bhutan.

Genus *Tramea* Hagen, 1861

- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing incomplete.
- Lobe of prothorax small and usually naked.
- Discoidal field in fore-wing with borders diverging slightly at wing margin.
- Genital hamules very large, projecting and conspicuous in profile.
- Cells at the base of hind wing becoming arranged into straight rows of closely packed narrow cells.
- Pterostigma unequal in both the wings; that of hind-wing is smaller than the fore-wing.
- One row of cells between *IRiii* and *Rspl*.
- *Riii* evenly curved, not undulated.
- Apical angle of anal loop much more acute than the distal.

23. *Tramea virginia* (Rambur, 1842) (Fig. 40)

Size : *Male* : Abdomen : 34-38 mm. Hindwing : 43-49 mm.

Female : Abdomen : 35 mm. Hindwing : 49 mm.

Field diagnosis : **Male** : *Head* : Face and frons olivaceous, the latter suffused with bright rose-red and with a very broad black border at base above which has a metallic violaceous reflex; occiput dark olivaceous. Eyes reddish-brown above, paler below.

Thorax : Prothorax dark ochreous with a black stripe between anterior and the middle lobes. Pterothorax dark olivaceous-green. Legs black.

Wings : Hyaline with reddish reticulation at basal half. Only a single black spot of variable size at the base of hind wing and a very broad, dark brunt-brown mark extending distally to distal end of discoidal cell and involving nearly whole of anal loop of the same wing are sufficient enough to distinguish the species in the field. Pterostigma dark ochreous and that of hind-wing slightly more than half the length of that of fore-wing.



Fig. 40. *Tramea virginia* (Rambur, 1842)

Abdomen : Bright red marked with black on last three segments. Anal appendages black, red at extreme base.

Female : More or less same as males excepting the sexual characters. Base of hind-wing seems to have two spots by a large indentation.

Habits and Habitat preference : Adults are shy insects and fly along marshy water channels.

Flight period : May–July.

Distribution : Found in Guandong, Guangxi, Hainan, Hong Kong, Taiwan, Viet Nam, Thailand, Indonesia, India, Japan, Myanmar and Bangladesh.

Genus *Tholymis* Hagen, 1861

- Base of discoidal cell in hind-wing at level of arculus.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 3 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop running on to meet posterior border of wing, apex of loop open.
- Abdomen broad at base then tapering gradually to the end.
- Male with an opalescent white spot at the centre of hindwing.

24. *Tholymis tillarga* (Fabricius, 1798)
(Fig. 41)



Fig. 41. *Tholymis tillarga* (Fabricius, 1798)

Size : *Male* : Abdomen : 28-33 mm. Hindwing : 33-37 mm.

Female : Abdomen : 27-31 mm. Hindwing : 31-37 mm.

Field diagnosis : *Male* : *Head* : Face and frons yellowish to ochreous. Eyes brown capped with reddish, olivaceous below.

Thorax : Prothorax and pterothorax golden yellow. Legs ochreous.

Wings : Hyaline, with a broad golden-brown fascia extending from node to base of hind-wing which, together with the above said opalescent white spot at the centre of the same wing makes the species distinct in the field. Pterostigma reddish-brown and is framed in thick black nervures.

Abdomen : Bright rust-red. Anal appendages reddish.

Female : Quite same as the males but devoid of the opalescent white spot.

Habits and Habitat preference : Adults are crepuscular in habit and breeds in marshy water bodies.

Flight period : Almost throughout the year.

Distribution : Found in Guandong, Hainan, Hong Kong, Taiwan, Peninsular Malaysia, Lao, Viet Nam, Thailand, Indonesia, India, Sri Lanka, Philippines, Japan, Myanmar and Bangladesh.

Subfamily UROTHEMISTINAE

- The sectors of the arculus are not fused.
- Venation quite open, with few antenodal crossveins (about 5).

Genus *Macrodiplax* Brauer, 1868

- Base of discoidal cell in hind wing at level of arculus or a shade distal.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 2 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing complete.
- Lobe of prothorax small and inconspicuous, usually naked.
- Frons non-metallic above.
- Only 1 or 2 rows of cells between *IRiii* and *Rspl*.
- Subtrigone in fore-wing 3-celled.
- Black dorsal markings on all abdominal segments from 1 to 10.

25. *Macrodiplax cora* (Brauer, 1867)
(Fig. 42)

Size : *Male* : Abdomen : 15-17 mm. Hindwing : 30-32 mm.

Female : Abdomen : 22-24 mm. Hindwing : 32 mm.

Field diagnosis : *Male* : *Head* : Face and frons dark red. Eyes capped with reddish-brown, pale yellow below.

Thorax : Prothorax blackish-brown. Pterothorax golden olivaceous on dorsum; laterally bluish-green, with a short black streak on the upper part of each lateral suture. Legs black.

Wings : Hyaline, with a narrow amber-yellow band at basal border of hind-wing. Pterostigma bright ochreous framed in thick black nervures, covering less than one cell.



Fig. 42. *Macrodiplax cora* (Brauer, 1867)

Abdomen : Bright red on dorsum with mid dorsal black marking extending the whole length. Anal appendages ochreous.

Female : More or less similar to males but, more robust than the latter.

Habits and Habitat preference : Adults are common along marshy water channels, freshwater ponds, semi-saline ponds and brackish water near estuaries. Upon disturbance the males flies high up and again returns mostly to the same perch.

Flight period : April–September.

Distribution : Found in Hong Kong, Taiwan, Peninsular Malaysia, Thailand, Indonesia, India, Sri Lanka, Philippines and Japan.

Genus *Urothemis* Brauer, 1868

- Base of discoidal cell in hind wing at level of arculus or a shade distal.
- Costal side of *Dc* in fore wing not angulated.
- Anal loop made up of more than 6 cells.
- Discoidal field in fore wing beginning with 2 rows of cells.
- Claw hooks shorter than the claws and arising from about middle of the latter.
- Borders of anal loop converge and meet before posterior border of wing.
- Distal antenodal nervure in fore wing complete.
- Lobe of prothorax small and inconspicuous, usually naked.
- Frons non-metallic above.
- Only 1 or 2 rows of cells between *IRiii* and *Rspl*.
- Subtrigone in fore-wing 3-celled.
- Black dorsal markings on abdominal segments 9 and 10 only.

26. *Urothemis signata signata* (Rambur, 1842) (Fig. 43)



Fig. 43. *Urothemis signata signata* (Rambur, 1842)

Size : Male : Abdomen : 27-28 mm. Hindwing : 34-37 mm.

Female : Abdomen : 25-27 mm. Hindwing : 34-36 mm.

Field diagnosis : Male : *Head* : Face and frons blood-red. Eyes blood-red above, reddish-brown laterally, lilaceous below.

Thorax : Prothorax dark reddish-brown. Pterothorax red on dorsum to olivaceous with reddish tinge laterally. Legs dark brown.

Wings : Hyaline with crimson reticulation. Base of fore-wing with golden amber at the extreme border while that of hind-wing much broader and extended and sufficient enough to identify the species in the field. Pterostigma ochreous above, pale whitish-yellow below.

Abdomen : Blood-red with black stripes on the dorsum of segments 8 and 9. Anal appendages pale reddish.

Female : Ground colour more brownish to ochreous than blood-red of male. Anal appendages tipped with black.

Habits and Habitat preference : Adults are quite common near the small weedy ponds and permanent monsoon ponds.

Flight period : Late April–July.

Distribution : Found in China, Hainan, Hong Kong, Cambodia, Viet Nam, Thailand, India, Sri Lanka, Pakistan, Myanmar and Bangladesh.

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