FAUNA PALAESTINA • INSECTA V

ODONATA OF THE
LEVANT

by

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PREFACE

The Odonata fauna of the Levant dealt with in this volume covers 82 species, belonging to 36 genera of the suborders Zygoptera (damselflies) and Anisoptera (dragonflies).

The geographical scope is not restricted to cis- and trans-Jordan, and information is given on species found in Israel, Egypt (Sinai), Jordan, Syria and the Lebanon.

The main repositories are the National Entomological Collection at Tel Aviv University, the “Beth Gordon” Collection at Kibbutz Deganya A, my personal collections, Armin Heymer’s collection from Israel and Sinai, the British Museum (Natural History), and the Royal Scottish Museum, Edinburgh.

Larval forms are discussed in a special section, including identification keys.

The numbers in parentheses which appear after the locations refer to the geographical areas on the map of Israel and Sinai, at the end of the book. The spelling of names of localities in Israel and Sinai is according to the maps published by the Survey of Israel.
ACKNOWLEDGEMENTS

I dedicate this book to my children Patrick and Jani who, for many years, knew their father as that strange visitor to the house, who used to rush in to drop one suitcase, pick up another, and again depart for some mysterious destination, a desert or some other locality. I hope it may show them that this was not all just for fun or because of some weird, and as I now experience, highly contagious travel virus.

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Ms Judith Kahan and Ms Tamara Leff did the typesetting and Ms Ferber also prepared the index and saw the book through the press.
**LIST OF ABBREVIATIONS**

A - anal vein or analis;  
Ab - anal bridge;  
A.C. - anteclypeus;  
Ac - anal crossing;  
ac - anterior collar;  
AFr (=VR) - anterior frame;  
ah. str. - antehumeral stripe;  
al. sin. - alar sinus;  
AK - ejaculation chamber;  
an - antennal cross-veins;  
Anus - anal opening;  
A.O. - anterior ocellus;  
ApI,2 - apodemes;  
app. dors - appendix dorsalis or lamina supra analis;  
ar - areulus;  
At - anal triangle;  
aw - anterior wing implant;  
b - bursa;  
ba - bursal arms;  
BHA - base of anterior hamulus;  
BV - base of vesica spermatis;  
C - costal vein or costa;  
car - carina;  
cerci - appendices superiores;  
cf - carinal fork;  
Cu - cubital vein or cubitus;  
Cu1 and Cu2 - first and second branches of cubital vein;  
CV - cubital cross-veins;  
Cx1 - coxa of first pair of legs;  
Cx2 - coxa of leg 2;  
Cx3 - coxa of leg 3;  
d - discoidal cell (quadrangle);  
d - discoidal cell (wing triangle);  
epm3 - mesopimerum;  
epm3 - metaepimerum;  
epst2 - mesopisternum;  
epst3 - metaepisternum;  
F - frons;  
f.g. - female gonapophyses;  
G - gena, genae;  
gen.op. - genital opening;  
Gl - glossa;  
h - hook;  
HA - hamulus anterior;  
HP - hamulus posterior;  
h.s. - humeral suture;  
h. str. - humeral stripe;  
h1 - hypertriangle;  
in2 - mesoinfraepisternum;  
in3 - metainfraepisternum;  
IP - inner plate of hamulus anterior;  
IR2 - second interradial vein;  
IR3 - third interradial vein;  
L - ligula;  
L1,2 - segments of ligula;  
LA - lamina anterior;  
LB - lamina batilliformis;  
lam. mes. - lamina mesostigmatis;  
lam. sub. an. - lamina subanalis (= appendix inferior);  
lam. supra an. - lamina supra-analis;  
Lbr - labrum;  
lr - lower rim of hind margin of pronotum;  
m - caudal membranaceous part of vesica spermatis;  
Md - mandibula, mandibles;  
me1, me2 - median lobes of pronotum;  
M - median vein or Medius;  
Me - membranula;  
MR - opening of reservoir of vesica spermatis;  
ms - mesostigma [= s2];  
Mspl - median suplementary sector (vein);  
mt - meta sternum;  
Mx - maxilla;  
N - nodus;
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Occ – occiput;
os – ostium (opening of bursa);
P (=Z) – plug;
P₁ – first segment of paraglossa;
P₂ – second segment of paraglossa or palpus;
P.C. – postclypeus;
Pe – ejaculatory pore;
PF – processus furculiformis;
PFr (=HR) – posterior supporting frame of hamuli;
Pg – pronotum;
ps – postnodal cross-veins;
P.Oc. – postocular spots;
P.Oc.T. – postocellar triangle;
Pst – pseudopterostigma;
pr – posterior rim of pronotum;
P₁ – pterostigma;
pw – posterior wing implant;
r – sperm reservoir;
R – radial vein or Radius;
R₁ – R₂; R₃ – branches of radius;
R + M – fused radius and medius, basal to arculus;
Rf – radial fork;
Rs – radial sector;
Rsp – radial supplementary sector;
s₂ – mesostigma;
s₃ – metastigma;
Sarc – sector of the arculus;
Sc – subcostal vein;
Schw – erectile tissue;
St – styli;
stm – stigma;
str – sterigmata (sclerotized plates);
sts – styles;
Su₁ – suture 1;
Su₂ – suture 2;
ur – upper rim of hind margin of pronotum;
V – vertex;
V₁₄ – segments of vesica spermatitis;
V₁₃ – first to third pair of valves
[ovipositor];
V₂ – apical valves;
V₃ – basal valves;
Vf – valvifer;
v₁ – vulvar lips;
VS – vesica spermatitis;
V.v – vulvar scales or lips (valvulae vulvae).
INTRODUCTION

GENERAL CHARACTERS OF THE ORDER ODONATA

Amphibirotic, hemimetabolous, medium- to large-sized four-winged insects. Imaginal state comparatively short (from a few days to two months), aerial; larval stage usually much longer-lived, aquatic. All stages are predacious. Compound eyes large. Antennae short. Prothorax small, free. Meso- and metathorax fused, tilted at an angle to the body axis, so that the legs are moved frontad and the wings posteriad. Abdomen composed of 11 segments. Male with reduced penis, but with a secondary copulatory organ and accessory genitalia on ventrum of abdominal segments 2 and 3. Females oviparous, with or without an ovipositor. Sexes of similar size and habitus, but often differing in colour pattern of the thorax, abdomen, legs and/or wings.

Three suborders are extant. Of these, the Anisozygoptera are represented by one genus (Epiophlebia) and two species (one in Japan, one in the Central Himalayas). Differences between suborders Zygoptera (the most primitive of all, and probably a monophyletic group) and Anisoptera (more advanced Odonata, but probably not a monophyletic group) will be discussed under the various sections on anatomy.

EXTERNAL ANATOMY OF THE ADULT

Head (Figs. 1–8): Large, extremely mobile, wider than thorax. Shape different in the two suborders (Zygoptera — transversely elongate; Anisoptera — subglobular), but also major differences among families. In the Zygoptera, the compound eyes are always widely separated from one another. Three ocelli (supplementary, single ommatidia) are situated on the vertex, here a flat area between the compound eyes. They are arranged in a triangle, and the foremost ocellus is slightly larger than the posterior pair. The antennae are short and consist of 7 segments. Scapus and pedicellum are usually more strongly built than the apical flagellum. The occiput is narrow medially, but expands laterally. When the dorsum of the head is dark coloured, one frequently observes two clear spots on either side of the occiput — the postocular spots. Anteriorly situated are the vertex, the frons which is rarely (Ceriagrion) transversely ridged, and the clypeus (epistome). The clypeus is divided into a large postclypeus, and a smaller, often triangular anteclypeus, adjacent to the labrum. The labrum overhangs the mouth. The mouth parts are raptorial. The mandibles are strongly developed; the number and shape of their teeth is genus-specific, often
Fig. 1: Head of a zygopteran; a. ventral view; b. dorsal view
A.C. – anteclypeus; A.O. – anterior ocellus; basis Mx – base of maxilla;
F – frons; G – gena; Lbr – labrum; Md – mandibles; Oec – occiput;
P.C. – postclypeus; P.Oc. – postocular spots; V – vertex
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Fig. 2: Head of a gomphid
A.C. – anteclypeus; F – frons; G – genae; Lbr – labrum; Occ – occiput;
P.C. – postclypeus; P.Oc.T. – postocular triangle; V – vertex

Fig. 3: Head of an aeschnid
A.C. – anteclypeus; F – frons; Lbr – labrum; Md – mandible;
Occ – occiput; P.C. – postclypeus; V – vertex
Fig. 4: Mandibles

Fig. 5: Maxilla

species. One is small, considered Labium. Zygopterus rudimentary. Cordulidae in the Cordulidae. The appendages in the Aeshnidae. Gomphidae small. The labrum between the different arrangements.
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species-specific (Fig. 4). Maxilla (Fig. 5) with two apical lobes, of which the internal one is strongest and bears rows of stiff internal spines. The external lobe is sometimes considered a palpus. The base is formed of the cardo and stipes, as usual.
Labium (Figs. 6–8) strongly developed. The glossae (internal lobi) are free in the Zygoptera (Fig. 6), or fused to form a single ligula in the Anisoptera (Fig. 7). A rudiment of a median cleft may, however, be present. It is relatively deep in the Cordulegasteridae (Fig. 8). The paraglossae (lateral lobi) are more strongly developed in the Anisoptera, and particularly in the Libelluloidea (= Libellulidae plus Corduliidae), than in the Zygoptera. They are composed of one or two articles. Again, the apical article is sometimes considered a palpus.
The anisopteran head is further distinguished by the fact that the eyes are larger than in the Zygoptera, often confluent along the mid-dorsum of the head (Libellulidae, Aeshnidae). In the Cordulegasteridae, the eyes meet only in one point, and in the Gomphidae they are separated (Fig. 2). However, in all Anisoptera the occiput is small, often reduced to a small triangle, and never much wider than the distance between the outer ocelli. The vertex, on which the ocelli are located, is usually differentiated, rarely flat. In forms where the compound eyes meet, the ocelli are arranged in a triangle as in Zygoptera. In most Gomphidae, however, they are more or less aligned.

![Diagram]

Fig. 6: Labrum of a zygopteran (Calopteryx)
GI – glossa; P₁ – first segment of paraglossa;
P₂ – second segment of paraglossa or palpus
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Fig. 7: Labrum of a (non-cordulegaster) anisopteran
L – ligula; P₁ – paraglossa; P₂ – paraglossa 2 or palpus

Fig. 8: Labrum of Cordulegaster, with median cleft in ligula
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Thorax (Figs. 9–12): The prothorax is small and free. Its dorsum, the pronotum, is composed of an anterior collar, two median lobes, and a posterior rim. The posterior rim may be raised, and present various differentiations. Often, a median outgrowth is found, which may or may not be flanked by upright teeth, and flanked anteriorly by projecting stylets. In Zygoptera — particularly females — this, in conjunction with the lamina mesostigmaticus, forms the grasping area for the male’s anal appendages, and has enormous diagnostic value (see keys).

The meso- and metathorax are strongly developed and fused into a single block — the synthorax or pterothorax. This “block” stands obliquely, in an aerodynamic position, to the longitudinal body axis, so that the legs are moved frontad and the wings caudad. The “body” of the synthorax is formed by pleurites, including the anterior half of its dorsum. Tergites are small, reduced to a meso- and metascutum and scutellum, flanked by the membranaceous implants of the wings. The meso- and metasternum may present distinctive colour patterns.

Each of the strongly expanded pleurites is divided into three sclerites: an episternum, an epimerum, and an infra-episternum. The mesoepisternum (eps1) on either side fuse along the mid-dorsum to form the median suture, often raised into a crest. Left and right rami of the crest usually remain visible as individual thickenings. Anteriorly, the median crest (carina) opens to form a median frame or fork, while posteriorly it forms two ante-alar sinuses. The carina may present a hump or a spine in Anisoptera (Fig. 10). The suture between eps1 and eps2 (= epimerum 2 or mesoepimerum) is called the humeral suture; it either runs straight or is somewhat wavy, but is always well developed and entire.

Clear bands on eps1, flanked by black stripes on the carina and the humeral suture, are called antehumeral stripes. The dark striae overlying the humeral suture itself are the humeral bands. The humeral suture forks anteriorly to accommodate the infra-episternum 2 or mesoinfra-episternum (inf1) The eps1 has an anterior differentiation flanking the carinal frame — the lamina mesostigmaticus (lam. mes.) (Fig. 11). In zygopteran copulation, it forms a functional unity with the hind lobe of the pronotum. It is the main area where the male superior appendages grasp. In some cases, areas of the largely membranaceous pre-episternum (that articulates with the prothorax and accommodates the mesothoracic stigmata) may be scleritized (epaulettes) and take part in tandem linkage mechanics.

The suture (Su1) between meso- and metathorax is complete in the Calopterygidae only (Fig. 9). In other Zygoptera and in all Anisoptera, it is only very partially visible. The suture (Su2) between eps1 and eps2 is entire, anteriorly forked at the level of infra-episternum 3 (inf2). Behind eps2, an upfolded rim of the metasternum (mt) may be laterally visible.

The legs (Fig. 12) are prehensile. The prothoracic pair is shortest, the metathoracic pair longest. They are of classical structure: coxa, trochanter, femur, tibia, tarsus (3 segments) and claws. Both the shape and colour of parts of the legs (usually the tibiae) may be of taxonomical significance. Also the number, shape, and structure of the spines on the femur and tibia can vary with taxa at different levels.
Fig. 9: Thorax of a zygopteran (*Calopteryx*)

- ac – anterior collar of prothorax; al. sin. – alar sinus;
- aw – anterior wing implant; cf – carinal fork;
- Cx₁ – coxa of first pair of legs; Cx₂ – coxa of leg 2; Cx₃ – coxa of leg 3;
- epm₂ – mesepimerum; epm₃ – metaepimerum; epst₂ – mesoepisternum;
- epst₃ – metaepisternum; h.s. – humeral suture; inf₂ – mesoinfracosternum;
- inf₃ – metainfracosternum; lam. mes. – lamina mesostigmalis;
- me₁, me₂ – median lobes of pronotum; mt – metasternum; Pn – pronotum;
- pr – posterior rim of pronotum; pw – posterior wing implant;
- s₂ – mesostigma; s₃ – metastigma; Su₁ – suture 1; Su₂ – suture 2

Fig. 10: Thorax of a gomphid

- ah. str. – antehumeral stripe; car. – carina; h. str. – humeral stripe;

All other symbols are as for Fig. 9
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Fig. 11: a. Accessory genitalia of a coenagrionid
AFr (=VR) – anterior supporting frame of hamuli; HA – hamulus anterior;
HP – hamulus posterior; IP – inner plate of hamulus anterior; L – ligula;
LA – lamina anterior; LB – lamina batilliformis; MR – filling hole of
vesica spermatis; PFr (=HR) – posterior supporting frame of hamuli;
st – stigma; VS – vesica spermatis;
b–c. Pronotum structure in Zygoptera
ac – anterior collar; cf – carinal fork; lam. mes – lamina mesostigmalis;
ir – lower rim of hind margin of pronotum; me1–2 – median lobes;
ms – mesostigma; sts – stylets; ur – upper rim of hind margin of pronotum
Wings (Figs. 13–15): The wing is a double membrane, supported by a skeleton of 6 longitudinal, strongly sclerotized main veins, with numerous ramifications and cross-veins. The longitudinal veins all lie in different planes, so that the fractions of the membrane stretched between them stand at angles to one another. Wings may be hyaline, tinged, or display well-defined colour-spots. Wings may become darker with age, and become suffused with colour, especially around the veins. In perching, Zygoptera hold their wings closely apposed across the dorsum of the abdomen (or partially open in the genus *Lestes*). Anisoptera never close their wings when at rest, but the angle between the left and right pairs may vary according to families and genera.

The wing venation of dragonflies is complex but easy to study and has thus traditionally been used as a basis for classification and for discussing the phylogeny of the order.
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Figs. 13–14: Wings of Zygoptera

13. Coenagrion; 14. Calopteryx

A – anal vein or analis; Ab – anal bridge; Ac – anal crossing;
an – antenodal cross-veins; arc – arculus; C – costal vein or costa;
Cu – cubital vein or cubitus; Cu, and Cu2 – first and second branches of
cubital vein; d – discoidal cell (quadangle); IR2 – second interradial vein;
IR3 – third interradial vein; M – median vein or Medius; N – nodus;
pn – postnodal cross-veins; Pt – pterostigma; PsPt – pseudopterostigma;
R – radial vein or Radius; R1, R4-5 – branches of radius;
R + M – fused radius and medioum, basal to arculus; Sc – subcostal vein

of the order. In the past fifteen years, however, alternative approaches have been made
(see further). A nomenclature of the wing venation was devised by Comstock &
Needham (1903). It was followed in early handbooks by Ris (1909–1919), Schmidt
(1929) and May (1933). Tillyard (1917) and Tillyard & Fraser (1938–1940) later
proposed an alternative system, which is now widely followed, and employed in this
book.
The costa (C, or costal vein) forms the anterior border of the wing, from base to apex.
The subcosta (Sc) extends from the base to a thick cross-vein (the nodus, N), somewhat
before halfway along the length of the wing. The Radius (R) extends from wing base
to apex (posterior to the nodus it is called R1). Posterior to the nodus, there is one
row of cells between C and R1. Subapically, a large cell (extending over the length of
a single or several normal cells) is found — the pterostigma (Pt). The Pt is often
conspicuously coloured, and without cross-veins. Cross-veins are found only in the
females of Calopteryx, where the structure is called the pseudopterostigma. Calopteryx
males have no pterostigma at all.
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Fig. 15: Hind wing of anisopteran (Anax)
arc – arculus; At – anal triangle; Cv – cubital cross-veins;
d – discoidal cell (wing triangle); ht – hypertrigone; Me – membranula;
Mspl – median supplementary sector (vein); Rf – radial fork; Rs – radial sector;
Rspl – radial supplementary sector; Sarc – sector of the arculus; sn – subnodus
Other symbols as for Figs. 13–14

The Medius (M) and the Radius are fused (R + M) between the base of the wing and a cross-vein, the arculus (arc), which is the site where M (and Rs — see hereafter) abruptly turn down. Via an extension of arc, the arculus sector (Sarc), M then continues its way towards the lower rim of the wing, which it reaches at about its middle. Next comes the cubitus (Cu), straight between the wing base and arc and then, either in a curve or in an angle, making up part of d (see hereafter), towards the wing rim. The last longitudinal vein is the analis (A). In Zygoptera with stalked wings (thus not in Calopterygidae and Euphaeidae), it builds the posterior rim of the petiole. In the two families cited, plus all Anisoptera, it may give rise to one or more branches, which may form loops and thus define particular cell groups (anal cells). In anisopteran hind wings, which are always broader than the forewings, a small group of cells, the anal triangle (At), is isolated between the proximal branch of A and the proximal wing margin. Adjacent to it lies a basal, usually coloured membrane, the membranula (Me). A membranula is never found in Zygoptera, where forewings and hind wings are always similar in shape.

On the arculus, above Sarc, springs another vein or sector, the radial sector (Rs). From this vein emanate all remaining branches of the radius: R3, R4, and R4-5, which remain fused in all modern Odonata. Between R3 and R4-5 lies IR3, the third interradial vein. In some of the larger Aeshnidae, IR3 may be forked (Rf) near the level of the petiolar segment. Not directly connected to any of the main veins are Rspl, the radial supplementary sector, and Mspl, the median supplementary sector. Fairly close to the wing base is located the discoidal cell (d). In Anisoptera, it is divided into the discoidal cell proper (d), and the hypertrigone or hypertrigone (ht). In Zygoptera, no hypertrigone is found and d consists of a single cell, except in the Calopterygidae, where d is elongate and traversed by a number of cross-veins.
Certain cross-veins are of particular importance: the antenodal cross-veins (an) extend from C and Sc to R (or R + M) between the wing base and the nodus (and its extension, the subnodus, Sn). In primitive Zygoptera, they are two in number, but more numerous in Calopterygidae and Euphaeidae. In Anisoptera, there are always more than two antenodals. However, in some less advanced families, the original two antenodals (called primary antenodals) can still be identified as more strongly sclerotized than the secondary antenodals. In evolved groups, like the Libellulidae, the primaries are completely merged with the secondary antenodals. By analogy, the cross-veins between C and R₁ are called postnodal cross-veins (pn). Between Cu and A, from wing base to d, one or more cubital cross-veins (Cv) are found. In the more primitive Zygoptera, where Cv is usually a single vein, it is called anal crossing (Ac) and represents an important vestigial structure, indicating a former ending of the anal vein. Its point of insertion relative to the point where the anal vein branches off the wing petiole is of diagnostic value. The portion of the anal vein between the wing margin and a cross-vein situated at the distal corner of d is called the anal bridge (Ab) in Zygoptera.

*Abdomen* (Figs. 16–29): The abdomen consists of 10 complete segments, and a vestigial 11th one. It is elongated, cylindrical (all Zygoptera, non-libelluloid Anisoptera) or triangular (most Libellulidae) in cross-section, and in the latter case, often has a dorsal and two lateral carinae. The tergites are strongly developed, and form the dorsum and the sides of the segments; the pleurites are small and infolded; the sternites form the floor of the segments. The first segment is short, the second one longer, segments 3–7 (S₃–₇) long, S₈ and S₉ again shorter, and S₁₀ very short. S₂ in males of Gomphidae, Aeschnidae, and Cordulidae has lateral ocellules (Fig. 20). The genital opening of the males is situated on the ventrum of S₁; in females between S₈ and S₉. In males the genital aperture is flanked by two valves, and the penis is rudimentary. In females, the area around the genital pore may be simple, or carry an ovispositor (see below). Unique to the order is the fact that the male copulatory and accessory genital organs are not situated on S₉ but on S₁, S₂, or both, and have no internal or external connection with the genital duct and the reduced peneal organ. They are secondary formations, and for that reason it is incorrect to use the terms penis or phallos for the male intromittent organ. A basic study of the morphology of the male genitalia was performed by Schmidt (1915). It was revised, completed and reinterpreted in terms of functional morphology and phylogeny by Pfau (1970, 1971). The description offered hereafter is based on the work of these two authors.

In Zygoptera (Figs. 11a, 16–17), the copulatory organ consists of a two-segmented ligula (L₁ and L₂; L₂ is sometimes called the “glands”), and evagination of the second sternite. It lies in a deep fossa of the floor of S₂ and has dorsally an open sperm groove over most of the length of L₁, the “stem.” However, sperm — which are actively transferred here by the male prior to copulation — are stored in a reservoir, the vesica seminalis (VS), which belongs to S₈, and is not connected to the ligula. The reservoir opens cranially via a filling hole (MR). Further differentiations of the sternite of S₃ are the lamina anterior (LA), with a pair of outgrowths (apodemes: Ap₂), eventually
hooks (h), on which laterally rest a pair of hamuli anteriores (HA, or ham. ant.). The latter are anchoring organs during copulation. They consist of an apical part, the hamulus proper, and a strong base (BHA). In Zygoptera, an inner thickening or plate (IP) is found. The lamina anterior shows a median invagination in which, in Zygoptera, a U-shaped lamina batilliformis (LB) finds a place. It forms a frontal protection to the base of the ligula. The ligula is fixed, by the processus furculiformis, on a sclerotized anterior frame (AFr). There is also a posterior frame (PFr) that supports a second pair of anchoring structures, the hamuli posteriores (HP or ham. post.). Medially, and between AFr and PFr, a small median lobe is found, the plug (P). Sternite 3, apart from the vesica spermalis and two pairs of apophyses (apodemes), shows no further differentiations.

In Anisoptera, the intromittent organ is not the ligula but the vesica spermalis, which has become 4-jointed (Figs. 18–19). The ligula here supports and protects the vesica (Figs. 20–21), and assists during copulation, but no longer has any copulatory function itself. The vesica has a filling pore between the 2nd and 3rd segment, against which the rudimentary penis is pressed during sperm transfer. It leads into a sperm reservoir (r). During copula, sperm flows back from it and is ejaculated into the vagina. In Aeschnidae, there is an open groove between the filling pore and the apex, a zygopteroid character. In all other Anisoptera, at least part of the groove is closed to
form a sperm tube which, in the most evolved forms (Libellulidae), ends in an ejaculation chamber. Swelling bodies are present in the various segments of the vesica (Fig. 22). These are also found in the zygopteran ligula (but not in the anisopteran ligula). They anchor the intromittent organ into the vagina.

The apical segment (L₂, V₄ or "glans") may bear various appendages, such as flanges and long spines and horn-like processes. At least in Calopteryx, Waage (1979) has convincingly shown that these serve to displace sperm from previous copulations from the bursa copulatrix and spermathecal arms of the female, prior to ejaculation. The complexity of the glans in some libellulids, involving flagellae, a sclerotized apical outgrowth (the retinaculum, cf. Pinhey, 1970), and in- and outgoing flanges, suggests the possibility for complex interactions of structure and function here as well, but virtually no research has been carried out in this domain.
Fig. 18: Structure and position of the vesica seminalis in *Aeshna cyanea* (Müller) (after Pfau, 1970)

- Ap1,2 – apodemes;
- BV – base of vesica seminalis;
- L – ligula;
- m – caudal membranaceous part of vesica seminalis;
- MR – opening (in Aeschnids: tip of slit-shaped aperture) of vesica seminalis;
- V1–4 – segments of vesica seminalis

Fig. 19: Longitudinal section through the vesica seminalis of a *Cordulegaster* (after Pfau, 1970)

- AK – ejaculation chamber;
- P1 – filling pore;
- Pe – ejaculatory pore;
- r – sperm reservoir;
- Schw – erectile tissue
In Anisoptera, the lamina batilliformis is reduced or absent. In many Anisoptera there are two pairs of hamuli. However, only one pair is found in the most evolved families (the Libelluloidea).

Each hamulus may then be differentiated into an inner and outer branch. In libelluloids the hind ventral angle of S3 is produced into a hump, the lobus genitalis (lob. gen.). In Aeschnidae, the ventral margin of pleurite 2 may be variously modified. The female genitalia are situated on the ventrum of S4 and S5. In all Zygoptera and in the Aeschnidae the genital opening is flanked by three pairs of gonapophyses, differentiated into valves. Together they form an ovipositor adapted to insert eggs one by one into plant tissue (endophytic mode of oviposition). In Zygoptera, the floor of S4 is usually raised posteriorly, sometimes produced into a point (vulvar spine), and with a distal valvifer (Vf) that supports the first pair of valves (v1). The second and third pairs sit directly on S5. The second (v2) is narrow, and both v1 and v2 are accommodated within v3, which has a broad base (almost as broad as the length of S5) and bears an apical pair of styli (St). Valves v1 + v2 form the perforating apparatus proper (Fig. 23), and have to be lifted out of v3 (the latter often serrated along its margin) during oviposition. In the Cordulegasteridae, the ovipositor is long (stretching out behind the abdominal tip), and strongly built, but composed of only
two pairs of valves (Fig. 24) and unfit for inserting eggs into plant material. Instead it is adapted to pushing eggs into a wet sandy or muddy bottom. In all other Anisoptera, the gonapophyses are reduced to a single pair of very small tubercles at the most (Fig. 25). The genital opening is here flanked by a pair of vulvar lips (valvulae vulvae: V.v.), of varying development. The V.v. overlie the vulvar opening that leads into the vagina, and further into a bursa copulatrix, provided with lateral horns — the spermathecal arms (Fig. 26). Sclerotites sometimes flank these structures. In Trithemis, these were termed sternomata by Pinhey (1970), in analogy with other insect groups. Very few studies have as yet been conducted to elucidate the function and taxonomical value of these structures.
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Fig. 22: Longitudinal section through vesica spermalis of *Aeshna cyanea* (Müller) 
(after Pfau, 1970)
MR – opening of reservoir of vesica spermalis; r – sperm reservoir; Schw – erectile tissue

Fig. 23: Female ovipositor structure

a. Ovipositor of a zygopteran
lam. sub. an. – lamina subanalis; lam. supra an. – lamina supra-analis; 
cerci (appendix dorsalis); St – styli; Vf – valvifer; V1-3 – first to third pair of valves 
8–10 – segment numbers

b. Ovipositor in an aeschnid. Only valves 1 and 3 visible
Fig. 24: Ovipositor in *Cordulegaster*
V_b – basal valves; V_a – apical valves;

Fig. 25: Terminalia of a female libellulid (*Brachythemis fuscopalliata*)
f.g. – female gonapophyses; V.v – vulvar scales or lips (valvulae vulvae)
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Fig. 26: Bursa copulatrix in females of *Trithemis*

a–b. *T. arteriosa*; c. *T. annulata*; d. *T. kirby*

b – bursa; ba – bursal arms; os – ostium (opening of bursa); str – sterigmata (sclerotized plates); vl – vulvar lips

**Anal Appendages:** The anus is situated in terminal position on $S_{10}$. In Zygoptera, it is hidden under a rudiment of the 11th segment, the appendix dorsalis or supra-anal lamina (lam. supra an.) (Fig. 27). The mid-dorsum of $S_{10}$ is often raised into a hump, and its posterior margin hollowed out to accommodate the lam. supra an. In Anisoptera, this lamina is greatly expanded, to form the appendix inferior (app. inf.), of very variable shape, sometimes deeply cleft, but never paired (Figs. 28–29).

In Zygoptera, two tubercles (laminae subanales, lam. sub. an.), flanking the anus ventro-laterally, and also remnants of $S_{11}$ have grown out to form the inferior appendages. These are, consequently, always paired in this suborder, and situated below the anal opening. In all Anisoptera the lam. sub. an. are reduced to a pair of inconspicuous tubercles.

In both suborders, the superior appendages (app. sup.) or cerci are implanted terminally on the dorso-lateral angles of $S_{10}$. They are always paired. The specificity of the complex of appendages, laminae, circum-anal floor of $S_{10}$, and hind rim of $S_{10}$ provides a remarkable example of reproductive-anal isolation by mechanical means. The area of pronotum-lamina mesostigmalis-anterior carinal frame in female Zygoptera, or dorsum and rear of head in Anisoptera, indeed interacts as a lock-antilock system with the male terminalia.
Fig. 27: Terminalia of a male zygopteran (*Lestes*), dorsal and lateral view
app. dors - appendix dorsalis or lamina supra analis; cerci - appendices superiores;
lam. sub. an. - lamina subanalis (=appendix inferior)

Fig. 28: Terminalia of a male anisopteran (*Aeshna*), lateral and ventral view
Anus - anal opening; cerci - appendices superiores; gen. op. - genital opening;
lam. sub. an. - lamina subanalis (these do in fact, flank the anus, and are homologous
to the app. inf. of the Zygoptera); lam. supra an. (=lamina supra analis);
these are the appendices inferiores of the Anisoptera, homologous to the appendix
dorsalis of the Zygoptera, but not to the appendices inferiores of the Zygoptera);
8-10 - segment numbers
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Fig. 29: Terminalia of a male gomphid (ventral view)
Symbols as for Fig. 28

NOTES ON BIOLOGY OF ADULTS

For a detailed account on the ecology of the Odonata, both larval and adult stages, the reader is referred to the book by Corbet (1962), supplemented by a recent review article (Corbet, 1980). A worked-up version of Corbet (1962) has been announced for the near future. For the ethology of Calopterygidae, Heymer (1973) may be consulted, and for Epallage fatime — Heymer (1975).

I here present in brief some essential features of dragonfly behaviour, partly in conjunction with what has been said earlier about (functional) morphology.

EGGS
There are two modes of egg-laying. In all Zygoptera and in the Aeschnidae, the female inserts eggs one by one in living or dead plant tissues. She may therein be accompanied by the male in tandem formation, or the male may perform a patrol flight in the neighbourhood of the female, or the female may oviposit solitarily. Oviposition may occur in branches and twigs of trees overhanging or adjacent to water (Lestes viridis selects willow and oak), or into submerged vegetation. Here too, there may be selective or aselective oviposition (the European Aeshna viridis selects Stratios aloides; Pseudagrion syriacus possibly selects Mentha sp.) and the female may partially descend into the water while ovipositing. A variant of this endophytic mode of
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Oviposition is found in Cordulegaster, where the female always oviposits alone in shallow marginal areas of running waters or springs. She pushes her eggs into the bottom sand or mud, hovering in a vertical position above the water surface, and bouncing up and down at a rate of about 30–40 egg-layings per minute. All endophytically laid eggs are fusiform.

In the Gomphidae and the Libelluloidea, egg-laying is exophytic. Although the female will sometimes oviposit from a perched position, and release whole strings of eggs at a time into the water, eggs are usually released one by one or in packages by airborne females. In some females (Sympetrum, Crocorthes), where the vulvar lips or scales are produced into a scooper-like structure, eggs are not dropped but projected into the water with considerable speed and accuracy. Occasionally, egg-laying occurs on the dry beds of temporary pools or rivers. Exophytically laid eggs are globular or subglobular.

Larval Life and Emergence of the Imago

Almost all dragonfly larvae are aquatic. From the egg hatches a prolarva, which quickly molts into a first instar larva. After a series of larval molts, and a period of time ranging from six weeks (in some Ischnura) to five years (in some Cordulegaster), the final instar larva leaves the water and the adult emerges from it. Emergence occurs on stems of emergent aquatic vegetation, or on rocks, or on whatever more or less vertically oriented substrate available. It begins with a fissure of the larval skin on the mid-dorsum of the thorax; synthorax, wings and head are first retracted from the larval skin. The legs unfold and immediately grasp the substratum (Zygoptera), or the anterior half of the body temporarily bends over backwards first (Anisoptera). The caudal half of the abdomen is then pulled out of the exuvia, and the wings, later the abdomen, are stretched through pumping movements. Emergent dragonflies are very vulnerable to predation. Visual predation by birds may be reduced by emergence either at dawn or at dusk, but this is no absolute rule, and there is also a heavy loss to non-visual predators such as spiders and small insectivorous mammals.

Recently, I have reported circumstantial evidence for estivation in the larvae of two libellulids that are widespread in desert environments, Orthetrum chrysostigma and Trithemis arteriosa. Larvae were found buried in damp sand at depths of about 30 cm, in beds of temporary pools in the Sahara (Dumont, 1979). Estivation is evidently adaptive in areas where rainfall is erratic.

All dragonfly larvae are carnivorous. According to their size, they feed on zooplankton, insect larvae, or even fish fry and small fish. Most larvae of Zygoptera live among aquatic vegetation, as do those of Aeschnidae and many Libellulidae. Some Libellulidae, Cordulegaster and most gomphids spend their larval life in mud or sand, with only the eyes and antennae emerging. Among the regional species, Epallage fatime, Calopteryx syriaca, Pseudagrion syriacum, all gomphids (except Paragomphus sinaicus), Cordulegaster insignis, Calaesachna microstigma, and Zygonyx torrida are rheophilous. All other species occur in stagnant water as well.
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Prey are captured by a highly specialized labium, modified into a two-jointed “mask”. The two segments, connected by a hinge joint, are folded back under the head when at rest, but can be extended at great speed when a suitable prey comes within reach. Details on the morphology of the mask, which is of great taxonomical importance, are given in the section on larval identification.

ADULT LIFE: MATING STRATEGIES

After a period of maturation — often spent away from water — during which first the wings dry out completely, the body colours fully develop and, internally, the gonads ripen, males return to water. Females continue to spend much time away from water, and usually return for mating and oviposition only. Males are often territorial. Territories may be ephemeral or permanent, and need to be re-selected, re-established, and defended against competitors daily. Territories are primarily sites where courtship display and mating can take place. In some cases, they are oviposition sanctuaries for females, and hunting grounds for males.

Courtship display has been intensely studied in *Platycnemis* and *Calopteryx* (Buchholz, 1955, 1956; Heymer, 1973, 1975). In both genera, pre-contact recognition of a conspecific male by the female takes place. This involves a characteristic dance by the male, in which the shape and colour of legs (*Platycnemis*), and colour of the ventrum of the male’s terminal abdominal segments are exhibited to the female. In *Calopteryx* males, extensive wing clapping produces a distinct stridulatory effect due to the contrasting hyaline and coloured portions of the wings, which also contributes to female acceptance or refusal of tandem formation. This ethological mechanism of reproductive isolation is so strong that the structural (or mechanical) aspect has lost all selective pressure: the male terminalia and female pronotal structure in all West-Palaearctic species of *Calopteryx* are generalized, and thus selectively neutral. In *Platycnemis*, this is not absolutely true: the leg display has not eliminated mechanical reproductive isolation completely, and structural differences between the key-areas in both sexes are still present. In other coenagrionids, the lock-antilock mechanism prevails although, as shown by many authors, females may still visually pre-select males on sighting certain areas of the body, usually the terminal abdominal segments that show characteristically coloured areas.

There are also many tactile setae on the pronotum of the female, and on the superior appendages of the male (see figures in the text), which suggest that fine mechanoreceptive stimuli in both sexes might be releasers of further copulatory display. Tennessen (1975) is of the opinion that chemoreception may play some role, although there is no conclusive evidence for this hypothesis at present.

Males land on the dorsum of the female synthorax, quickly run forwards, and grasp the female’s pronotum and lamina mesostigmalis (in *Zygoptera*) with their terminalia. In *Anisoptera*, courtship display is reduced or absent, and males grasp females across the vertex and the frons with their inferior appendages, while the superior appendages hold the rear of the head, eventually the anterior collar of the pronotum. In *Anisoptera*, it is often possible to ascertain whether females have copulated or not:
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the male inferior appendix frequently leaves copulation scars on the compound eyes, by damaging the ommatidia that lie immediately adjacent to the vertex. Once a successful tandem has been formed, and sometimes even prior thereto, males have to "charge" their vesica spermalis with sperm. To do this, they curve the abdomen backwards, and press the rudimentary penis against the filling pore of the vesica. The male then invites the female, mainly by lifting her gently, to press her genitalia against his secondary copulatory complex (formation of a copulatory "wheel"); anchorage, at this stage, is mainly achieved by the hamuli. The ligula (Zygoptera only) is then moved caudally into the vagina, where it anchors itself by means of the swelling bodies. Sperm is released along the dorsal groove in the ligula by a downward movement of S3, which compresses the caudal area of the vesica and pushes the sperm mass into a "genital aperture" formed by the female vulva and the ligular groove. The latter is closed up (so that no losses of sperm occur) by the plug (P).

As indicated above, the appendages of ligular segment 2 (the "glans"), at least in Calopteryx, but probably in many genera and species, fulfill another function as well: prior to sperm transfer, they empty the bursal arms and the bursa copulatrix of the female of sperm deposited there during previous matings. Since these apical flanges are widespread in Zygoptera, and copulation is here a rather long event, this behaviour is possibly of widespread occurrence (perhaps also in Aeshnidae, Gomphidae?). In many libelluloids, tandem formation and mating are extremely quick events that may take place during flight, and copulation often occurs immediately after copulation. It is therefore not clear whether the vesica spermalis plays a dual role here as well, in spite of the elaborate structures that are found on the glans. It has been suggested that sperm from previous matings may be pushed beyond the level where the oviducts reach the bursa, so that "old" sperm is no longer available for fertilizing eggs that move down the oviducts.

In Aeshnidae, the vesica spermalis, supported by the ligula, is introduced into the vagina, and anchors itself by means of its swelling bodies (no such structures are found in the ligula here). Sperm is transferred through the open grooves on the third segment of the vesica, by compression of the basal sperm reservoir. The injection pore is situated between S3 and S4. This is an archaic system, and suggests that the Aeshnoidea are monophyletic and plesiomorphic to all other Anisoptera. The top segment of the vesica has no role in sperm transfer: it unfolds some of its apical appendages for better anchoring (and for removal of sperm from previous matings?). In all other Anisoptera, the third segment has a closed sperm tube, and an ejaculation chamber in the fourth segment, that acts as a suction-and-pressure pump.

COLORATION

Bright metallic cuticular colours are found in the adults of the Calopterygidae and in Lestes where they extend over the whole body and, in Calopteryx, even on the main wing veins. In the latter genus there is sexual dimorphism in both colours and coloured wing spots, males usually being blue and females green. Metallic colours are also found in a few species of Coenagrionidae, and in male and female brown prunella.
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in a few libellulids (Rhyothemis, Zygonyx), but are often restricted to small areas of the body, such as the frons in some species of Trithemis.

All other Odonata have subcuticular lipoprotein colours, with blues often dominant in males and greens in females, but numerous other colours (often tinges of yellow, brown and red) are also frequent. In quite a few species, a waxy blue, blue-grey or white pruinosity may develop secondarily on thorax and abdomen as specimens age.

Distribution of the Order

Odonata occur worldwide. The total number of species may be estimated at between 4,000 and 6,000. The vast majority of these occur in tropical and subtropical climate zones. The West-Palaearctic dragonfly fauna has suffered much from Pleistocene glaciations and, today, is greatly impoverished, numbering some 220 species. The reason for this is that, unlike in North America, there were only limited possibilities for refugia to form, and, after the glaciations, recolonization from other areas was hampered by desert and mountain barriers. The two most important refugia were the Maghrebo-Iberian and the Anatolian-Levantine ones.

Biogeographical Composition of the Levantine Dragonfly Fauna

The 82 species included within the Levantine fauna (and Sinai) represent very different affinities, as could have been expected from the general botanical and zoological knowledge of the area. Bodenheimer (1937, 1938), Schmidt (1938), and more recently Por (1975) have outlined the complexity and the richness of the regional fauna, situated at the crossroads of the Palearctic, Oriental and Afro tropical regions.

Biographical Nature of the Regional Fauna

I have divided all elements into 10 categories, that can be reduced to three major classes: species with restricted ranges ("endemics"), species with a wide range (i.e. the whole or greater part of a major biogeographical area), and species with very wide ranges (i.e. occurring in at least two major biogeographical areas). For the endemic species, I have indicated — wherever possible — to which of the wider ranges their nearest relative(s) belong and, finally, the relative importance of the various elements — expressed as a percentage of the whole fauna.

The categories are:


II. Wide ranges: 4. Saharian (including the Arabian desert); 5. Afro tropical; 6. Oriental; 7. South-Mesasiatic (the steppe Irlano-Turanian province of Asia); 8. West-Palaearctic.

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The first remarkable fact is the high percentage of endemic species (about one third of the total). About one-fourth of the fauna is restricted to the Eastern Mediterranean basin, while some 9% are endemic to only a small part of that area. If one tracks down the phylogenetic origin of these endemics, 27% appear to be derived from a Palaearctic ancestry, only 6% are from African stock, and none is from truly Oriental stock. Among the wide-ranging species, the situation is more balanced: 19% of the species are either of West-Palaearctic or African origin, while 17% are Asiatic. The very wide-ranging, often subcosmopolitan species are remarkably few in number, totalling only 10%.

Summing up all species (that is, both endemics and wide-ranging elements) according to the respective faunal areas where they belong or stem from, the predominance of the West-Palaearctic element is seen to be overwhelming: more than 40%. The Afrotropical element comes next (25%), while the Asiatic element represents only 17% (and truly Oriental species not more than 5%) of the fauna.

There are steep north-south-oriented gradients in the dragonfly fauna of the Levant. Roughly, north of Por's (1975) Nehring line, one finds more Palaearctic species, while south of the Bodenheimer line, the number of Saharan and Irano-Turanian elements increases sharply. However, the area also holds two important relict “pockets”, mainly for Afrotropical species. One is the former Lake Hula where, until its recent drainage (but probably much more as a sequel to the eutrophication of the remaining lakelet), at least three endemic subspecies of African species existed. Only one is extant today. The second one is the Dead Sea basin, and primarily its eastern side, where several permanent rivers (the largest one being Wadi Mujib or Naḥal Arnon) drain into the Dead Sea.

The composite fauna of the Levant is the outcome of a series of historical events, such as the absence of glaciation during the Pleistocene, that made the Anatolian-Levantine zone a major focus for the survival of a Palaearctic faunal segment destroyed elsewhere. That there was no glaciation does not mean that no climatic fluctuations occurred. They were expressed in temporarily increased or decreased precipitation and mean annual temperature. Probably, the maximum of climate change did not go in phase with the glacial maximum in Europe and the Pontic Alps. This means that maximum faunal interchange between the Oriental and Afrotropical areas, partly via the Levant, occurred either before or after the glacial maximum.

No fossil evidence of these events is available for the Odonata. Therefore, unless speciation occurred and the species that evolved could survive the later influx of competitors, repetitive migrant waves from both regions involved must have introgressed with previously established populations. Thus, little can be said about immigrant waves much older than the latest main stadial of the Würm, that peaked at about 20,000–18,000 BP. Shortly before that stadial, a major warm pluvial epoch bridged the Sahara (and Sinai) to the extent of creating permanent running waters other than the Nile. This permitted the ancestor of rheophilous species such as *Pseudagrion syriacum* (closely linked to *Mentha*, growing in permanently flowing rivulets), and the ancestor of a slowly dispersing species such as *Agriocnemis sanya*
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(which may, in fact, have been the Oriental A. pygmaea Rambur, today still occurring on the Seychelles), to extend their ranges. During the subsequent desiccation of the Sahara (and in fact of most of Africa) they evolved into their present status. Whether the endemics of Lake Hula underwent the same period of isolation from their African stock is unknown but not improbable. From a more general study of the aquatic biota of northern Africa (Dumont, 1979), it indeed appears that at least 20,000 years are needed to furnish evidence of allopatric speciation. In Sahara, Ischnura saharenensis (Aguesse), a sister-taxon to the insular (Sardinia, Corsica, Sicily) I. genet Rambur, is an example. This species has a range that covers the entire Sahara Desert. In the east, it is limited by the Nile Valley, where I. senegalensis occurs. Both species are mutually exclusive, and I. senegalensis has managed to spread into Sinai and as far as the Dead Sea depression. Here, it meets with another member of the I. elegans-group (I.e. ebneri), and again, both show little or no intergrading.

Clearly, many more species than presently extant must have made intercontinental crossings during this Late Pleistocene humid phase. The Oriental anisopteran Hemicordulia asiatica Selys, which was first found in Africa on Lake Victoria (Pinhey, 1961), and later in other localities of central East Africa as well, may possibly have reached that area at this time, but could not maintain colonies in the vast intermediate zone between India and East Africa in later periods. There may have been many cases of this nature. One important fact, not often stressed in biogeographical reasoning, is that not all waves of immigrant species are necessarily successful in establishing themselves in newly conquered areas in the long run, even in the absence of major environmental changes. Immigrants indeed face a pre-existing fauna, with which they have to compete for niches. Slight environmental changes in their new biotopes, insufficient to eliminate the species if it were occurring there alone, may still tip the balance of competition in favour of previously established species, and thus ultimately cause the extinction of the apparently successful invaders. By this type of interaction, one may intuitively grasp the reasons behind the fact that of the three Pseudagrion species occurring in the Levant, only one is found in the Nile delta, while only one of the three deltac Pseudagrion of Egypt is also known to occur in the Jordan Valley.

The latest glacial peak, around 20,000 BP, causing great aridity and a lowered mean annual temperature over most of Africa, created unfavourable conditions for tropical dragonflies in the Levant, and certainly eliminated many. One strong argument for this is that, through a eustatic 120–130 m lowering of the sea level, close contact between Corsica and Tunisia on the one hand, and Italo-Sicily and Tunisia on the other hand, was established. Relatively few dragonfly species (but still a substantial number) crossed over on this occasion. None of them were tropical in nature, and very few were Oriental or Irano-Turanian, indicating that the route from Asia via the Levant was not a very effective pathway at that time. However, the Hula and Dead Sea pockets were probably fully exploited in preserving relict populations. Following warming up of the climate and deglaciation, a new wave of north–south migration started. It is quite conceivable that at least part of the Afrotropical fauna...
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of the Levant re-immigrated into the area during the post-Würm humid spell of 12,000–7,000 BP, and that the Nile was its major pathway. Quite a few of the South-Mesolithic species in the Levantine fauna may also have reappeared here at that point in time. Crossing Sinai, and moving into North Africa, they did indeed penetrate rather deeply into the Sahara (sometimes even crossing it). Some reached the Iberian Peninsula, but none could colonize Sardinia, Corsica, or Sicily which, as a result of the rising of the sea level that accompanied the melting of the ice caps in Europe, had become out of reach for any colonizer lacking strong migratory powers. It should be added that there has also been faunal exchange between Africa and Asia via the south of the Arabian Peninsula, with species crossing the Straits of Hormuz and Bab el Mandeb.

The dragonfly fauna of Saudi Arabia, as far as is known, mainly consists of two segments: Mesolithic species, and Afrotropical species. The Palaeartic element is negligible (Waterston, 1980). The fauna of the Nile Valley, likewise, is dominated by Afrotropical species, a broad segment of Mesolithic species, and only very few Palaeartic "relics" (e.g., Sympecta fusca) (Dumont, 1980).

COLLECTION AND PRESERVATION

Adults may be collected with a butterfly net, and killed in a killing-jar using cyanide, ether, or any quick-killing agent. Species with metallic body colours can be preserved without further manipulation, and stored in collection either pinned or in papers. Prune-scent species and dull brown, ochre or olivaceous species may also be preserved directly, and will not show drastic colour changes post mortem. Most coenagrionids and aeshnids, however, with delicate subcutaneous blue and green colours, will turn black some time after death, unless treated with a lipid solvent. Acetone is most widely used for this purpose. Coenagrionids should be immersed completely in an acetone bath, and left there for at least a few hours. In aeshnids, especially females, the ventrum of the abdomen should be opened and the viscera removed. Care should be taken not to scratch the internal surface of the tergites, thus damaging the colour layer. With the aid of a rather blunt pin, a few holes can be punched into the ventrum of the thorax and the rear of the compound eyes, in order to allow better impregnation by the solvent. However, in spite of this, the deep bright colours of the eyes will not normally preserve well, even if carefully treated. Aeshnids should not be left in acetone for more than, say, half an hour. Acetone is, indeed, a powerful water extractant as well, and animals treated with it will tend to become very brittle. This can be partly overcome by the addition of a few drops of glycerol (as is recommended by those who use alcohols).

If it is necessary to preserve animals in liquid permanently (which may be desirable if at a later stage anatomical observations have to be made), alcohol (either ethyl alcohol or a higher homologue) should be used, never acetone.
Introduction: Collection and Preservation

A less widely used, though quite productive way of obtaining dragonflies, is to collect live larvae, breed them in aquaria, and allow adults to emerge from them. In the case of powerful flyers such as most aeshnids, this is often the easier way of securing specimens. A special advantage, in particular in an area like the Levant where so many species are not yet known in the larval stage, is that the exuvia can be equated directly with the adults emerging from them. Freshly emerged specimens should not be killed immediately, but allowed to mature in cages for a few days (no feeding is normally required), until their cuticle has hardened and their body colours are fully developed.
SYSTEMATIC PART

Order ODONATA

Key to the Suborders of Odonata

1. Both pairs of wings of similar shape; membranula absent. Labrum with glossae of the same shape as paraglossae, mostly deeply cleft in the middle. d without a ht.
   Compound eyes widely separated, with ocelli implanted between them on a flat, undifferentiated vertex, and arranged in a triangle.
   Males with superior and inferior appendages paired, and the inferior appendix implanted below the anus.
   Vesica spermalis simple, not segmented. Lamina batilliformis well developed. Females with an ovipositor.
   Abdomen always cylindrical. Zygoptera
   Hind wing with a broader base than forewing, and usually with a membranula. d with a ht.
   Glossa usually smaller than paraglossae and fused into a single ligula (except in Cordulegaster). Compound eyes confluent in a point or over a longer distance; if separated, vertex usually with differentiations and ocelli more or less lined.
   Males with paired superior appendages, but only one inferior appendix, although it may be deeply cleft. Appendix inferior situated above the anus. Vesica spermalis strongly developed, 4-segmented.
   Females with or without ovipositor.
   Abdomen cylindrical or depressed. Anisoptera

Suborder ZYGOPTERA

Key to the Families of Zygoptera

1. Numerous an; wings not petiolated. Analis not confluent with hind wing margin at wing base 2
   Two an; wings petiolated. Analis forms hind margin of wings between base and Ac 3
2. Lateral suture between mesothorax and metathorax complete. Discoidal cell elongate, traversed. A pseudopterostigma in the females, no Pt at all in the male. Body brilliant metallic blue or green. Calopterygidae
   Lateral suture between mesothorax and metathorax incomplete. Discoidal cell simple, not traversed. Body not metallic. Pt present in both sexes. Euphaeidae

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3. IR₃ and R₄,₅ arise closer to level of arc than to level of N. Pt elongate, almost as long as the two underlying cells. Body often green metallic.  
   - IR₃ and R₄,₅ arise almost directly below N. Pt less than twice as long as wide, and much shorter than the combined length of the two underlying cells (measured along R₁)  
4. d quadrangular. Tibiae of legs 2 and 3 often greatly expanded.  
   - d a trapezium. Tibiae of legs 2 and 3 never expanded.  

**Family CALOPTERYGIDAE**

Medium- to large-sized damselflies, with first lateral suture on synthorax complete and non-petiolated wings. Wing venation very dense, with numerous antenodal and postnodal cross-veins. Anal vein separated from hind wing margin along its entire length; an anal field, composed of rather numerous cells, is present. No true pterostigma in either sex. A pseudopterostigma (traversed by cross-veins) in the females. d many times longer than wide, traversed by numerous cross veins. Wings with or without blue coloured spot. 

One regional genus.

**Genus CALOPTERYX** Leach, 1815 (emend. Burmeister, 1839:825)  
*Edinburgh Encyclopaedia, 9:137. (Calopteryx)*

*Agrion* Fabricius, 1775:425.

Type Species: *Libellula virgo* Linnaeus, 1758. 
Medium-sized damselflies, with blue or green metallic body sheens. Female with or without white pseudopterostigma. App. sup. of males not divided, simple, forcipate, slightly longer than S₁₀. App. inf. cylindrical, straight, about 2/3 the length of the app. sup. 

Restricted to running water, *Calopteryx* species are poor dispersers. With time, inhabitants of single stream basins therefore develop recognizable population characters which in many cases, however, have not reached the level of “official” taxonomical ranks. 

One relatively well-defined species inhabits the Jordan Rift Valley. A possible second species is found on the Litani and extends well into Syria, where a third taxon, believed to be part of the *C. splendens*-group, is also found. The genus does not extend to Sinai and does not occur in the lower Nile Valley. 

Distribution: North America, Europe, North and Central Asia, including Japan.
Calopterygidae: Calopteryx

Key to the Species of Calopteryx
(Figs. 6, 9, 14, 17, 30–31)

1. Body colours metallic green in both sexes. No Pt or pseudo-Pt. No coloured wing spots in either sex. Male with ventrum of S8–10 greenish-ochraceous.  
   - Body colours metallic blue in the males, and a coloured wing spot always present on all wings. Ventrum of S8–10 bright ochraceous. Females with or without coloured wing spots

2. Males with wing spot extending between apex of wing and nodus, usually reaching well basal to nodus. Females without (heterochrome) or with (homochrome) wing spots on all wings. Legs black.
   - Males with wing spot extending between apex of wing and half to 2/3 the distance between apex and nodus, never reaching the nodus. Females usually heterochrome. Pseudo-homochromes have the apex of the hind wing enfumed or darkened. Flexor side of all femora lightly coloured (covered by bluish pruinose in mature specimens).

   C. syriaca Rambur

Calopteryx syriaca Rambur, 1842
Figs. 30a, b, 31

*Calopteryx syriaca syriaca* — Bartenev, 1912: 69.

Type Locality: Mount Lebanon.

*Male*

Head: Mouth parts black, except cardo and stipes of maxilla (yellow), and labrum, which is yellow with a median black marking and black margins. Pedicellum of antennae bright yellow. Rest of head blue-green metallic, often with purple sheen; rear of head with occipital corners produced into a ridge which, in dorsal view, appears as a pair of lateral tubercles.

Thorax: Pronotum and synthorax entirely metallic. Sutures black, except S4 which is overlaid by a yellow band with black margins, widening over inf4 and including the metathoracic stigma. Suture with metasternum yellow too. Legs black. Femora yellow on flexor side. In fully mature specimens, this yellow colour often masked by a whitish-blue pruinose layer that also covers the ventrum of the thorax and the first abdominal segments.

Abdomen: Dorsum and sides entirely metallic blue. The tergites overlap the sternites, and are yellow at their margins. The sternites are black, with a spiny median carina. Some yellow at the end-rings of the segments only. This yellow colour increases in width posteriorly, and the sternites of S8–10 are all bright ochraceous, with a narrow median black stripe on S8, sometimes a rudimentary one on S9. App. inf. also
Fig. 30: Calopteryx spp.

a. wings of Calopteryx syriaca Rambur, 1842; male;
b. aged female of C. syriaca with enfuscated hind wings;
c. Calopteryx splendens intermedia Selys, 1887; male (Selys' type)
Calopterygidae: Calopteryx

Fig. 31: Calopteryx syriaca Rambur, 1842
male terminalia, dorsal and lateral views

ochraceous in ventral view, with metallic tips. App. sup. metallic black. Accessory genitalia: lam. ant. (LA) with a tubercle on each side; ham. ant. (HA) black, strongly developed; ham. post. (HP) small, hollowed-out. Ligula with flanges and horn-like appendages on apical segment. Vesica elongate.

Wings: Apex with coloured spot. Never a hyaline fringe between the wing tip and the spot. Basal extent of the spot variable. It may reach fairly close to the nodus (but never attain it), or extend not further than midway between the apex and the nodus. The wing spot is already clearly visible in freshly emerged specimens.

Female
Head and thorax as in the male, but green metallic. Dorsum and sides of abdomen green, sometimes with a cupric sheen on the terminal segments. A narrow yellow stripe may be seen on the mid-dorsum of S₇-₁₀. The rims of all tergites are broadly yellow. The ovipositor is entirely yellow. In older females, pruinosity may extend over all sternites of the abdomen.

Wings: R₁ distinctly curved. A bright white pseudopterostigma, traversed by up to 6 cross-veins, often smaller in hind wing than in forewing. Never a wing spot on the forewings. In some specimens the apex of the hind wing can become enumped to the extent of developing a pseudo-wing spot. It is, however, never as opaque as in the males.


Distribution: Common in Syria, the Lebanon, Jordan and Israel, on the following river systems: Asi (Orontes), Litani, Yarmouk, and Jordan. Also on the eastern drainage of the Dead Sea: Wadi Mujib, Wadi Wala, Wadi Hasa and on some of the short coastal rivers of Israel. Not extending beyond the Dead Sea. Specimens have been captured between March and October. The species is very sensitive to pollution, and stream regularization schemes also affect it greatly.
Odonata of the Levant

Israel (Locality records): Benot-Ya'aqov bridge on River Jordan (1), East of Lake Hula (1), Gadot (1), Gonén (1), Dan (1), Tel el Qadi (1), Sede Nejemya (1), Naḥal 'Ammud (2), Wadi Bira (2), 'Akko (4), Bet She'an (7), Tel 'Amal (7), Lake Kinneret (7), Ashdot Ya'aqov (7), Yarmouk River (7), Migdal (7), Deganya (7), Tabigha (7), Wadi Fari'a (12), Wadi Qilt (13).

Also recorded from Naher ez Zerqa, from Wadi Mujib (Naḥal Arnon) on the eastern side of the Dead Sea, and from the tributaries of the Jordan River in Jordan (Wadi Yabis, Wadi ez Zigel, Wadi Tairya), although damming and regularization schemes during the 1970s have greatly reduced its populations there (Schneider, pers. comm.).

Calopteryx hyalina (Martin, 1909)

Calopteryx splendens hyalina Martin, 1909:213.
Calopteryx syriaca hyalina —. Bartenef, 1912:72.

Type Locality: Lake Homs, Syria.

Male
Structure and dimensions as in C. syriaca, except for the absence of a coloured wing spot, and the flexor side of the femora, which is not yellow. The tibiae may be dark brown instead of black.

Female
Hard to distinguish from females of other regional Calopteryx species. The legs, which are uniformly brown or black, may serve as a discriminatory character, but this is certainly not infallible. No dark spot develops on the hind wing in females. The pseudopteroistigma, in all specimens I have seen, was of similar shape in both pairs of wings, but this character should be rechecked on longer series.

Distribution: C. hyalina was described from the area of Lake Homs. Buccholtz (1955) found this species in the coastal areas of Syria and the Lebanon, as far south as the lower Litani. Ethological isolation from C. syriaca, with which it co-occurs in the Levant, was observed. C. hyalina does not seem to cross the Jordan-Litani divide.

Calopteryx splendens intermedia Selys, 1887

Fig. 30c

Calopteryx splendens race intermedia Selys, 1887:39.
Calopteryx intermedia intermedia —. Bartenef, 1912:77; Schmidt, 1954:b:244.
Calopteryx xanthostoma intermedia Selys, 1882 (sic!): St. Quentin, 1965:534.
Calopteryx splendens intermedia intermedia —. Bartenef, 1930:523.

Type Locality: Ekbaz, Hatay Prov., Turkey.
Euphaeidae

Structurally and by dimensions, this species, too, cannot be distinguished from C. syriaca. Males are characterized by a large wing spot that extends between the very apex of the wing (only rarely is there a very narrow hyaline fringe on the apex) and 5–20 cells basal to the nodus. In specimens with a maximum extent of the wing spot, half of the space between the nodus and the wing base is coloured. In specimens with a minimum extent of the wing spot, this coloured area extends only slightly basal to the nodus. Both types may occur as extremes within a single population. The basal margin of the wing spot may be smoothly rounded, or deeply crenulate. Both types, again, may co-occur within single populations. Heterochrome females cannot be told apart from heterochromes of C. syriaca, except sometimes by the colour of the femora. Heterochrome females of C. s. intermedia have a deep brown wing spot, with a strongly contrasting, large, pure white pseudopterostigma. The basal extent of the wing spot is usually as in minimum-males, and the basal margin of the spot is, as a rule, smoothly rounded. The percentage occurrence of homochrome females within single populations varies greatly.

In both males and homochrome females, the wing spot is visible immediately upon emergence.

Measurements as in C. syriaca.

Distribution: A mountain species that occurs on running waters and limnocrones in Anatolia, Iran and northern Iraq. It extends to the Amanus Mountains in the south (where the type locality is situated). Possibly, isolated colonies occur in the Lebanon and Anti-Lebanon ranges.

Family EUPHAEIDAE

Robustly built damselflies with large, globular eyes, and a rounded frons, which is not angulate. Prothorax with a large rounded lobe lateral to the middle lobes; posterior rim broad but simple, without medial differentiations. Synthorax robust, usually banded (in males often uniformly coloured by secondary melanism). Wings hyaline, eniwured in females, with or without apical spots, shortly or not at all petiolated. Reticulation fairly close, with many supplementary sectors between the main veins. Numerous antenodal and postnodal cross-veins; primary antenodals not indicated. Pterostigma long and narrow, with oblique ends. Abdomen cylindrical, tip of S₁₀ not raised. Anal appendages of males: superiors forciate, strongly built, as long as or longer than S₁₀. Inferiors small to moderately large, but always shorter than superiors. Females with anal appendages as long as S₁₀, acutely pointed. Ovipositor robust. Abdomen with lateral stripes.

One regional genus.
Genus EPALLAGE Charpentier, 1840

Type Species: Agrion fatime Charpentier, 1840.
The genus is monotypic.

Epallage fatime (Charpentier, 1840)
Figs. 32-35

Agrion fatime Charpentier, 1840:132.
Epallage fatime — Schneider, 1845:115; Selys, 1853:50; Selys & Hagen, 1854:165; Fraser, 1934:76; Morton, 1924:28; Schmidt, 1938:136; Schmidt, 1954a:62; Dumont, 1977b:133.
Euphaea fatima — Selys & Hagen, 1850:143.

Type Locality: Thracia (Turkey-in-Europe).

Male
Head: Mouth parts and genae largely ochraceous, darkening with age. Labrum ochraceous, with a median black tongue. Clypeus yellow, marked with black. Frons, vertex and occiput black, covered with a dark blue pruinosity. Prothorax black and entirely pruinose. In freshly emerged specimens, a colour pattern very similar to that in the female is seen, with extensive yellow on vertex and occiput, and on the anterior collar of the pronotum, and with yellow antherumeral and lateral thoracic bandings. Yellow stripes are also observed on the femora and the tibiae. Very soon, however, all these clear parts darken, and become covered by a waxy blue coating. Legs short.
Wings hyaline with brown apical fringe. The extent of this brown marking varies from a hardly visible rudiment to a spot extending halfway to the pterostigma, which is black and elongate (typically as long as five underlying cells). 11–17 an., 14–21 np. Anal vein describing an anal loop in both pairs of wings.
Anal appendages black. App. sup. distinctly longer than S10, robust. In dorsal view, a single very strong, downwardly turned apical hook is seen. In lateral view, the external apical area of the appendix also bears a second, less robust hook, and between the two hooks lies a cavity, which grasps and holds the lateral angles of the posterior lobe of the female's pronotum in tandem formation. The inner surface of the main hook is particularly smooth, and rests on the lam. mes. during copula. The app. inf. are 2/3 the length of the app. sup., conical, with a small subapical spine. Accessory genitalia: lam. ant. (LA) without tubercles; ham. ant. (HA) hammer-shaped; ham. post. (HP) small, twisted. Vesica spermatalis heart-shaped, with quadrangular apex.
Female
Differs from the male in being more stoutly built, and in showing reduced pruinose. Yellow colours are far more extensive. On the dorsum of the head, only the areas around the ocelli and the suture between frons and vertex are black in young
Euphaeidae: Epallage

Figs. 32–34: *Epallage fatime* (Charpentier, 1840)
32. male terminalia, dorsal and lateral views;
33. habitus and markings of a teneral female;
34. minimum and maximum extent of apical wing spots

females. Gradually, black colours develop, so that finally only isolated yellow spots beside the ocelli and on the occiput remain. Similarly, the pronotum darkens considerably with time, except for the lateral bosses. The ground colour of the synthorax and the abdomen, likewise, is yellow. The carina is flanked by two black stripes and by a pair of black humeral bands. There is a narrow black humeral stripe, extensive black markings on Su₁ and Su₂, and black patches on epm₂, epm₃, and on inf₁ and inf₂. The femora of all pairs of legs also show longitudinal yellow stripes. The wings have apical spots usually more strongly developed than in the male, and extensive basal amber may occur, sometimes extending as far as the nodus. The basal amber tends to become paler and eventually disappear with age, but the whole wing remains more or less enfumed.

The abdomen is marked with a lateral black stripe on either side, and two dorsal stripes. The latter grow longer with age, beginning in tenthers as two black dots at the base of each segment. In old females, they are triangular, with a broad base. Styli yellow with black apex.

Male grasping area: the hind rim of the pronotum is a plate, slightly depressed medially, with uplifted edges. The lam. mes. is triangular, with an anterior and lateral ridge, and smooth posterior border. The anterior carinal frame is a deep V that
Fig. 35: *Epallage fatime* (Charpentier, 1840); female
a. average extent of apical wing spot;
b. teneral female with typical pigmentation along main veins in wing basis

broadly widens towards the laminae. At the point of deflexion of the V a blunt tubercle occurs on either side of the frame.

*Measurements (mm): Male.* Total length 42–50; abdomen 28–37. *Female.* Total length 40–47 mm; abdomen 28–37 mm

*Distribution:* Macedonia, Greece, Thracia (Turkey-in-Europe), Anatolia, northern Iraq, Iran, and reaching Baluchistan in the east. In the south, it is found in Syria, the Lebanon, Jordan, and Israel. It occurs in most of the habitats where *Calopteryx* can also be expected, and is thus distinctly restricted to running water. Capture data range from March to September.

*Israel (Locality records):* Benot Ya'aqov bridge on Jordan River (1), Gadot (1), Dan (1), Tel el Qadi (1), Hula (1), Kefar Hittim (2), Wadi Bira (2), Buteicha Swamps (7), Deganya (7), 'Ubeidiya (7), Bitania (7), Tabigha (7), Wadi Hammam (7), Ramallah (11), Wadi Far‘a (12), 'Ein Duyuk (13), 'En Gedi (13), “Dead Sea” (13), 'Ein es Sultan (13), Jericho (13), Wadi Qilt (13).

Also recorded from Ghur es Safi, from Wadi Mujib, Wadi Yabis, Wadi ez Ziqlab, and from Wadi Yarmouk near Kaziyé (Jordan-Syrian border).
Family LESTIDAE

Damselflies of small to moderate size with metallic or non-metallic body colours. The species with metallic colours perch with the wings half opened; those without metallic colours perch with the wings closed across the dorsum of the abdomen. Wings hyaline, no coloured spots, petiolated. Petiole ends at Ac; Ac meets Ab at hind border of wing. Only two an. d. elongate and narrow, ending in a sharp distal angle. Sectors of arc arising at midpoint of arc. An oblique vein (o) always found between R3 and IR3 about midway between N and Pt. Pt elongate, usually about twice as long as wide. Synthorax with Su1 reduced to a short trait close to the wing insertion. Abdomen slender; app. sup. of males always forcipate, spined externally.

Key to the Genera of Lestidae
(Figs. 27, 36–48)

1. Body colours not green metallic; base colour pale brownish, with numerous dark brown markings. Blue pruinosity, if present, restricted to wing implants. Pronotum with strong central lobe on posterior margin. d extremely narrow, and narrower in forewing than in hind wing, acutely pointed. Pt in forewing closer to wing apex than in hind wing by at least its own length. Males: ham. ant. (HA) leaf-shaped, rounded; ham. post. (HP) yellow, blade-shaped.
   - Body colours green metallic, with some yellow on sutures and ventral parts, and occasionally blue pruinose and black stripes on parts of the body. Pronotum never with a strong central lobe on its posterior margin. Wings with d less narrow and similar in shape in forewing and hind wing. Pt in both wings at about the same distance from wing apex. Males: ham. ant. (HA) leaf-shaped, pointed; ham. post. (HP) black, hollowed-out.

Genus SYMPECMAN Burmeister, 1839
Handbuch Entomologie, 2:823

Sympecma Charpentier, 1840:19.

Type Species: Agrion fasca Vander Linden, 1820.
One regional species.
Odonata of the Levant

Fig. 36-40: Sympecma fusca (Vander Linden, 1820)
36-37. Maximum and minimum extent of dark bandings on synthorax
38. Abdominal markings of a teneral male; 39. Terminalia (anal appendages) of a male;
40. Ovipositor of a female

(Author and page number)
Lestidae: Sympecma

fascia (Vander Linden, 1820)

Vander Linden, 1820a: 4.
Selys & Hagen, 1854: 161.
—. Selys, 1887: 43.
—. Morton, 1924: 30; Dumont, 1977b: 134.

genae, labrum and clypeus yellowish. Frons heavily marked with black. Occiput black with narrow, sinusuous, transverse yellow line at level of eyes. Rear of head yellow. Central part of occiput shallowly indented.

gely black, lateral lobi yellow. Hind ridge with strong central lobe, in colour, depressed; lateral lobi upright, yellow. Synthorax: ground own; carina yellow flanked by broad bronze bands. Humeral suture very thick with apical widening and black patch on inf 2. A second black band between Su 1 and Su 2. Su 1 again very narrowly black, widening near its apex. Legs yellow with black spines and narrow external black stripe, interrupted and then forming a series of black spots.

genus. Pt elongate, brown.

Ground colour light brown, with bronze markings that widen near the top of pronotum. In older specimens, most of the dorsum of S 7–9 black. Appendages: tarsus, with robust internal, subbasal tooth. Appendix narrowing slightly before tip, 4–7 strong black spines externally. App. inf. closely apposed, tip surpassing the level of the tooth on the app. sup. Accessory genitalia: ant. (LA) deep and narrow, its margins swollen; ham. ant. (HA) narrow, rounded at tips, with a constriction in its external rim; ham. post. yellow, blade-shaped. Vesica spermalis elongate.


Palaeartic. Europe and western Asia. Species of the genus Sympecma fascia. Adults. They are therefore on the wing from the early days of spring till midsummer. Records: A rare species, recorded from Nazareth (2), Galilee, 23.V.1922 (4), and from Hadera (8); “Beth Gordon” Collection, Kibbutz Deganya.
Genus LESTES Leach, 1815
*Edinburgh Encyclopaedia*, 9:137

Type Species: *Agrion sponsa* Hansemann, 1823.
Rather small damselflies with extensive green metallic markings on a yellow-ochre base colour; 
Ac situated about midway between the level of the two an. Pt always at least twice as long as wide; d similar in shape in both pairs of wings. Perching animals hold their wings half opened.
Distribution: Europe, Africa, N. America, temperate Asia. Four species are regional; two more are found in Turkey.

*Key to the Species of Lestes*
(Figs. 27, 41-48)

1. Rear of head yellow
   - Rear of head dark (except in freshly emerged specimens), usually green metallic or with blue pruinosity

2. Pt bicolorous, brown in its proximal half, clear in its apical half.
   Male: app. sup. yellow, with dark apices; app. inf. with divaricate apices.
   Female: valvifer of ovipositor posteriorly rounded or notched. Lam. mes. a narrow triangle, raised exteriorly into a crest. **Lestes barbarus** (Fabricius)
   - Pt unicolorous, reddish-brown in fully coloured specimens (paler in freshly emerged ones), with narrow light yellow fringes.
   Male: app. sup. whitish; app. inf. short, slightly convergent, with rounded tips.
   Females: valvifer of ovipositor, laterally seen, produced into a backwardly directed point.
   Lam. mes. a narrow, fairly flat triangle. **Lestes virens** (Charpentier)

3. Pt black or very dark brown, as long as 3–4 underlying cells.
   Male: app. sup. with broad inner expansion and one basal tooth.
   Female: lam. mes. and anterior rim of carinal frame raised.
   - Pt brown, as long as 2 underlying cells.
   Male: app. sup. without broad inner expansion, and with two inner teeth.
   Female: lam. mes. and anterior rim of carinal frame not steeply raised.
   **Lestes viridis parvidens** Artobolevski

**Lestes barbarus** (Fabricius, 1798)
Figs. 43, 47

*Agrion barbarum* Fabricius, 1798:286.
*Lestes barbarum* — Selys, 1840:142.

Type Locality: “Barbary”, probably N. Morocco.
50
Lestidae: Lestes

2 metallic or with
3

Figs. 41-48. Lestes spp.
41-44. male terminalia; 45-48. female ovipositor
41, 42. L. viridis (Fabricius, 1798); 43, 44, 46. L. uren (Charpentier, 1825);
47, 48. L. barbarus (Eversmann, 1830)

Artobolevski
Odonata of the Levant

Male
Dorsum of head bronze-green metallic; face and rear of head yellow. Yellow patches around the ocelli and the antennal implant.

Pronotum yellow marked with bronze. Thorax metallic bronze-green; carinal and humeral sutures yellow. epm1 and epst1, almost entirely yellow. S10 narrowly black.

Legs yellow with black spines and dark tarsi. A black external stripe on all femora.

Wing venation light brown; Pt dark brown in its proximal half, light creamish in its distal half.

Abdomen: Dorsum of S1-8 marked with bronze, narrowly interrupted near the base of each segment. S10 with a central black spot, rest yellow. Sides of all segments yellow.

Appendages yellow, tip of superiors dark. App. sup. with a basal spine, but no apical inner angle, and with a dorsal fold at the level of the inward curvature of the forceps. App. inf. less than half the length the superiors, apically pointed, divaricate, curved dorsad. Accessory genitalia as for genus.

Female
Colour markings as in male, but bronze-green replaced by bright metallic green.


Distribution: Europe, where it is distinctly more common in Mediterranean climatic conditions than elsewhere. Extending far east into Asia, reaching India.

Israel (Locality records): Wadi Kurdana (4), Ramallah (11), Wasit (18), Birkat Bab el Hawa (18), Mt. Hermon (19). Capture data range from May till August.

Lestes virens virens (Charpentier, 1825)
Figs. 42, 46

Agrion virens Charpentier, 1825: 8.

Lestes vestalis Rambur, 1842: 290.


Type Locality: Lusitania, i.e. Portugal and adjacent parts of Spain.

Male
Mouth parts, genae, postclypeus yellow (but a specimen from Hadera with postclypeus and labrum olivaceous). Dorsum of head dark metallic. Rear of head yellow, sometimes pruinose.

Pronotum green metallic, partly pruinose in mature specimens. Synthorax: dorsum metallic green, sometimes with cupric sheen. Humeral suture with or without yellow humeral stripe. In specimens from Hadera, this yellow stripe extended from the lam.
Lestidae: Lestes

mes. to the alar sinus. In a long series from Birkat Bab el Hawa (Golan), this yellow band was narrowed by black stripes evolving on either side of the suture, eventually rupturing it near the alar sinus. In old specimens, the yellow stripe tends to become completely obliterated and replaced by a black stripe. csp12 covered by metallic green, overshooting distally on epm2. Margins of this stripe somewhat wavy. epm3 yellow; a broad black stripe develops parallel to the one on the humeral suture. Very soon, however, it becomes covered by a layer of blue pruinose. inf1 yellow, with broad basal black spot. inf2 yellow, later blue pruinose. Metasternum yellow, with one or two pairs of ellipsoidal black spots. In senescent specimens, the metasternum turns very dark and pruinose. Legs yellow; spines and tarsi black, and a black stripe on the outer surface of the femora.

Wings: Venation light brown; Pt light to dark brown, its posterior and anterior rims bounded by a clear yellow vein. Costal and radial margins dark brown, almost black. Abdomen green metallic with or without cupric sheen. End-rings of segments, and in old specimens their base, black. In younger specimens, base of S1, with yellow ring, medially interrupted by a black line. Appendages: app. sup. dark brown to black, with a basal tooth and moderately expanded, denticulated inner margin, not constricted (i.e. not forming an angle) at the level of the inward bend of the appendix. App. inf. yellow, short, apically rounded, and with convergent tips. Accessory genitalia: ham. ant. rather pointed posteriorly; ham. post. blade-shaped, their apex hollowed-out.

Female

Colour similar to that in the male, but cupric sheens more pronounced.

Abdomen S1 with styli yellow, shorter than segment. Ovipositor: v1 denticulated. Valvifer produced posteriorly in lateral view, broadly embayed in ventral view.


Distribution: Europe and South-West Asia.

Israel (Locality records): Found between April and July at Yir'on (1), Haifa (3), Migdal (7), Ga'ash (8), Hadera (8), Birkat Bab el Hawa (18).

Note 1: Subspeciation

On the Iberian Peninsula (terra typica) and in the Maghreb countries, Lestes virens always has a yellow humeral stripe, no black on epm3, and reduced black on the metasternum. This represents the true Agrion virens of Charpentier. In temperate Western Europe, in Central Europe, and in the Balkans, a form is found in which the yellow humeral stripe is — at least — interrupted posteriorly, if not obliterated completely, while heavy black markings invade the sides and the ventrum of the synthorax. This form has been equated with Agrion vestalis Rambur, described from the environs of Paris (Schmidt, 1938), and is now widely considered as a subspecies of Lestes virens. However, Schmidt (loc. cit.) had seen specimens from Hadera (= Khedera), all collected on the same day, in which the female was typically virens, but the male vestalis. Specimens seen by me from that same area agree very well with typical virens, but specimens from the Golan Heights displayed intermediate morphs.
Odonata of the Levant

as well as typical *virens* and typical *vestalis*. No subspecific status can thus be assigned to Levantine forms, but it is certainly worth placing on record that the local populations display a range of variability found only as extremes in the Western Mediterranean on the one hand, and in continental Europe on the other (see also hereafter).

**Note 2:** The status of *Lestes sellatus* Selys, 1862 (Selys, 1862: 34)
A few males from “Syria and Egypt(?),” collected by Ehrenberg, and communicated to H.A. Hagen, were described by Selys (1862) as a separate species. The presumed type was re-examined by Schmidt (1938). It differs from *virens* in that the dorsum of the head is brownish-yellow (not metallic black). The app. inf. are said to be short, and each of them “almost forked”, but presumed to be damaged. In the specimen seen by Schmidt, the app. inf. were lacking, but the interior dilated margin of the app. sup. narrowed apically in an angular fashion. The synthorax showed an unusually broad humeral suture, combined with extensive black markings on the sides. While the mention of “Egypt” is almost certainly misplaced, it remains possible that somewhere in the “Syria” of the nineteenth century, an as yet not rediscovered lepidid occurs. On the other hand, it is quite possible that *L. sellatus* is nothing but a form of *L. virens*, combining the characters of the two described subspecies in an extreme form.

**Lestes macrostigma** (Eversmann, 1836)
Figs. 44, 48

*Agrion macrostigma* Eversmann, 1836: 246.

*Lestes macrostigma* —. Selys & Hagen, 1850: 150; Selys, 1862: 296; Selys, 1887: 42; Morton, 1924: 30; Dumont, 1977b: 135.

**Type Locality:** Orenburg, Russia.
A pruinose species.

**Male**
Head: Mouth parts and genae yellow; rest of head, including rear side, black, except for some small yellow patches near the ocelli.

Pronotum black, covered by blue pruinosity. Legs black.

Wing venation black. Pt black, as long as 3–4 underlying cells.

Abdomen dark metallic (green, with bluish or cupric sheens). S1 and S2 in part pruinose. Appendages: app. sup. forcipate, with basal spine, and a median internal expansion, set with fine spines at its free border, constricted at the level of the curvature in the forceps. App. inf. less than half the length of the superiors, black, with broadly rounded apex, blade-shaped. Sides of the abdomen black, except for ventral margins of the tergites, and narrow end-rings of segments which are pale yellow. Rest dark green-blue metallic. Accessory genitalia as for genus.
Lestidae: Lestes

Female

As male. Lam. mes. triangular, but raised steeply above the level of the synthorax. Anterior rim of carinal fork raised likewise. Ovipositor entirely black; valvifers not produced laterally, with a ventral, medially pointed invagination.


Distribution: A species that favours brackish water for its larval development. In addition, it is thermophilic, and occurs in a fringe around the Mediterranean with only limited incursions into continental areas, except perhaps in the saline waters of the Pannonian plain. It is also found on major Mediterranean islands such as Cyprus and Sardinia.

Israel (Locality record): The only record available is from 'Atlit, S. of Haifa (4), in May (Morton, 1924).

Lestes viridis parviden Artobolevski, 1929

Figs. 41, 45

Lestes viridis (Vander Linden). Morton, 1922:80; Morton 1924:30; Barteneff, 1925:56.


Type Locality: The Crimea.
A non-pruinose species.

Male

Head: Occiput, vertex and frons metallic green; yellow spots at the implantation of the antennae, around the ocelli, and on the hind rim of the occiput. Rear of head metallic. Anteclypeus black, sometimes with two yellow spots. Postclypeus and labrum greenish; labrum with dark fringe. Rest of mouth parts and genae yellow. Pronotum yellow with median lobi dark metallic. Lateral lobi black. Synthorax: lam. mes. and anterior ridge of carinal fork largely yellow. Carina and humeral stripe yellow. Su₁ black. ep₇ and most of ep₁🤖 yellow. Rest of synthorax bright metallic green. Legs yellow with black stripes along their entire length. Wing venation brown; Pt relatively long, white in freshly emerged specimens, turning brown in mature animals.

Dorsum of abdomen green metallic. Sides yellow. End-rings of segments black. S₉ with a lateral, marginal and apical black stripe. S₁₀ with an apical, squared embayment. App. sup. yellow with black tips. A basal tooth is present, but the inner margin is not dilated. The tip of the forceps is hollowed-out inwardly, and a small blunt tooth is implanted on the inner rim of the folding. Inferior appendages reaching to about half the length of the superior ones, black, conical, their apices upturned and pointed. Accessory genitalia as for genus.
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Female
Colour pattern similar to that in the male.
Abdomen with styls black. The side of S₂ is yellow, surrounded by black; v₁ of the ovipositor also heavily marked with black. Teeth on ventral margin of S₃ comparatively strong. Valvifer rounded in lateral view; in ventral view, deeply hollowed-out.
Distribution: The nominal subspecies inhabits west and central North Africa, and most of Europe, while ssp. parvidens is found in the Caucasian area, Anatolia, and in the Levant. Records range from April till October.
Israel (Locality records): Dan (1), Hula (1), Mt. Tabor (2), Nahal Tut (8).

Family PLATYCNEMIDIDAE

Damselflies of small size, coloured white or brown-red, marked with blue or black, sometimes pruinose, not metallic. At rest, the wings are closed over the dorsum of the abdomen. Wings hyaline; Ac arising halfway between the two antenodals. Petiolation beginning at or proximal to Ac; Ab always present, continuing as A. d is a quadrilateral, elongate, widening distally. Abdomen cylindrical, narrow, sometimes slightly compressed in males. Superior appendages shorter than inferiors. Head transversely elongate, about twice as wide as synthorax.

Genus PLATYCNEMIS Burmeister, 1839
Handbuch Entomologie, 2:822

Type Species: Libella pennipes Pallas, 1771.
Small damselflies, with petiolated wings, a subquadrangular discoidal cell, and an oblique, diamond-shaped Pt. Pronotum with posterior lobe a broad plate in the male, and an isosceles triangle in the female. Lamina mesostigmalis triangular; anterior border of carinal ridge bulbously swollen in females. Males with app. sup. triangular; app. inf. longer and forcipate. Accessory genitalia: ligula with apical segment, flask-shaped, curved upwards, and with lateral flanges. Female with ovipositor relatively small.
Distribution: Europe, Asia, Africa.
Platycnemididae: Platycnemis

Key to the Species of Platycnemis
(Figs. 12b–c, 49–55, 57–59)

1. Tibiae of 2nd and 3rd pairs of legs conspicuously dilated in both sexes. Male whitish or pale bluish with black markings; females brownish-reddish. App. sup. triangular with smooth apex. No pruinescence.

   P. dealbata Selys & Hagen

   Tibiae not dilated. Teneral males whitish with black markings, very quickly turning dark blue to almost black due to the development of a layer of pruinescence. App. sup. triangular with bifid apex. Females coloured as males.

   P. kervillei (Martin)

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Platycnemis dealbata Selys & Hagen, 1850

Figs. 12c, 51–52, 54–55, 57–59

Platycnemis dealbata Selys & Hagen, 1850:165 (race of acutipennis), p. 388 (good species).
Platycnemis latipes race dealbata —. Selys, 1863:167 (formal description).
Platycnemis dealbata (race of latipes) —. Selys, 1887:46.
Platycnemis dealbata (sic!) —. Morton, 1924:30.
Platycnemis latipes dealbata —. Schmidt, 1938:141.

Type Locality: “Egypt” (almost certainly misplaced!).
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Note
Klug cannot have authority over the name *dealbata*, since he never published it himself. Information about the species was communicated by H.A. Hagen to Selys, and incorporated into *Revue des Odonates* (1850), which was published under the joint authorship of both dragonfly workers. On pp. 165–166 *dealbata* is considered, on evidence of a female, as a “race” of *P. acutipennis* (a Western Mediterranean species), but in a correction on p. 388, it is given full specific status. An important diagnostic character, the strongly dilated legs, is explicitly recorded here, and since no similar species is found in the Near East, we can be confident that what is currently referred to under the name *dealbata* indeed corresponds to this type material.

The type locality poses another problem. We do not know what is meant by “Egypt”, but it is almost certain that *dealbata* does not occur in classical Egypt. Andres (1928) states that specimens from Sinai are present in the collection of the plant protection section of the Ministry of Agriculture, Cairo (collected by C.B. Williams), which might or might not be the area where the types were taken. It should be mentioned here that

Figs. 53–54: Pronotum and lamina mesostigmaalis in female *Platycnemis* spp.
53. *P. kerriilei* (Mart. 1909); 54. *P. dealbata* Selys & Hagen, 1850
(arrows point to diagnostic differences on lamina mesostigmaalis)
Platycenemidae: Platycnemis

Hagen, already in 1849, had seen additional specimens from Syria, and had given them the manuscript name *P. syriaca* (see Selys & Hagen, 1850). On the other hand, early nineteenth century collectors often travelled to Egypt via the Levant, and many misplaced records have resulted from this. Among Odonata records from Egypt such species as *Calopteryx syriaca*, *Lestes viridis*, and *Coenagrion puella* fall into this category.

In conclusion, it appears that the *terra typica* of *P. dealbata* is not deltaic Egypt but either Sinai (from where no recent records are available), or the Eastern Mediterranean coastline.

Figs. 55–56: Heads of *Platycnemis* sp. and *Coenagrion* sp.

55. *Platycnemis dealbata* Selys & Hagen, 1850;
56. *Coenagrion scitulum* (Rambur, 1842)
(with pear-shaped postocular spots)
Figs. 57–59: *Platycnemis dealbata* Selys & Hagen, 1850;
abdominal markings
57. teneral female;
58. mature female;
59. a. mature male;
b. lateral view of terminal segments
**Platycnemididae: Platycnemis**

**Male**

Mouth parts, labrum, genae greenish-white or with bluish sheen. Dorsum of head greenish white, with a black stripe on the frons, between the antennae, and a broad black transverse band on vertex and occiput. Rear of head pale. Antennae brown but pedicellum whitish-green.

Prothorax with pronounced relief, pale on the sides, but with extensive black markings, confluent to a large central patch on the middle of the pronotum. Hind rim of pronotum a wide plate, narrowing at its lateral edges. Synthorax: laminae triangular, with hind ridge slightly raised, especially outwardly. Carinal fork deep, anteriorly bounded by a thick rim, not bulbously swollen. Most of carina clear, flanked by a broad black band on either side. Humeral suture covered by a black stripe, extremely narrow and locally interrupted in teneral specimens, widening in older specimens, but rarely as wide as the clear antehumeral bands. A black stripe may also appear at the level of the meso-metathoracic suture, connected anteriorly to the humeral stripe. A very fine black line may, finally, appear on S₁ as animals age. Legs white or pale bluish with long black spines. A very fine black line on all femora, accentuated as a dark brown-black dot at the articulation of femur-tibia. Tibiae of second and third pairs of legs strongly dilated and flattened, pale, unmarked. Tarsal claws reddish-brown.

Wing venation brown. Pt light reddish-brown.

Abdomen pure white, or with a pale turquoise sheen. Segments 2–6 unmarked or with a diffuse darkening near the top of each segment. A fine mid-dorsal black line may be seen on S₁; S₁₀ unmarked in young adults. S₁ first develops apical black markings, which later extend across S₄ and S₅ as bilateral black stripes. Eventually, a pair of lateral black dots may appear on S₁₀. Appendages: app. sup. triangular on a squared base. Apex rounded. App. inf. forciolate, with dark tips, considerably longer than superiors. Accessory genitalia: lam. ant. broadly excavated; ham. ant. broadly rounded posteriorly but pointed at inner apical corner; ham. post. small, inconspicuous. Vesica spermalis elongate, somewhat broadened posteriorly; membranaceous filling-aperture heart-shaped. Ligula with broad, blunt apex.

**Female**

Head entirely unmarked, reddish-brown, turning dark brown on maturity. Pronotum reddish-brown, developing black medial spots, in particular in the raised median sector of the hind ridge in old specimens. Shape of pronotum characteristic: the median lobes are divided into two tubercles by a median depression (the grasping area of the male's app. sup.). From the anterior collar, a V-shaped outgrowth projects backwards, deepened into a central pit. The hind ridge is medially produced into an upright, pointed tooth. Synthorax: lam. mes. triangular, the hind ridges of each triangle raised. Carina narrowly forked, with thick rims, deeply hollowed-out. Anterior rim bulbous, frame swollen. Synthorax cream-coloured, with brown markings, later stripes, developing in time. Abdomen, likewise, starting out wholly whitish-blue, turning cream brown, eventually two fine black stripes across the dorsum of S₁–₁₀ (Figs. 57–59). Legs with tibiae of 2nd and 3rd pair dilated, though
Odonata of the Levant

somewhat less than in males. Pure white in young specimens, they turn brown with age. In senescent specimens, a fine black stripe appears on the back side of the femora. Ovipositor relatively small; v3 without spines; valvifer small. Pt white in young specimens, soon changing to a creamy colour, and to reddish-brown in fully mature specimens.


Distribution: Central and eastern Anatolia, the Caucasus, Iran, Iraq, Afghanistan, northern India, Syria, the Levant.

It is one of the most widespread damselflies of Israel, and it is most commonly found between March and October, on virtually all running waters. In the south-west, it has been reported from Sinai in September (Andres, 1928), but precise localities are not known, and no specimens have been collected here in recent years.

Israel (Locality records): HaGosherim (1), Shamir (1), ‘En T’eo (1), Sedê Nejîmêya (1), ‘Ein Jalabina (1), Qiryat Shemona (1), Montfort (1), Nahal ‘Ammu (2), Nahal Dalinya at Bat Shelomo (3), Ma’agan Mikha’el (4), ’Akko (4), Nahalal (5), Ashdot Ya’aqov (7), Migdal (7), Nahal Zalmon (7), Umm Juni (7), Kinneret (7), Hammat Gadër (7), Bitanya (7), Massada (7), Deganya (7), ‘Ubeidiya (7), Tabigha (7), Wadi Samak (Nahal Samekh) (7), Binyamina (8), Rosh Ha’Ayin (8), Nahal Poleg (8), Ashqelon (9), Nabi Rubin (9), Jerusalem (11), Wadi Fari’a (12), Wadi Qilt (13), Qushiya (18).

Also recorded from Naher ez Zerka, and further from Wadi Wala, Wadi Hasa, Wadi Mujib, and all eastern tributaries of the Jordan River in Jordan. For Syrian records, see Al Hariri (1968) and Schneider (1981a); for Anatolian records, see Dumont (1977b).

Platycnemis kervillei (Martin, 1909)
Figs. 12b, 49–50, 53

Platycnemis pennispe kervillei — Schmidt, 1950a:82.

Type Locality: Lake Homs, Syria.

Male
Head: Genae and mouth parts yellow. Labrum black in adults. Dorsum of head conspicuously black, covered by bluish pruinosity. In teneral, head brownish, a brown-black stripe across the frons and a second, wider one, across vertex and occiput. Rear of head brownish.

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Coenagrionidae

Pronotum as in P. dealbata, yellow, very heavily marked with black in tenerals. Very soon, the entire prothorax turns uniformly black. Synthorax in teneral male marked with carinal, antehumeral, humeral, and Su2 black stripes as in male P. dealbata. Again, the dorsum of the synthorax, down to the level of the suture between meso- and metathorax, soon turns uniformly black, covered by blue pruinoscence. Metathoracic pleurites yellow, with black stripe over Su2. Pt creamy in tenerals, bright brown in mature specimens. Legs pale yellow in tenerals, heavily striped along their entire length in adults. Tibiae not dilated.

Abdomen whitish with end-rings narrowly black and two small cuneiform oblique stripes at the base of each segment. S6-10 soon covered by black, and the entire abdomen becoming invaded by blue pruinosity in adults. Appendages entirely black, shaped as in dealbata, but superiors apically bifid. Genitalia as in dealbata, but filling aperture of vesica rounded posteriorly, not pointed.

Female

Light brownish when freshly emerged, with dorsum of head totally unmarked, and synthorax with carinal black stripe, humeral stripes, and a faint black suture on Su2, and two incomplete brown striae between Su2 and Su3. Legs yellow, with a series of brown spots along the femora. Abdomen uniformly pale. All these colours very soon turn black and pruinose blue, like in the male. Ovipositor as in dealbata. Styli short, shorter than S10.

Pronotum: Hind rim more strongly raised than in dealbata, its lateral angles wider; lamina and carinal fork as in dealbata, but hind rim of laminar triangle not raised into a crest.


Distribution: East Anatolia, northern Iraq, Syria, the Lebanon. The species has not been found in the Jordan Valley, but it occurs in the southern Litani Valley and in numerous localities in Syria. It thus typically represents a species bounded in the south by the Nehring line. P. kerrii is a late spring species that has been found between April and late July. It occurs on stagnant or slow-running waters. In habitus, it comes closest to Pseudagrion syriacum, while structurally it is very near to the western Anatolian and European Platycnemis pennipes (Pallas).

Family COENAGRIONIDAE

Rather small damselflies. Thorax with Su1 reduced, visible only in its upper part. Wings hyaline, petiolated, with wing venation fairly open and most cells quadrangular. Two an. Ac arises halfway between the an, meeting Ab at the wing border (not in regional species) or some distance from it. d always untraversed, with lower distal angle acute, and costal side much shorter than cubital side. Tibiae of legs never dilated. Male accessory genitalia with ham. ant. large, squared, pointed at its inner anterior angle; ham. post. small, inconspicuous.
Odonata of the Levant

Key to the Genera of Coenagrionidae
(Figs. 11a, 13, 56, 60–203)

1. are situated distal to level of an2, Very small species. 
   - are situated at level of an2

2. Dorsum of head entirely black, without postocular spots, or postocular spots present in 
   - Erythromma Charpentier
teneral specimens only.
   - Dorsum of head black with blue or green postocular spots, or dorsum of head so sparsely
   marked with black that no such spots are defined

3. Frons with an angular crest. Ground colour of abdomen bright red, with or without 
   - Ceriagrion Selys
   markings in the female. Some females forms largely or entirely black, but without vulvar 
   spine.
   - Frons gently rounded, not angular. Ground colour of thorax and abdomen blue, green,
   brown or orange, but never bright red. In females, a vulvar spine may be present

4. Males 
   - Females

5. Pt in forewing bicolorous, usually divided into a black and a clear part. Pt in hind wing 
   - Ischnura Charpentier
   unicolorous, clear.
   - Pt unicolorous and of same colour in both pairs of wings

6. Ground colour of thorax and abdomen brown, green, or yellow with black markings.
   - Pseudagrion Selys
   Azure blue, if present, only on S8,9 of abdomen. Eyes and dorsum of head brick red in 
   some species. Body occasionally pruinose.
   - Ground colour of thorax and abdomen azure blue, marked with black. Eyes never red,
   body never pruinose

7. App. inf. simple, not differentiated into an inner and outer branch, triangular in side view, 
   - Enallagma Charpentier
   with upturned apex.
   - App. inf. not triangular in side view, of compound structure, with a well-differentiated 
   inner and outer branch.

8. A vulvar spine on the ventrum of S8 
   - No vulvar spine on the ventrum of S8

9. Robust species. R3 springs more than 4 cells distal to N in forewing, more than 3 cells 
   - Enallagma* Charpentier
   in hind wing. Hind margin of pronotum an oblique, smoothly rounded plate, without 
   medial differentiation.
   - Slenderly built species. R3 springs 4 cells distal to N in forewing, 3 cells distal to N in hind 
   wing. Hind margin of pronotum with a well-differentiated middle lobe (except I. 
   - Ischnura Charpentier
   senegalensis).

10. Hind margin of pronotum sinuous, always with a more or less uplifted and protruding 
    - Coenagrion Kirby
    middle lobe, but without stylettes and epaulettes. Ground colour green or blue.
    - Hind margin of pronotum upright, straight, with stylettes projecting anteriorly (sometimes 
    reduced to a tubercle) and epaulettes. Ground colour of synthorax green, brown or 
    reddish.

* Females of Ischnura senegalensis may key out here. Refer to Fig. 146. In I. senegalensis the vulvar 
spine is much more strongly developed than in Enallagma cyathigerum.
Genus *Agriocnemis* Selys, 1869

In: *Faune Madagascar, Insectes*,
(eds. Schlegel & Van Dam), p. 24

Type Species: *Agriocnemis lacteola* Selys, 1877.
Extremely small and fragile damselflies, ranking among the smallest species known. Colours non-metallic, usually blue or green marked with black, occasionally bright red. Females often occurring in several colour forms. Wings hyaline. Pt small, covering less than one cell. Usually 5–6 pm, rarely 8–9, d acutely pointed at distal lower end. arc situated distal to level of an. Ab arises proximal to Ac; Ac thus not springing from rim of wing. Head narrow, frons rounded. Postocular spots present. Posterior lobe of pronotum often with conspicuous differentiations. Abdomen slim, somewhat dilated terminally. Legs short. Female without vulvar spine.

Distribution: Asia, Oceania, Australia and Africa. Confined to tropical and subtropical climates.

One regional species.

*Agriocnemis sania* Nielsen, 1959
Figs. 60–71

*Agriocnemis pygmaea* — Morton, 1924:34.

Type Locality: Oasis of Ghat, Fezzan, Libya.

**Male**

Mouth parts and anteclypeus pale yellow. Frons black, usually with two minute lateral green dots. Labrum black, metallic. Postclypeus, vertex, occiput black. A narrow yellow margin fringes the occiput. Postocular spots present, rounded, green. Pronotum black with metallic purple sheen, its sides and hind rim yellow. Hind rim trilobate, with small side-lobes, and strong, upright, yellow middle lobe, deeply hollowed-out anteriorly. Synthorax black with purple sheen. Antehumeral stripes narrow, green. epm<sub>3</sub> black, except for some green on anterior half and on in<sub>3</sub>; epm<sub>4</sub> and epst, greenish yellow. Legs greenish-yellow, exterior surface somewhat darkened. Spines black.

Dorsum of abdominal segments 1–6 largely black. S<sub>1–3</sub> greenish laterally, changing to brick red on subsequent segments. S<sub>7</sub> greenish-yellow laterally, basal half of dorsum black, apical part brick red. S<sub>8–10</sub> red dorsally, green laterally. Appendages: app. sup. subquadrangular, with a downwardly pointed, foliate process, seen laterally. In posterior view, inner margin arcuate; foliate expansion appearing as a thin projection, outwardly directed. A strong basal spine on the lower inner corner, plus a tuft of
Figs. 60–63: *Agriocnemis sania* Nielsen, 1959; abdominal markings
60. male; 61. female, green form;
62. a. female, red form; b–d. female, red form, evolution of markings on S₁–S₃ with time;
63. female, red form, abdominal segments 6–10 in aged specimens
golden hairs. Margins of $S_{18}$ produced all around, but especially at the sides of the segment, hiding the short app. inf. App. inf. roughly triangular, ridged, with an oblique row of black spines near their base, a median fold, and a robust upper black spine. Wing venation brown; Pt yellow; rest of venational characters as for genus.

Female

Two colour forms occur; the red one is common, the green one is rare.

Red form: Black markings very much reduced. Head entirely orange (but mouth parts yellow), except for a black patch around the ocelli. Pronotum orange. Some black on hind ridge only. Synthorax orange-red, sides changing to yellow. Abdomen orange; end-rings of segments and dorsum of $S_{8-10}$ with some black. Legs: femora orange, rest yellow. Spines black.

Green form: darker. Clypeus and dorsum of head copiously marked with black. Abdomen entirely black dorsally, except for $S_{8-10}$ where the black colour is reduced to spots. Sides of synthorax and of abdomen apple green.

Structure of pronotum and lam. mes. (Fig. 69): hind rim of pronotum trilobate, with lateral lobes smaller than central lobe, the latter flanked by two dorso-lateral tubercles of variable shape. Lamina mesostigmaticis triangular, of complex relief. Carinal fork wide, each of its two arches widening into a triangular plate, bounded by an anteriorly raised rim, consisting of two adjacent tubercles.

Figs. 67-69: Agriocnemis sania Nielsen, 1959
67. male terminalia, posterior view; 68. hind ridge of male pronotum; 69. female pronotum and lamina mesostigmalis, dorsal view
Coenagrionidae: Ischnura

Figs. 70–71: *Agrionemis sania* Nielsen, 1959; male terminalia, dorsal and lateral views

Distribution: In the type locality, the species has been exterminated by the introduction of *Gambusia*. Pinhey (1974) records it from Ethiopia and from N. Kenya. There are no records from deltaic Egypt, but the species occurs in Sinai, and reaches the Jordan Valley.

Israel (Locality records): Benot Ya'aqov bridge on the Jordan River (1), Lake Hula (1), Mt. Tabor area (5), Petah Tiqwa (8), Hadera (8), Bet She'an (7), and Quseima Oasis (17).

Specimens have been caught between March and September.

Genus *ISCHNURA* Charpentier, 1840

*Libellulinae eur.*, p. 20

Type Species: *Agrion elegans* Vander Linden, 1820.

Damselflies of small size, slender. Colours non-metallic, usually green or blue, sometimes brown, extensively marked with black. Females polychromatic. Wings hyaline. Pterostigma of males of different shape and colour in both pairs of wings, that of forewing bicolorous, short, covering one cell or less. d acutely pointed at its distal end. arc situated at an anterior point; Ab arising proximal to Ac. Head narrow; frons without angular crest. Postocular spots present. Posterior rim of pronotum mostly with prominent central lobe. Abdomen moderately short, segment 10 with distal rim raised to form one or two tubercles. Legs short. Female with a vulvar spine. Accessory genitalia: Lamina deeply cleft; ham. ant. squared, with inner anterior spine; lam. post. small. Ligula: the apical segment (glans) strongly built, often roughly triangular in lateral view, with long flanges and a pair of stylettes.

Distribution: Cosmopolitan, except for South America. Five species are regional.
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Key to the Species of Ischnura
(Figs. 72-115)

1. Pt in forewing and hind wing differing in shape, that of the forewing being larger. Spine present on the inner-posterior corner of the lam. mes., adjacent to the carinal fork.
   - Ischnura pumilio (Charpentier) (Figs. 72-74)
   2. Males
   3. Females

3. App. inf. much longer than app. sup. and about as long as $S_{10}$, forcipate
   - App. sup. and app. inf. of about equal length; these appendages not prominent, not forcipate, and much shorter than $S_{10}$
   4. Hind ridge of pronotum with middle lobe modified into a steeply erected lamina; app. sup. crossed-over at their lower tips.
      - Ischnura elegans ehleri Schmidt (Figs. 75-77)
   5. Hind ridge of pronotum with middle lobe inconspicuous, rounded, not erect. App. sup. with tips not crossed-over.
      - Ischnura senegalensis (Rambur) (Figs. 78-80)

5. Pt in forewing black in its middle, surrounded by a white fringe. App. sup. somewhat horse shoe-shaped, its inwardly and downwardly curved apex blunt.
   - Ischnura evansi Morton

6. Vulvar spine strongly developed, long, produced over $S_{9}$. Hind rim of pronotum without any conspicuously developed middle lobes.
   - Ischnura fontainei Morton

6. Vulvar spine acutely pointed, but not produced over $S_{9}$. Hind rim of pronotum always with a well-differentiated, upright middle lobe
   - Ischnura senegalensis (Rambur)

7. Middle lobe of hind rim of pronotum an upright lamina, longer than wide, not curved backwards.
   - Ischnura elegans ehleri Schmidt (Figs. 81-83)

7. Middle lobe of hind rim of pronotum shorter than wide, sometimes rounded, deeply bent over backwards
   - Ischnura evansi Morton

8. Middle lobe about half as high as wide, arising from the upper rim of the hind border of the pronotum; the lower rim forms two folds at the sides of the lobe, not confluent under the lobe. Lam. mes. triangular, with hind ridge raised above the level of the synthorax along its entire length. Carina not forked, but preceded by a squared depression. Hind ridge of the depression not markedly raised.
   - Ischnura evansi Morton

8. Middle lobe less than half as high as wide, arising from the upper rim of the hind border of the pronotum. The lower rim forms a fold at the sides of the lobes that is continuous under the lobe. Lam. mes. triangular, with hind ridge raised outwardly, but fading out towards the squared depression in front of the carina. Hind ridge of this depression markedly raised.
   - Ischnura fontainei Morton
Coenagrionidae: Ischnura

Figs. 72–74: *Ischnura pumilio* (Charpentier, 1825); synthoracic markings
72. male; 73. old female; 74. teneral female

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Figs. 75–82: Wings (pterostigma area) in *Ischnura* spp.
75–76. *I. pumilio* (Charpentier, 1825); female, forewing and hind wing;
77–78. *I. pumilio*, male, forewing and hind wing;
79–80. *I. elegans ebneri* Schmidt, 1938; male, forewing and hind wing;
81–82. *I. evansi* Morton, 1919; male, forewing and hind wing

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...larger. Spine of larval fork...

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*ebneri* Schmidt 1938, App. sup.

*transis* (Rambur) 1843, App. sup. somewhat

*evansi* Morton 1919

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...finger-shaped...

---

...hind border not confluent...

---

...hind border continuous...

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Figs. 83–97: Ischnura spp., male terminalia, dorsal, lateral, and posterior views
83–85. I. elegans ebneri Schmidt, 1938;
86–88. I. senegalensis (Rambur, 1842)
89–91. I. pumilio (Charpentier, 1825);
92–94. I. fountainei Morton, 1905;
95–97. I. evansi Morton, 1919
Figs. 98–101: *Ischnura* spp.
98. *I. pumilio* (Charpentier, 1825); female, pronotum and lamina mesostigmatici; 99, the same, *I. pumilio*, male;
100. *I. pumilio*, male, terminalia, posterior view;
101. *I. evansi* Morton, 1919; male, terminalia, posterior view

Figs. 102–103: *Ischnura senegalensis* (Rambur, 1842); head
102. teneral female; 103. aged female
Figs. 104–106: Ischnura spp., male terminalia, posterior view
104. I. elegans ebneri Schmidt, 1938;
105. I. senegalensis (Rambur, 1842);
106. I. fountainei Morton, 1905
Figs. 107–110: *Ischnura* spp. pronotum and lamina mesostigmalis

Figs. 111–115: Ischnura spp., female ovipositor
111. I. senegalensis (Rambur, 1842);
112. I. plumosus (Charpentier, 1825);
113. I. elegans ebneri, Schmidt, 1938;
114. I. evansi Morton, 1919;
115. I. fountainei Morton, 1919
**Coenagrionidae: Ischnura**

**Ischnura pumilio** (Charpentier, 1825)
Figs. 72–78, 89–91, 98–100, 112

*Agrion pumilio* Charpentier, 1825: 22. Selys, 1840: 156.
*Ischnura pumilio* — Selys, 1876a: 267; Morton, 1924: 32; Schmidt, 1938: 142; Dumont, 1977b: 140.

Type Locality: “Northern Italy”.

**Male**

Mouth parts and clypeus yellowish. Dorsum of head black. Postocular spots large, blue or blue-green.

Pronotum black, its sides yellow or bluish. Posterior margin medially produced into a broad, rounded plate. Lam. mes. triangular, with a strong hook on the inner posterior corner. Carinal fork present between the laminae, with thick ridges. Synthorax black on dorsum, with a humeral stripe, and sides and ventrum bluish. Legs yellow, with dark external stripe.

Wings hyaline. Pterostigma in forewing black in its basal half, clear in its apical half. In the hind wing, it is unicolorous (pale yellow) and distinctly smaller than that in the forewing.

Abdomen black on dorsum, with end-rings narrowly yellow; posterior half of S₈ and most of S₉ blue, variously marked with black spots. Hind ridge of S₁₀ only moderately raised and hollowed-out posteriorly. App. sup. shorter than app. inf., rounded in lateral view. In posterior view, they appear as two roughly triangular plates, rather acutely angled ventrally, somewhat concave medially. App. inf. longer than half of S₁₀, comparatively simple, forcipate.

**Female**

There are two basic colour forms.

**Red form**: Head bright orange, with isolated black spots on labrum and postclypeus. Vertex black. Postocular spots very large, orange-red, confluent across the dorsum of the head. Pronotum orange, with a large black patch at the base of the hind lobe. Free border of hind lobe orange. Legs orange, with interrupted black line on tibiae. Synthorax entirely orange. A carinal black line with wavy borders, and a very fine black stripe on the humeral suture. The partial suture between meso- and metathorax also accentuated by a fine black stripe. Abdomen S₁, S₂ and apical one-fourth of S₃ bright orange. Rest of abdomen black on dorsum, orange on sides. Styli short and robust, orange. As specimens age, the bright orange colours change to more brownish tinges; S₁ and S₂ become progressively covered by more extensive black markings, turning brown on their dorsum and greenish on the sides. The humeral space on the synthorax, likewise, turns chocolate brown.

**Green form**: The orange colour replaced by apple green. In old specimens, the green colours become darker; the postoculars shrink in size, their edges first turning deep brown. Eventually, they get separated from one another. The humeral space of the
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synthorax becomes brownish, as well as the dorsum of S₁–S₃. The styli are brown. In both forms, the vulvar spine is strongly developed, and the ovipositor comparatively small. The Pt, light brown in both pairs of wings, is distinctly smaller in the hind wing than in the forewing. That in the forewing tends to be asymmetrical, in having the distal margin longer than the proximal one.

**Measurements (mm): Male.** Total length 30–33; abdomen 23–26. **Female.** Total length 25–34; abdomen 20–27.

**Distribution:** Europe, the Maghreb countries of North Africa, Asia Minor, West and Central Asia. The species is locally common in Turkey.

**Locality records:** Morton reports a male from ‘Amman (30.VIII.1921) and another male from Wadi Samak [Naḥal Samak; 7], 13.V.1921. Schmidt (1938) cites a male from Beharre, N. Lebanon, while Bolivar (1893) reports *I. pumilio* from “Syria”. I have an additional record from Birkat Bab el Hawa, Golan Heights (18), June 1972.

**Ischnura elegans ebneri** Schmidt, 1938

Figs. 79, 80, 83–85, 104, 107, 113

**Agrion elegans** Vander Linden, 1823: 104.

**Ischnura elegans** —. Morton, 1924: 32; Fraser, 1933: 351.


**Type Locality:** Bethlehem (Solomon’s Pool).

**Male**

Labium pale whitish, marked with black at base. Rest of mouth parts and genae largely greenish-blue. Anteclypeus blue, postclypeus steely black; dorsum of head black, with rounded blue postocular spots.

Pronotum black, sides of prothorax blue-green. Posterior rim with a robust middle lobe, steeply erect, longer than wide, black. Synthorax black to level of suture between meso- and metathorax; antehumeral stripes present, blue. Lower half of synthorax blue, blue-green or green. A black stripe over S₃. Legs green or blue, with black stripes.

Wings hyaline; Pt of forewing diamond-shaped, its membrane white or pale blue, but its lower half strongly suffused with black. Pt in hind wing about the same size, its basal half not or only slightly blackened, and in any case not distinctly bicolorous and much paler than that in forewing.

Abdomen: Dorsum of S₁–S₈ black. End-rings narrowly yellow. Sides of S₁, S₂ and sometimes S₃ blue. S₃–7 with yellow sides. S₅ dorsally blue. S₈–₁₀ dorsally black, laterally blue. S₁₀ with hind rim steeply raised, deeply cleft apically, thus forming the structure which apposes to the middle lobe of the female pronotum in copula. Appendages: app, sup. short, rounded in lateral view; in posterior view, with broad rounded body and
**Coenagrionidae: Ischnura**

strong internal tooth. The inner teeth of both appendages almost invariably overcross each other (most diagnostic character of this subspecies). App. inf. much longer than app. sup. and more than half the length of S₁₀. Their base broadly triangular, with an inner blunt brown tooth, and external black, nipper-shaped projection.

**Female**

Much like the male, except for the genitalia and the Pt, which is pale yellow in both pairs of wings. Styli short, black. Ovipositor yellow. In young specimens, the sides of the synthorax are sometimes violaceous; in old specimens, the synthorax and the blue spot on the dorsum of S₇ may turn olivaceous or brownish. No heterochromatic form (without humeral black stripe, and with bright orange base colour of the synthorax) has been reported from the Levant (see further).


**Distribution:** The subspecies occurs in south and central Anatolia, and in the Levant. Together with *P. dealbata*, it is the commonest damselfly of Israel, although the species does not reach beyond the Dead Sea. It has been found to co-occur with *I. evansi* on the Yarmouk River and in other localities in Syria and Jordan (Schneider, 1981a), and also in the oasis of El Azraq, Jordan (Dumont, unpublished observations), but not with any other of the regional *Ischnura*. It is on the wing from March to October, probably in several overlapping generations. In northern Anatolia and the Balkans, it is replaced by ssp. *pontica*.

Israel (Locality records): Dan (1), Yir'on (1), Sedeh Nehemya (1), ‘Ein Jalabina (1), Qiryat Shemona (1), Hula (1), Hurshat Tal (1), Haifa (3), Zikhron Ya’aqov (3), Nahalal (5), Migdal (7), Nahal Zalmon (7), Umm Juni (7), Lake Kinneret (7), Hammat Gadœr (7), Bitanya (7), Massada (7), Deganya (7), ‘Ubediya (7), Bet She’an (7), Hadera (8), Tel Aviv (8), Rosh Ha’Ayin (8), Bethlehem (11), Aqua Bella (11), Jericho (13), Ramat Magshimim (18), Wasit (18), Birkat Bab el Hawa (18).

Also very common on the wadis east of the Jordan River in Jordan, in the Lebanon and Syria (Schmidt, 1954a), and in Anatolia (Dumont, 1977b).

**Ischnura fountainei** Morton, 1905

Figs. 92–94, 106, 109, 115


**Type Locality:** Oasis of Biskra, Algeria.

**Male**

Mouth parts yellow. Labrum greenish with black base-line. Anteclypeus, genae and most of frons green. Postclypeus and dorsum of head black. Postocular spots small, blue.
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Dorsum of pronotum black, sides yellow. Trochanters and femora broadly black, and a black stripe on all tibiae. Hind margin of pronotum with middle lobe almost completely reduced; a broad black lamella on the lower rim of the lobe forms a posteriorly directed plate with rounded margins. Synthorax lam. mes. triangular. Carina not forked, but has a squared depression in front of it, between the laminae. Hind ridge of this depression markedly raised. Dorsum of synthorax black almost down to level of mesothoracic suture. Antehumeral stripes narrow, interrupted, or almost completely obliterated. S1 black in its upper part. Metathorax olive green, with brownish darkening on sutures.

Wings: Pt in forewing small; costal and radial veins much shorter than proximal and distal margins, thickened. Membrane whitish, but largely superimposed by black. In older specimens the whole Pt may turn black, with only a very fine whitish fringe. Pt in hind wing slightly larger, its four margins of roughly equal length, yellow with a very fine black reticulum, but not bicolorous.

Abdomen: S1–7 black dorsally; S1, S2, apical half of S3 blue laterally; S3–6 yellow laterally and on top of each segment, where the black colour contracts. S9 entirely blue; sides of S9–10 blue as well, their dorsum black. Hind margin of S9 only slightly raised, forked. Appendages very short, roughly of equal length. Superiors dark brown to black, inferiors yellow. Seen from behind, the app. sup. consist of a rounded outer tubercle, and an inner, slightly curved finger-like projection. App. inf. triangular, with a horizontally and inwardly directed black spine on top. Accessory genitalia as for the genus.

Female

Two basic forms occur. One is coloured more or less like the male (homochrome form), while the other has orange or brown as base colour, and lacks black humeral stripes (heterochrome form).

Homochrome form: this is by far the rarest. Coloured like the male: S1 dorsally steel blue-black, and S9 dorsally blue. Sides of synthorax greenish-brown. Pt yellow, parallelogram-shaped, identical in shape in both pairs of wings.

Heterochrome form: base colour of young specimens bright orange on the dorsum of the head, which has relatively small postocular spots. Legs entirely bright orange. Pronotum orange, with some black in the middle of the anterior collar, and at the base of the middle lobe of the hind margin. Synthorax bright orange, with a median humeral black stripe, divided into two halves by an orange carinal suture. Abdomen with S1–3 dorsally and laterally orange; a black marking on S2, S3–7 black dorsally, yellow laterally. S9 orange, but often considerably darkened by a mid-dorsal black marking. The same is true for S9, the sides of S9–9, and the whole of S10. Styli and ovipositor orange. As specimens age, the postocular spots turn green, a series of black spots appear on the tibiae, ultimately confluent into a black stripe, the humeral area of the synthorax becomes a black stripe, and the humeral area of the synthorax turns chocolate brown, while the sides and dorsum of S1–2 become olive green. More brown appears on the terminal segments. The styli darken considerably and the ground colour of the abdominal segments changes to brown. No structural difference exists between the male and female.
**Ischnura evansi** Morton, 1919

Figs. 81–82, 95–97, 101, 110, 114


**Type Locality:** Basra and Amara, lower Iraq.

**Male**

Mouth parts and genae greenish, labrum green with broad basal black band. Postclypeus and frons green. Anteclypeus, vertex and occiput black. Small blue spots may be found in front of each ocellus. Postocular spots relatively small, blue. Hind ridge of head yellow.

Dorsum of pronotum black, with some minute yellow spots. Sides and margins of hind rim greenish-yellow. Median lobe well developed, upright, about half as long as wide. Adjacent to it, hind margin sinuously depressed, then raised again in a small lateral lobe. Lower rim of hind margin produced into a narrow plate, contiguous across the middle lobe, but at least slightly concave here. Lam. mes. broadly triangular; hind ridge of each triangle raised along its entire length. Hind ridge of carinal fork moderately raised. Synthorax with dorsum black. Black humeral sutures wide, but antehumeral stripe may be as wide as humeral stripe and is never obliterated. Sides of synthorax greenish or bluish. Some black on mesothoracic suture and on Su2. Legs yellow, heavily marked with black on femora, and striped on tibiae. Wings: Pt in forewing black, surrounded by a narrow yellow reticulum. Pt in hind wing yellow with very fine dark reticulum.
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Abdomen: S1-7 black dorsally, S1-2 blue laterally, S2-7 yellow laterally, S8 blue dorsally. Hind rim of S10 strongly raised, deeply bifid, the whole segment laterally elongate. App. sup. dark brown to black, app. inf. light brown, both pairs very short and appearing in side view as an upper blunt tubercle (sup.), and a lower blunt tubercle (inf.). In posterior view, the app. sup. are bulbous, with an internal, down wardly bent, blunt black tooth on each appendix, the tips of which are slightly divergent. App. inf. block-shaped, with a deep longitudinal furrow. From the upper external corner, a robust black spine projects inwardly. The lower inferior corner is swollen, and forms a blunt boss. Genitalia as for genus.

Female

The female is polychromatic, but there are distinct differences from all other species, including the preceding ones.

Homochrome form: head, pronotum (although often with rounded yellow spots on middle lobes) and legs coloured as in male. Synthoracic black bandings as in male but ground colour of synthorax and sides of S1-2 greyish-blue. Abdomen coloured as in male; S4 (partly), S10 and styli brown in young specimens, black in mature specimens.

Heterochrome form: differs from all other regional ones by the fact that true black humeral stripes develop here with age. Moreover, the ground colour of the synthorax in young specimens is not bright orange as in I. fontainei or in I. senegalensis, but has a distinct tinge of ochre, or sometimes dark yellow. Humeral bands begin to develop near inf2 and under the humeral suture. As they lengthen, a second stripe appears more distally and above the suture. With time, both bands expand and finally merge into a single humeral stripe. This whole process is accompanied by a darkening of the humeral area, which turns chocolate brown. S1 is mostly coloured as the synthorax, but S2 is always largely black dorsally. S4 is brown dorsally, not blue. The pronotum has two broad brown spots on its middle lobe, near the anterior collar, and two kidney-shaped brown patches behind the middle lobe of the hind rim in young specimens. With age, the kidney-shaped spots disappear, and the patches on the middle lobes decrease in size. The postocular spots are round, not acutely angled anteriorly. When these spots are confluent, the rear of the occiput always remains black behind them. Structurally, both colour forms are identical. Pronotum: hind ridge with well-expressed, tongue-shaped middle lobe; its sides depressed, somewhat sinuous. Side lobes small. Lower ridge of hind margin expanded on both sides in the depression between middle and side lobe, but these expansions not confluent under the middle lobe. Lam. mes. triangular, the hind ridge of each triangle raised along its entire length. Hind rim of carinal fork not raised above level of laminae.

Dimensions as for I. fontainei.

Distribution: Iraq, Iran, Syria, Jordan, Saudi Arabia, Sinai, Western Desert of Egypt. The westernmost record is from Siwa Oasis (Kimmins, 1950). In the latter locality and all over Sinai and the Negev, it is in frequent association with I. fontainei and I. senegalensis, often in great population densities. On the wadis east of the Dead Sea, and as far north as the Yarmouk River, and in the oasis of El Azaq, I. evansi is found in the company of I. elegans ebneri.
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Israel & Sinai (Locality records): Jericho (13), ‘En Gedi (13), Nahal Arugot (13), ‘Ein Fashkha (13), ‘En Avedat (17), Quseima Oasis (17), Wadi Hibran (22), Hammam Musa (23).

Ischnura senegalensis (Rambur, 1842)
Figs. 86–88, 102–103, 105, 108, 111

Ischnura senegalensis — Selys, 1876c:273; Sewerby, 1917:10; Morton, 1924:32; Ris, 1928:159; Andres, 1928:25; Morton, 1929:60; Fraser, 1933:348; Dumont, 1977b:141.

Type Locality: “Senegal”, West Africa.

Male
Mouth parts, genae, postclypeus, most of frons yellow or greenish. Labrum yellow with black base. Anteclypeus black, as are vertex and occiput. In young specimens, some green around the individual ocelli. Postocular spots round and blue.

Pronotum black. Anterior collar and sides green. Hind border of pronotum with wavy upper rim. Middle lobe expressed as a moderately developed, triangular plate. Inferior rim developed into a broad lower plate, with more or less strongly upturned margins. The two laminae and the carinal fork confluent to form a single post-pronotal triangle, sometimes with a small depression at the level of the carina. Synthorax green or blue, with narrow antehumeral bands. Legs: External side entirely black, flexor side greenish.

Wings: Pt in forewing a parallelogram with most of the membrane black and only the apical corner pale coloured. Pt in hind wing of same shape as in forewing, yellow with dark reticulum.

Abdomen: sides of S₁-2 blue, dorsum black, contracted on top of S₂. Sides of S₃-7 yellow, dorsum black. S₈ entirely blue; sides of S₉-10 blue, dorsum black. Anal appendages: app. inf. longer than app. sup.; app. sup. rounded in lateral view. Seen posteriorly, they are U-shaped, with inner rim longer than outer rim, somewhat spatulate, black. App. inf. with green base and black apex, forcipate, simple. Accessory genitalia as for genus.

Female
Again, a homochrome and a heterochrome form are found, the latter going through a continuous colour change with age.

Homochrome form: coloured like the male.

Heterochrome form: clear parts of head, pronotum, synthorax, abdominal segments 1–2, and legs light orange. Postocular spots confluent with each other and with the rear of the head. A central black patch on the pronotum and a carinal black band on the synthorax. Later, this colour changes to light brown, and further to chocolate brown or to dark olive green. In old specimens, the true postocular spots turn blue

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as in the homochrome form, while the posterior area of the head remains ochraceous or dark orange. The legs may develop dark brown, almost black stripes on femora and tibiae. The upper rim of the hind ridge of the pronotum (all forms) converges medially into a point. The hind ridge of the pronotum is underlain by a narrow, duplicature on its lower rim. The laminae and carinal fork combine to form a large triangle owing to supression of the medial rims of the laminal triangles. Pt as in hind wing of male. Vulvar spine strongly developed, long and produced, projecting over S9.

Dimensions as for I. elegans ebneri.

Distribution: This species has a very wide range, covering the whole of Africa (except the Sahara), Iraq, Iran, India and even Japan. It is common in the deltaic area of Egypt, and in Sinai, and reaches the Negev. It is presumably perennial in localities where the climate permits.

Israel & Sinai (Locality records): Ga’ash (8), Rosh Ha’Ayin (8) (two isolated, very northern records of the species, the only ones within the domain of I. elegans ebneri), ‘En Gedi (13), Jericho (13), Quseima Oasis (17), ‘En Avedat (17), HaMakhtesh HaGadol (17), El ‘Arish (20), ‘Ein el Furtaga (22), Wadi Tayiba (23), Sarabit al Khadim (23), Et Tur (23), Feiran Oasis (23).

Genus COENAGRION Kirby, 1890

Cat. Odonata, p. 148

Type Species: Libellula puella Linnaeus, 1758.

Damselflies of small to moderate size, colours non-metallic. Male always with azure blue as ground colour, marked with black. Females with green or blue as ground colours. Wings hyaline. Pt similar in both pairs of wings, slightly longer than wide.

8–11 on forewing, d acutely pointed distally, arc situated at an2. Ab present, arising well proximal to Ac, which is situated halfway between an1 and an2, or nearer to an1.

Head narrow, no frontal ridge.

Postocular spots mostly well developed. Posterior lobe of pronotum variously modified. Legs not flattened. Anal appendages variable, occasionally of complex structure. Female without vulvar spine. Accessory genitalia: lam. ant. deeply cleft; ham. ant. as for family. Ligula with apical segment curved back over basal segment. Flanges present.

Distribution: Europe, N. America, Africa, most of Asia.

Key to the Species of Coenagrin
(Figs. 13, 56, 116–141)

1. Male: app. sup. as long as or longer than S10, simple (not differentiated into an internal and external branch), forciplate.

Female: a bulb-like, spiny swelling flanks the lam. mes. Coenagrion lindeni (Selys)
Coenagrionidae: Coenagrion

Figs. 116–118: Coenagrion lindeni Selys, 1840; abdomen
Fig. 116. dwarf male (Bet She'an);
117. normal male (Birkat Ram, Golan);
118. female (Birkat Ram, Golan)
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- Male: app. sup. shorter than S10, and differentiated into an internal and external branch. Only the external branch is occasionally forcipate.
  Female: no bulb-like swelling flanks the lam. mes.
  
2. Male: app. sup. and app. inf. not markedly differing in length, although the former are longer than the latter.
  Female: lam. mes. very broad, almost quadrangular, deeply hollowed-out.
  Coenagrion scitulum (Rambur)

- Male: app. sup. much shorter than app. inf.
  Female: lam. mes. a narrow triangle, not markedly excavated

Figs. 119–124: Coenagrion spp., male terminalia, dorsal and lateral views
119–120. C. lindenii zereyi (Schmidt, 1938);
121–122. C. scitulum (Rambur, 1842);
123–124. C. puella syriaca (Morton, 1924)
Coenagrionidae: Coenagrion

3. Male: tips of hook on apex of left and right app. sup. almost touching each other. Abdominal markings on S₃-₆ with long central peak.
Female: middle lobe of hind rim of pronotum notched.

Coenagrion ornatum (Selys & Hagen)
- Male: tips of hook on apex of app. sup. widely separated. Abdominal black markings on S₃-₆ with two lateral, but no central peaks.
Female: middle lobe of hind rim of pronotum rounded.

Coenagrion puella syriaca (Morton)

Figs. 125–126: Coenagrion lindeni zernyi (Schmidt, 1938); female
125. pronotum; 126. lamina mesostigma
Figs. 127–130: *Coenagrion puella syriaca* (Morton, 1924): abdominal markings
127. male; 128–129. variation on S1–S3, male; 130. female
Figs. 131–132: Coenagrion scitulum (Rambur, 1842); abdomen
131. male; 132. female
Figs. 133–135: Coenagrion spp., pronotum and lamina mesostigmalis
133. C. puella syriaca (Morton, 1924); female;
134. C. scitulum (Rambur, 1842); male;
135. C. scitulum, female
Figs. 136–138: *Coenagrion ornatum* (Selys & Hagen, 1850)

136. male abdomen; 137. female abdomen;
138. female, pronotum and lamina mesostigmalis
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Figs. 139–141: Coenagrion ornatum (Selys & Hagen, 1850); male; terminalia in posterior, dorsal, and lateral views
(A) blunt sclerotized tubercle on inner surface of app. sup.;
(B) ridge on downwardly directed tooth of app. sup.

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**Coenagrion lindenii** (Selys, 1840)
Figs. 116–118


Two possible subspecies are regional. The males may be separated as follows:

   - Black markings on S2 confluent with end-ring of the segment, and black spear-shaped spots on S3–7 confluent with end-rings of each segment. S4 dorsally blue with extensive black markings, or entirely black. **Coenagrion lindenii lindenii** (Selys)
   - Size small: abdomen 19–23.5 mm. Black stripe on meso-metathoracic suture only present in upper part. No black on S2. Black spot on S3 isolated from end-ring, and spear-shaped spots on S3–7 isolated from end-rings. S3 dorsally blue. **Coenagrion lindenii zernyi** (Schmidt)

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**Coenagrion lindenii zernyi** (Schmidt)

*Agrion lindenii* Selys, 1840: 167.

Type Locality: “Belgium”.

**Male**

Mouth parts, genae, labrum (except black virgule and base-line), postclypeus and frons blue. Anteclypeus black. Dorsum of head blue, with or without small blue spots.
Coenagrionidae: Coenagrion

around ocelli, and elongate blue postocular spots, sometimes reduced to narrow lines, sometimes confluent across occiput, all in all rather variable.

Pronotum black, with blue spots on middle lobes, on sides, on lateral lobes of hind rim. Middle lobe broad, slightly produced. Laminae triangular. Carinal fork typical. Humeral black stripe narrower or at most as wide as blue antehumeral bands. Sides of synthorax blue, with fine black stripe on visible part of meso-metathoracic suture and on Su2. Legs yellowish or bluish, with wide black stripe on back side of femora, and a narrow stripe on the tibiae.

Wings: Pt small (shorter than one adjacent cell), its distal side more oblique than its proximal side, yellow to light brown.

Abdomen blue, with black spear-shaped markings, confluent with end-rings of respective segments. Dorsum of S5 black, its sides blue; S6 entirely blue; S10 blue with black end-ring and a transverse black bar. Appendages: app. inf. less than half the length of app. sup., both pairs forcipate. Superiors long, longer than S10, simple, somewhat broadened at about half their length.

Female

Head as in male, but ground colour green or ochraceous. Pronotum usually with more extensive clear markings than in male. Hind margin of pronotum wavy, with middle lobe somewhat depressed. Laminae broad, almost rectangular, with adjacent spiny hemispherical knob on pre-episternum. Antehumerals as wide as or wider than humerals. Sides of synthorax with black sutures as in the male on green, blue-green or blue ground colour. Dorsum of abdominal segments with broad sword-shaped markings on blue or brown ground colour. Dorsum of S9-10 blue, brown or darkened. Ovipositor rather robustly built; v3 with a marginal row of spines. Wings as in male.

Measurements (mm): Male. Total length 30-36; abdomen 21-29. Female. Total length 30-36; abdomen 21-29.

Distribution: Europe, Anatolia, most of Syria.

The foregoing description applies to typical populations. I have included the nominal subspecies on evidence of its presence in Syria (Schneider, 1981a), and because of the occurrence at Birkat Ram (Golan Heights) of a peculiar form, which, although differing in some respects from topotypical material, stands closer to it than to C. lindeni lindeni (see below).

Coenagrion lindeni zernyi (Schmidt, 1938)

Figs. 116, 119-120, 125-126

Agrion lindeni, Morton, 1924:33.

Agrion lindeni zernyi Schmidt, 1938:143.

Type Locality: Hadera ("Khudeira"), Israel.
Odonata of the Levant

Male
Differs from the nominal subspecies by its smaller size (25–30 mm total length; 19–24 mm abdomen), by the reduced black on the lateral synthoracic sutures (no black on Su₂), by the abdominal black markings on S₁₋₅, not connected to the end-rings of the segments, and by S₁₀ which are entirely blue. In some specimens, however, the antehumerals are narrower than in nominotypical specimens, and narrower than the humerals.

Female
Not described by Schmidt (1938). A single specimen examined by me from ‘En Te’o differs from nominal examples by its size (total length 29 mm; abdomen 23 mm), by the antehumerals which are much narrower than the humerals, reduced black on the lateral sutures of the synthorax (a black stripe on the upper section of Su₂ only), and the dorsum of the abdomen, which is covered by broad black markings, including S₆ (dark brown) and most of S₁₀ (brown). The specimen is homochromic.

Distribution: Limited to the upper reacher of the Jordan River and the coastal rivers of Israel, where it flies between March and October.

Israel (Locality records): ‘En Te’o (1), Qiryat Shemona (1), Rosh Pinna (1), Lake Hula (1), Bet She’an (7), Deganya (7), Umm Junni (7), Bitanya (7), Bet Yerah (7), Hadera (8).

Status of the Golan Population of Birkat Ram (Figs. 117–118)
There is considerable variation in the extent of the black coloration on the abdomen, some specimens being close to zernyi in having the markings on S₂, S₁, and S₄ only narrowly or not at all connected with the end-rings of these respective segments. There is also variation in the extent of the black markings on the lateral thoracic sutures, but the antehumerals are wider than the humerals, and the specimens are robustly built, all well over 32 mm in length. The dorsum of S₆ is at least partly marked with black, but S₁₀ is always blue. The females in this population were all heterochromic, with very narrow humeral stripes, narrow black abdominal markings, and the dorsum of S₁₀ unmarked.

This population takes an intermediate position between the two subspecies. On evidence of size, the colours of the synthorax in the male, and the fact that S₅ is rarely entirely blue, I feel inclined to place it closer to the nominal subspecies than to ssp. zernyi, thus linking it up with typical populations that occur further north in Syria (Schneider, 1981a).

C. lindenii zernyi is a possible endemic of the Jordan Valley, although from the habitus of the Golan population, it appears that there is still genetical interchange with the nominal subspecies.
Coenagrioidae: Coenagrin

Coenagrin puella syriaca (Morton, 1924)
Figs. 123–124, 127–130, 133

Agrion puella syriaca Morton, 1924:32.
Agrion puella — Gadeau de Kerville, 1926:78.
Agrion ponticum Bartenev, 1929:64.
Agrion pulchellum — Gadeau de Kerville, 1926:78.

Type Locality: Zikhron Ya’aqov and Lake Hula, Israel.

Male
Abdomen blue with black markings. S_2 with U-shaped spot, sometimes stalked and connected to end-ring of segment. Subsequent segments with basal black dots, from which two lateral peaks project anteriad. Appendages: app. sup. short, composed of two branches. The upper, inner lobe is short, black, and inwardly pointed. The lower, longer branch sends a strong hook backwards and between the app. inf. (visible in posterior view only). App. inf. as long as S_10 and much longer than superiors. Their inferior internal angle short and rounded; upper external part produced into a long forceps. Accessory genitalia: lamina deeply but narrowly cleft; ham. ant. with long, pointed inner anterior corner. Vesica spermalis broad; filling area rounded posteriorly. Ligula with rather robust end segment and long curled flanges.

Female
A green and a blue form occur. Head, pronotum and synthorax with black markings as in male, but antehumeral stripes wider. Hind margin of pronotum sinuous, with centre depressed and sides uplifted. A rounded middle lobe is always defined. Laminae triangular, flat. Carinal fork very long and narrow. Abdomen with broad black markings on a green or blue background. Legs: femora less heavily marked with black than in male. Wings as in male.


Distribution: Israel, Syria, the Lebanon, Iran. In Anatolia, forms transitional to the nominal subspecies are found. The latter inhabits almost the whole of Europe. The intermediates seem to occur primarily in altitudinal biotopes, such as the Taurus
Mountains. In Israel, this is a spring species, limited to the upper Jordan Valley and coastal area.

Israel (Locality records): Hula (1), Gonén (1), Gadot (1), Naḥal 'Ammud (2), Zikhron Ya'qov (3), Hadera (8), Aqua Bella (11).

**Coenagrion scitulum** (Rambur, 1842)

Figs. 56, 121–122, 131–132, 134–135


*Coenagrion scitulum* — Dumont, 1977b: 143.

Type Locality: Environs of Paris, France.

**Male**


Pronotum black. Anterior collar, part of sides, and part of hind rim blue. Posterior margin medially produced. Laminae triangular, broad, almost quadrangular, deeply excavated, their floor ribbed. Carinal fork small and shallow. Dorsum of synthorax heavily marked with black. Blue antehumerals always present, narrower than humeral black stripes. Lateral sutures also marked with black. Legs greenish-yellow, striped with black.

Wings: Pt elongate, yellow.

Abdomen blue, covered with black dots as in Fig. 131. Appendages: app. sup. somewhat longer than app. inf., of composite structure. Base bulbously swollen, with external hook-shaped projection. Inferiors much shorter; consisting of an oblique plate, with an upper and outer hook. Accessory genitalia as in *C. puella syriaca*.

**Female**

A blue and a green form occur. Head, pronotum, synthorax as in male, but antehumerals narrower and abdomen more copiously marked with black. Hind ridge of pronotum with middle lobe well expressed, produced backwards, sides of margin adjacent to it infolded. Lamina broad, quadrangular, deeply hollowed-out. Carinal fork very shallow, rather short.


Distribution: Southern and Western Europe, and North Africa except Libya and Egypt. Eastwards extending to Iran. A late spring species, mostly found in June. Israel (Locality records): Hula (1), Wadi 'Ayun (1), Newè Ativ (18).
Coenagriionidae: Coenagriion

Coenagriion ornatum (Selys & Hagen, 1850)
Figs. 136–141


Type Locality: Hanover, W. Germany.

Male
Mouth parts yellow. A black stripe at the base of the labrum and at the base of the frons. Dorsum of head black. Postocular spots triangular, almost confluent across occiput, clear blue. Rear of head black, but a blue fringe on the back of the compound eyes.
Pronotum black, with anterior collar, two dots on median lobes, and fringe of hind margin blue. Synthorax: carina with broad black band. Black antehumeral about as wide as black humerals. Sides of synthorax blue, with black stripes on upper (visible) sector of meso-metathoracic suture and on S2. Legs blue, with posterior black stripe.
Wings: Pt black.
Abdomen blue. On S2, a black marking in the form of a trident; on S8–6, a black dot at the top of each segment, sending out a robust median peak anteriad. S8 blue with two minute black dots. S9, 10 largely black. Accessory genitalia as for genus. Appendages: app. sup. much shorter than app. inf., with a dorsal lobe that is apically hooked. Hooks of left and right appendage very close to one another. Lower lobe somewhat longer, rounded. App. inf. constricted at about half their length, ending in an inwardly curved hook.

Female
A blue and a green form occur. Built more robustly than the male, and with abdomen covered by extensive black markings over its whole length, contracting at the base of each segment only. Sides of abdomen blue, green, or yellowish-blue-green. Pronotum: hind rim with large lateral lobes, prominent and broadly rounded. Middle lobe much smaller, medially notched. The whole rim with a pale blue-green, almost white fringe. Adjacent lam. mes. narrowly triangular, flat.


Distribution: From northern Iraq, across western Iran and Anatolia to Central Europe. Preferably flies over Carex marshes that have slowly running water. A spring species usually found in May and June. No records from the Jordan Valley are available, and it may not cross the Nehring line, but there is one record from marshes near Damascus, May 1908 (Gadeau de Kerville, 1926), that appears realistic.
Genus ENALLAGMA Charpentier, 1840
 Libellulinae eur., p. 21

Type Species: Agrion cyathigerum Charpentier, 1840.
Small damselflies, with large postocular spots. Colours non-metallic. Males with terminalia usually short, with little or no differentiation. Accessory genitalia: lamina deeply cleft; hamuli as in Coenagrion. Ligula with short flanges and no styles. Females without styles or epaulettes on the pronotum, but with a vulvar spine on the ventrum of S9. Wings hyaline, arc close to an2. Ab branches from Ac; Ac between an1 and an2.
Distribution: North America, Europe, Asia and Africa.
One species is regional.

Enallagma cyathigerum (Charpentier, 1840)
Figs. 142-149

Agrion cyathigerum Charpentier, 1840: 163.
Enallagma cyathigerum — Selys, 1876: 496; Kirby, 1890: 145; Selys, 1887: 47; Gadeau de Kerville, 1926: 78; Dumont, 1977b: 141.

Type Locality: “Silesia”.

Male
Mouth parts yellow. Labrum blue. Face blue but clypeus partly black. Dorsum of head black with blue postocular spots, round, triangular or cuneiform.
Pronotum black with blue fringes. Synthorax: a broad black carinal band, and black humeral stripes, widening anteriorly, but narrower than blue antehumeral bands.
Sides of synthorax blue. Upper part of S2 black. Legs: flexor side blue-green, extensor side black.
Wings: venation as for genus. Pt oblique, rather large, dark brown.
Abdomen azure blue, with black markings. Marking on S2 typically omega-or cup-shaped (whence the name of the species). S8-9 blue, S10 largely black. Accessory genitalia as for genus. Appendages: superiors much shorter than inferiors, with inner (deeper) lobe and outer (upper) lobe. Inferiors simple, triangular in side view, with apices pointed and upturned.

Female
A homochrome form co-exists with a heterochrome form with ground colour clear brown. Postocular spots and antehumerals usually wider than in the male. Pronotum with broad clear fringes, and two large blue or brown oval spots on the middle lobes.
Hind margin an oblique, simply rounded plate. Abdomen broadly marked with black, this colour contracting at the base of each segment, especially on S8, but not on S10.
Ovipositor rather small, but a robust vulvar spine present on the ventrum of S9.


98
Males with maxillary palpi: lamina terminalis short, no stylets. Tarsal claws equal, simple, without spine on the outer side. Romance unguis between an	extsubscript{1} and an	extsubscript{2}.

Figs. 142–149: Enallagma cyathigerum (Charpentier, 1840)
142. male, abdomen;
143–145. variation on S	extsubscript{1}, male;
146. female, abdomen;
147–148. male, terminalia in dorsal and lateral views;
149. female, ovipositor
Odonata of the Levant

Distribution: A circumboreal species, widely distributed in Europe and Western Asia. Related species occur in North Africa and Central Asia. In the Caucasus, a possible subspecies (E. c. rotundatum Barteneff) occurs, but the species is typical on most of the Anatolian plateau (Dumont, 1977b). There is only one record from the Levant: marshes near Damascus in May 1908 (Gadeau de Kerville, 1926). The species might occur on the Golan Heights and Mount Hermon during summer.

Genus PSEUDAGRION Selys, 1876

Bull Acad. r. Belg., Ser. 2, 42: 490

Type Species: Agrion caffrum Burmeister, 1839.
Medium-sized, rather firmly built damselflies, variously coloured, occasionally pruinose, non-metallic. Frons without transverse ridge. Postocular spots present, of variable size, but in some females head almost unmarked with black. Female pronotum mostly with a pair of stylets, sometimes reduced to very small tubercles. Lam. mes. and carinal fork variously modified. Sometimes a lateral epaulette present. No vulvar spine. S 10 in males not raised into a terminal tubercle. App. sup. about as long as S 10 , mostly differentiated into an inner and outer branch, the latter invariably ending in an inwardly bent hook. App. inf. usually shorter, spatulate or of complex structure. Wings hyaline. Pt an elongate quadrilateral, similar in shape, size and colour in all wings. arc arises at an 2 . Ac arises about halfway between an 1 and an 2 or closer to an 2 . d with lower distal angle acute. Ligula: L 2 with a single pair of flanges, occasionally very short, never filiform.
Distribution: Afrotropical and Oriental regions.

Note
The regional representatives were reviewed in Dumont (1973). It was shown later, however, that P. acaciae Förster should be omitted and replaced by P. niloticum Dumont, an endemic of north east Africa (Dumont, 1978a). The latter species will probably not appear in Sinai and is not included in the present fauna.

Key to the Species of Pseudagrion
(Figs. 150–189)

1. Males
   - Females
2. App. sup. simple, no inner branch. Dorsum of head, pronotum and synthorax bright red.
   Pseudagrion sublacteum mortoni (Ris & Schmidt)
   - App. sup. with inner and outer branch, separated by a ridge. Head and thorax variously coloured, occasionally pruinose, but never red
3. Inner branch of app. sup. protruding well beyond the outer branch, finger-shaped. Dark insects, heavily pruinose, this pruinosity forming blue secondary antehumerals in mature specimens. Postocular spots small, rounded, green.
   Pseudagrion syriacum (Selys)

100
Western Asia.

In males, a possible coenagrion species exists in most of the Levant; in females this species might be Pseudagrion. Occasionally a small tubercle may be present. In males, the abdomen is bright red. In females, the abdomen is black. Female abdomens are usually less tubercled. Often, the male genitalia are not fully developed at emergence. The illustration shows various patterns of abdominal markings, size and color variations. The descriptions of the species will be shown later.

Coenagrionidae: Pseudagrion

Figs. 150–155: Pseudagrion spp., abdominal markings
150. P. torridum hulae Dumont, 1973; female;
151. P. torridum hulae, male;
152. P. sublacteum mortoni (Ris & Schmidt, 1936); male;
153. P. sublacteum mortoni, female;
154. P. syracum (Selys, 1887); female;
155. P. nubicum Selys, 1876; male
Inner branch of app. sup. about as long as or shorter than outer branch. Green-and-black or blue-and-black species with reduced pruinosity. Postocular spots green or blue, fairly large.

4. Inner and outer branches of app. sup. of about equal length. Inner margin of inner branch with a series of short teeth and a single, somewhat more strongly built sub-basal spine.

**Pseudagrion nubicum** Selys

Inner branch of app. sup. much shorter than outer branch, but strongly developed, with two strong thorn-shaped outgrowths, pointing medio-ventrad.

5. Distal rim of inner branch of app. sup. smoothly rounded. Dorsum of head marked with black in such a way that postocular spot are defined. Humeral and carinal black stripes relatively wide.

**Pseudagrion torridum torridum** Selys

Distal rim of inner branch of app. sup. concave. Dorsum of head with black markings so reduced that the postocular spots are not separated from the other clear areas of the dorsum of the head. Humeral and carinal black stripes narrow.

**Pseudagrion torridum hulae** Dumont

6. Styles reduced to a couple of very small tubercles on top of the hind margin of the pronotum.

**Pseudagrion sublacteum mortoni** (Ris & Schmidt)

- Styles present as projections of the hind margin of the pronotum towards the median lobes of the pronotum.

7. Styles long, finger-shaped, reaching the median lobe of the pronotum. No epaulette.

8. Styles short, apically pointed, not or slightly projecting beyond the hind lobe of the pronotum. A black lateral epaulette present.

**Pseudagrion syriacum** (Selys)
Coenagrionidae: Pseudagrion

Figs. 159–162: *Pseudagrion* spp., synthorax, dorsal and lateral views
159–160. *P. torridum hulae* Dumont, 1973; male,
161–162. *P. t. torridum* Selys, 1876; male (Sinai)

Figs. 163–164: *Pseudagrion syriacum* (Selys, 1887)
163. female, synthorax, dorsal view;
164. male, head, thorax and base of abdomen
   (striped: clear areas)
8. Stylets extending more than halfway across middle lobe of pronotum. Lam. mes. triangular, somewhat hollowed-out, its medial margin almost straight, not sinuously produced along carinal fork. Synthorax dark, antehumeral green stripe about half as wide as mesepisternum.

**Pseudagrion nubicum** Selys

- Stylets shorter than half the length of middle lobe of pronotum. Lam. mes. an irregular, hollowed-out, wide, ribbed triangle with medial margins sinuously produced against the greatly compressed carinal fork. Synthorax with more reduced black markings; width of antehumeral stripe exceeding half that of the mesepisternum


**Pseudagrion torridum torridum** Selys

- Carinal and humeral stripes narrow. Postocular spots not circumscribed by black. Lake Hula.

**Pseudagrion torridum hulae** Dumont
Figs. 170–179: *Pseudagrion* spp., male terminalia, dorsal and lateral views

Figs. 180–183: *Pseudagrion* spp., male terminalia, posterior view
180. *P. sublacteum mortoni* (Ris & Schmidt, 1936);
181. *P. nubicum* Selys, 1876;
182. *P. syriacum* (Selys, 1887);
183. *P. torridum torridum* Selys, 1876
Coenagrionidae: Pseudagrion

Figs. 184–186: Pseudagrion spp. females, pronotum and lamina mesostigmatis
184. P. sublacteum mortoni (Ris & Schmidt, 1936);
185. P. syriacum (Selys, 1887);
186. P. torridum torridum Selys, 1876
(sts=stylets; ep=epaulette)
Pseudagrion sublacteum mortoni (Ris & Schmidt, 1936)
Figs. 152–153, 156–158, 172–173, 180, 184, 188

Agrion sublacteum Karsh, 1893:40.
Pseudagrion acaiae Förster, 1906a:56. Morton, 1924:34.
Pseudagrion Morton, 1929:63.
Pseudagrion mortoni Ris & Schmidt, 1936:55. Schmidt, 1938:146.

Type Locality: Ghor es Safieh, Jordan.

Male
Labium, labrum dark orange; most of frons and dorsum of head bright red, including large confluent postocular spots. Synthorax red on dorsum, changing to green on sides. Carinal and humeral black stripes rather narrow. Ground colour of abdomen blue-green on $S_{1-7}$, marked with black as in Fig. 152, $S_{8-9}$ blue, unmarked. $S_{10}$ blue with black spot. App. sup. rather robustly built, compactly built, hooked apically, without an inner branch. App. inf. much shorter, roughly triangular in lateral views. In posterior view, a differentiation into an outer and inner half is observed. The outer
part consists of two tubercles, separated by a groove, the lower one the larger; the inner part forms a less strongly developed ridge. Accessory genitalia: lamina with a deep V-shaped cleft. Hamuli as for genus. Ligula: L₂ with short broad flanges. Legs yellow, femora brown.

Wings: Pt yellow, elongate, distal margin more acute than proximal one.

**Female**

Face pale brown, with an orange tinge on the labrum. Black markings on head sparse. Thorax and abdomen largely pale brown. A greenish sheen visible on the sides of the synthorax in live specimens. Black stripes and dots on synthorax as in Fig. 157. Hind margin of pronotum almost straight, steeply raised. Stylets reduced to a pair of very small tubercles. Lam. mes. triangular, well raised above synthorax, with wavy posterior margin. Carinal fork wide, its ridges widened into two ellipsoidal plates. Abdomen sparsely marked with black. Legs yellow, variously striped with brown on femora.

**Measurements (mm): Male.** Total length 32–38; abdomen 26–31. **Female.** Total length 33–39; abdomen 27–31.

**Distribution:** The nominal subspecies is widespread in Africa south of the Sahara, while ssp. mortoni is restricted to the valleys of the Jordan River and its affluents in Israel, Jordan, and Syria, and to the short coastal rivers of Israel. However, recently Waterston (1980) has reported this subspecies from Saudi Arabia, a very remarkable range extension.

Israel (Locality records): Hula (1), Haifa (3), Kefar Ruppin (7), Yarmouk River (7), 'Ubeidiya (7), Nahal Tanninim (8), Wadi 'Auja (13).

Also recorded from Naher es Zerka, and from several localities in Jordan and Syria (Schneider, 1981a).

**Pseudagrion syriacum** (Selys, 1887)

Figs. 154, 163–164, 169–171, 182, 185, 187

**Pseudagrion praetextatum** var. (?) syriacum Selys, 1887: 48.

**Pseudagrion syriacum** — Kirby, 1890: 153; Dumont, 1973: 179; Schneider, 1981a: 137.

**Pseudagrion praetextatum** Selys, 1876b: 494. Morton, 1924: 34; Gadeau de Kerville, 1926: 78.

**Pseudagrion kersteni** (Gerstaecker, 1869). St. Quentin, 1965: 538.

**Pseudagrion kersteni** (pars) — Ris & Schmidt, 1936: 18; Pinhey, 1964: 25.

**Type Locality**: Beirut, Lebanon.

**Male**

Pale brown when freshly emerged, but quickly turning dark grey, almost black. Face green, but dorsum of head black, with the exception of a couple of minute green postocular spots.

Pronotum black. Synthorax mainly black, with irregular green bands. Legs black. Abdomen black dorsally, with narrow green end-rings of segments, sides greenish. In
Odonata of the Levant

mature specimens, a blue pruinosity covers the face, dorsum of head, pronotum, sides and sternites of synthorax, the base or the legs and wings, and the sides of the abdomen. On the dorsum of the synthorax, this pruinosity produces two broad secondary antehumeral stripes. Appendages: superiors branched, the outer branch shorter and hooked inwardly at the apex. The outer branch extends as a finger-shaped projection well beyond the inner branch. App. inf. about half the length of app. sup., with broad base, from which arise two spoon-shaped leaflets. Accessory genitalia: lamina deeply but broadly cleft; hamuli as for genus.

Female

A much paler insect than the male, with reduced pruinosity except at the base of the wings. Face and dorsum of head brownish, with a dark stripe on the labrum, a fine black stripe on the frons, and some black spots near the ocelli and the antennal sockets. In old specimens, these individual black patches may merge into a single dorsal patch. Pronotum with hind margin depressed, smoothly rounded in the middle. Stylets short, not longer than the base of the hind lobe. Epaulettes present. Lam. mes. a broad flat, hollowed-out triangle. In the carinal fork appear two additional small triangles, adjacent to the lamina. Synthorax brown, with a black line on both sides of the carina. Carina itself brown. Synthorax brown, with a black line on both sides of the carina. Humeral black reduced to an anterior and a posterior spot. Abdomen brown, with broad black markings as in Fig. 154. Legs entirely brown. Wings as in male.


Distribution: Endemic to the Levant, and distributed from northern Syria (Lake Homs: Gadeau de Kerville, 1926; Orontes north of Homs: Schneider, 1981a) to the Dead Sea, where it is still common in the wadis of the eastern slope of the basin. Israel (Locality records): Jordan River at Benot Ya’aqov bridge (1), ‘Ein Jalabina (1), Kefar Ruppin (7), Buteicha Swamps (7), near Tiberias (7), Wadi Fari’a (12), Aqua Bella (11), ‘Ein Duyuk (13), Jericho (13), Wasit (18).

Pseudagrion torridum torridum Selys, 1876

Figs. 161–162, 165, 176–177, 183, 186


Type Locality: Dakar, Senegal.

Male

Mouth parts, face and dorsum of head green, marked with black as in Fig. 165. Postclypeus with trilobed black spot; frons with black band. Postocular spots large, confluent.
Coenagrionidae: Pseudagrion

Synthorax green with broad carinal and humeral bands. Sides of synthorax changing to greenish-blue.

Wings: Pt light yellow.

Abdomen: S₁₋₉ green, marked with black, sandglass-shaped spot. Appendages: app. sup. long, forcipute, with strong inner branch, separated from outer one by a deep ridge. Inner branch massive, sending two pointed projections ventrad, a distal stronger one, and a basal smaller one. App. inf. triangular in lateral view, shorter than app. sup. Legs light yellow, femora with black stripe. Accessory genitalia: lamina arched, converging into a point; hamuli as for genus. Ligula: L₁ rather elongate, with flanges extremely short.

Female

Face and head almost entirely brown, sparsely marked with black on anteclypeus, frons and ocellar area, and with a thin black bar between the compound eyes and the posterior ocelli. Pronotum orange-brown, hind lobe erect. Styllets well developed. Lam. mes. of complicated shape and relief, produced against the compressed carinal fork. Abdomen green with heavy black markings, contracted on S₆₋₉; S₁₀ blue.


Distribution: Most of Africa south of the Sahara, including the Nile Valley.

Sinai (Locality records): In Sinai, the species has been collected in the south-west: Abu Rudeis (23) and at Wadi Tayiba (22), Wadi Gharandal (22), Wadi Hibran (22) and Wadi Feiran (22). Capture data range from April to August.

Pseudagrion torridum hulae Dumont, 1973


Type Locality: Lake Hula, Israel.

The name applies to the northernmost population known; this subspecies is strikingly pale, paler than typical Afrotropical damselflies from Sinai.

Male

Black markings on head reduced (Fig. 166). Black stripes on synthorax narrow. Abdominal black markings, however, typical, but spot on S₁₀ often fragmented. App. sup. with the distal edge of the inner branch more deeply hollowed-out than in the nominal subspecies.

Female

Black markings on the head reduced to very small spots (Fig. 167). Abdominal black markings more contracted than in the nominal subspecies.


Distribution: Known only from Lake Hula (1) where it was collected in June.
Odonata of the Levant

Pseudagrion nubicum Selys, 1876
Figs. 155, 168, 174–175, 181


Type Locality: “Nubia”.

Male
Head greenish, frons partly black, dorsum of head black with blue spots near the ocelli, and rather large postocular spots, often confluent inter se.
Synthorax marked with black as in P. torridum. Antehumeral stripes green. Legs brown.
Wings with Pt dark brown.
Abdomen blue, heavily marked with black. S₃ with stalked U-shaped spot; S₅, S₇ black; S₈, S₉ blue; S₁₀ black on dorsum. Appendages: app. sup. with outer and inner branch, separated by a ridge. Outer branch ending in an inwardly bent hook. Inner branch blunt-ending, with a series of small marginal teeth and a stronger spine near its base. App. inf. only slightly shorter than app. sup. Accessory genitalia: lamina broadly arched. Ligula: L₂ with short, rounded flanges.

Female
Labrum green, postclypeus green with basal black; rest of face orange-brown. Vertex and occiput with less black than in male. Pronotum: hind lobe somewhat convex in the middle, with long stylets and no epaulette. Lam. mes. very broadly triangular, impressed into the synthorax, the edges slightly raised outwardly. Carinal fork narrow with a rounded plate projecting from lower rim of margin. Antehumerals wider than half the width of the mesepisternum but variable. In young specimens, the humeral stripe is sometimes almost completely absent. Heavy black markings on abdomen. S₁₀ blue, unmarked.

Distribution: Widespread in the Afrotropical region, and occurring in the Nile Valley as well. The species is included here because Andres (1928) cites it from Suez. It might therefore well occur in Sinai.

Genus ERYTHROMOMMA Charpentier, 1840
Libellulinae eur., p. 148

Type Species: Agrion najas Hansemann, 1823.
Small to medium-sized damselflies, with hyaline wings. Pt similar in all four wings; apical reticulation of the wings dense, in the posteriors more so than in the anteriors. Body colours blue (males) or green (females) and black, with eyes bright red in living
Coenagrionidae: Erythromma

males. Dorsum of head without postocular spots or, rarely, punctiform spots. S₁₀ in males not raised terminally. Female without vulvar spine. Legs robust, not flat-tended, acutely pointed distally. Ab arising well distal to Ac, closer to level of an₁ than of an₂.

Erythromma viridulum orientale Schmidt, 1960
Figs. 190-194

Agrion viridulum Charpentier, 1840: 149.
Erythromma viridulum — Selys, 1876a: 1304.

Type Locality: El Rhab on Orontes River, Syria.

Male

Eyes, mouth parts, face red, but postclypeus black. Dorsum of head black without postocular spots. Two rounded red spots located in front of lateral ocelli.

Pronotum black, sides blue. Synthorax black down to halfway the mesepisternum. Antehumeral narrowing distally, and narrower than humeral stripes. Lateral synthoracic sutures black on azure blue base colour. Legs yellow, femora black on posterior surface.

Wings hyaline. Pt elongate, brown.

Abdomen: S₁₀, S₁, top of S₁ blue laterally; S₃₋₇ black dorsally, greenish-yellow laterally; S₅ black on dorsum, blue on sides; S₉ totally black; S₁₀ blue with sandglass-shaped black spot. Appendages: app. sup. as long as S₁₀, apically bifid in a ventral plane, the upper branch hooked inwardly. The whole appendix widened before its base, then constricted again. Inferiors very short, yellow, vertically oriented, with upturned black hook. Accessory genitalia as in Coenagrion.

Fig. 190: Erythromma viridulum orientale Schmidt, 1960; male terminalia
dorsal and lateral views

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Fig. 191: *Erythromma viridulum orientale* Schmidt, 1960; male
a. abdominal markings; b. markings on head, synthorax and legs
(after Schneider, 1984)

**Female**
Head as in male, but clear parts yellow or green, not red. Pronotum black, sides yellow. Hind margin with upper ridge convex, upright, and lower margin angularly produced beyond it. Lam. mes. almost ellipsoidal, impressed into the synthorax, their bottom

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transversely ribbed. Pre-episternum curved along the external margin of the lamina. Carinal fork reduced to a central pit. Synthorax marked as in the male, but ground colour green, seldom blue. Abdomen blue or green, copiously marked with black.
Odonata of the Levant

Measurements: Two males from Lake Hula had a total length of 25.5 mm and 26 mm, abdomen 20 mm and 20.5 mm; specimens from Anatolia were in the range of 30–32 mm (total length), while the nominal subspecies in Central and Western Europe frequently exceeds 32 mm in total length.

Schmidt (1960) briefly characterized this subspecies as having wider antehumerals, and clear spots in front of the anterior ocelli. I find this a very relative and variable character and consider E. viridulum orientale a doubtful taxon, possibly a dwarf form, as is the case with Coenagrion lindeni zernyi.


Genus CERIAGRION Selys, 1876

* Bull. Acad. r. Belg., Ser. 2, 42:525

Type Species: *Agrion (Pyrhoshoma) cerino-rubellum* Brauer, 1865.

Damselflies of small to medium size. Colours non-metallic, red, orange or olivaceous, occasionally marked with black. Wings hyaline. Pt covering about one cell. Acutely pointed. Ab and Ac arising from the same point on the wing petiole or Ac arising from Ab distal to the point where Ab emerges from the wing margin. Head narrow; frons with a well-defined transverse ridge or crest. No postocular spots. Legs short. Anal appendages of males variously built. No vulvar spine in female. Accessory genitalia as for family.

Distribution: Palaeartic, Afrotropical and Oriental regions.

Key to the Species of Ceriagrion

(Figs. 195–203)

1. Wings: Ac arise from Ab, not from wing margin.
   Males: *S*19 raised into a semicircular tubercle, set with a crown of black spines. Dorsum of head and synthorax black; abdomen bright red.
   Female: head and thorax as in male, but abdomen red or red marked with bronze-black. Hind margin of pronotum an upright plate. Lam. mes. very small; carinal fork extremely wide with hind margins strongly raised in two upright, confluent triangular leaflets.
   Ceriagrion tenellum georgfreyi (Schmidt)
   – Wings: Ac and Ab with a common origin on the wing margin.
     Males: *S*19 with a flat terminal tubercle, split into two widely separated lateral bosses, each set with a tuft of black spines. Dorsum of head and synthorax olivaceous-brownish; abdomen bright orange.
     Female: head, thorax and abdomen uniformly olivaceous-brownish. Hind margin of pronotum a depressed, rounded plate. Lam. mes. triangular, simple. Carinal fork shallow, as wide as one lamina, without a hind ridge. Ceriagrion glabrum (Burmeister)
Coenagrionidae: Ceriagrion

Figs. 195–198: Ceriagrion spp., male terminalia, dorsal and lateral views
195–196. C. tenellum georgfreyi (Schmidt, 1953); 197–198. C. glabrum (Burmeister, 1839)

Ceriagrion tenellum georgfreyi (Schmidt, 1953)
Figs. 195–196, 199–201

Pyrrhosoma tenellum De Villers 1789:15. Selys, 1887:48; Morton, 1924:34.

Type Locality: Sariseki near Iskenderun, Turkey.

Male
Mouth parts yellow; labrum, clypeus, genae, antennae, frons reddish. Dorsum of head entirely black; two comma-shaped yellow markings in front of and beside the lateral ocelli. Pronotum black, its hind margin erect and somewhat concave in the middle. Synthorax black down to metathorax. Lam. mes. triangular, small. Carinal fork extremely wide and deep, its posterior margin forming a crest. Metathorax yellow, with St2 partly black, and a black patch on epst3 and epm3. Legs orange. Wings: Ac arises from Ab, about midway between an1 and an2. Pt light brownish. Abdomen uniformly red. S10 raised terminally into a tubercle, semicircular and hollowed-out in posterior view, fringed by a continuous crown of robust black spines. Appendages shorter than S10; app. inf. somewhat longer than app. sup. in side view.
Odonata of the Levant

upturned over the superiors, pointed, and with a slight subapical swelling. App. sup. rounded, with inferior teeth and apical tuft of golden hairs. The appendix strongly hollowed-out beyond the lower spine; an upper spine is barely discernable. Accessory genitalia as in Coenagrion.

Figs. 199–201: Ceriagrion tenellum georgfert (Schmidt, 1953)
199. female, hind ridge of pronotum (1) and lamina mesostigmatic (2) in dorsal view;
200. the same, lateral view;
201. male, pronotum and lamina mesostigmatic, dorsal view

Female
Head
Pronotum and tegmen triangular; other pronotum are red, only the pronotum being. Subspecies populus.
Measure length:
Distribution:

Ceriar

Agrion

Type

Male
Entirely darker
Pronotum
Only round
Wing
Abdomen
that is rather short
Acces
Coenagrionidae: Ceriagrion

Female
Head as in male, but a black dot on labrum, and postclypeus and part of frons black. Pronotum black, with yellow or reddish spots on sides. Hind lobe erect. Lamina small and triangular, but carinal fork wide, its hind margin formed by a conspicuous triangular, upright lobe on each side, confluent with the lamina but not with each other. These two upright lobes, in lateral view, higher than the hind rim of the pronotum. Synthorax as in male, but humeral suture may be wholly or partly marked by a yellow or orange line. Sides of synthorax, wings, legs as in male. Abdomen entirely red, or partly marked with black dorsally. The black colours may be limited to S₅-₇, but they may also cover the whole dorsum of the abdomen, in which case, the sides being yellow, no red colour is left at all. This last type, which is known in the nominal subspecies, has not yet been demonstrated to occur in Levantine or Anatolian populations.


Distribution: The nominal subspecies and a third geographical subspecies (C. tenellum nielsen) inhabit Europe and the Maghreb countries of North Africa; C. tenellum georgiayi is found in Anatolia, Syria, and almost certainly in the Lebanon and Jordan as well.

Israel (Locality records): Lake Hula (1), Jordan River near Hula (1), Binyamina (4), Bet She'an (7), Rosh Ha'ayin (8)

Ceriagrion glabrum (Burmeister, 1839)
Figs. 197–198, 202–203

Agrion glabrum Burmeister, 1839:821.
Ceriagrion glabrum —. Selys, 1876b:527; Andres, 1928:25; Longfield, 1932b:34.

Type Locality: Cape of Good Hope, S. Africa.

Male
Entirely devoid of black. Mouth parts and head uniformly yellow or orange, becoming darker in older specimens.

Pronotum, synthorax, legs all similarly coloured, the sutures slightly darker brown. Only the spines on the legs are black. Pronotum with hind margin a depressed, rounded plate. Lamina triangular; carinal fork shallow.

Wings: Ab and Ac rise from a single point on the petiole. Pt orange or brown. Abdomen entirely bright orange. Hind rim of S₁₀ raised but medially depressed, so that two lateral tubercles, each with a tuft of black spines, are formed. Appendages shorter than S₁₀, the inferiors longest, curved dorsal over superiors, pointed, with a rather strong subapical swelling. Superiors rounded, with a down-turned black spine. Accessory genitalia as in Coenagrion.
Female
As the male, but all colours more brownish, sometimes olivaceous, and some sutures on the vertex and the synthorax may darken with time to the extent of appearing almost black. Internal tip of lam. mes. black. Abdomen dark brownish-orange, the dorsum of the terminal segments sometimes very dark. Legs and wings as in male.


Distribution: Africa south of the Sahara. Specimens have been found near Cairo, and in Kharga Oasis (Andres, 1928). The possibility exists that the species occurs in oases in Sinai.
Suborder ANISOPTERA

Key to the Families of Anisoptera

1. Compound eyes completely and rather widely separated.  
   - Eyes meeting across dorsum of head, either in one point, or over a longer distance  
   2. d similar in all wings, its costal edge much longer than its proximal edge. Females with ovipositor. Males with oreillettes and with hind wings angulate at their base  
   - d dissimilar in forewings and hind wings, situated well distal to arc in forewing, at or adjacent to arc in hind wing. Females without ovipositor, usually with a pair of smallish vulvar valvules. Males without oreillettes, and with hind wings rounded at their base.

Libellulidae

3. Eyes meeting in a point only. Thorax and abdomen coloured yellow and black in both sexes. Females with long, straight, blunt ovipositor that extends well beyond the tip of the abdomen.
   - Eyes broadly contiguous. Coloration variable according to species and sex, usually a mosaic of brown, green or blue, yellow, but never yellow-and-black. Females with an ovipositor of zygopterous structure, not extending beyond tip of abdomen.

Aeschnidae

Family GOMPHIDAE

Medium-sized, rarely large dragonflies, coloured in various tinges of yellow, sometimes ochraceous or brown, and black, rarely pruinose. Head with eyes rather widely separated, and the vertex often with diagnostic modifications. Wings hyaline, sometimes slightly smoky at their base. Sectors of arc separated from their origin. Membranula very small, almost absent. Pterostigma elongate, medium-sized, sometimes dilated in the middle. d rather similar in fore wings and hind wings, but its longest axis vertical in fore wing, horizontal in hind wing. Hind wing of males excavated and angulate at the base, in females rounded. Antenodals always numerous (9–18), and primaries always readily visible. Male appendages variously structured, the inferiors always somewhat bifid or notched, frequently deeply cleft. Accessory genitalia genus-specific, often even species-specific. Females without ovipositor, with a pair of smallish vulvar valvules on S₆.

The oriental genus Anormogomphus, found in Iraq, differs, among other things, by the fact that the base of the hind wing is rounded in both sexes (Fig. 207). Anormogomphus kiritchenkoi Bartonef is not likely to occur in the Levant.
Odonata of the Levant

Key to the Genera of Gomphidae
(Figs. 2, 10, 29, 204–297)

1. Wings: both triangle (d) and hypertriangle (ht) traversed. Membranula well developed, dark coloured.
   - Wings: d and ht entire. Membranula reduced

   *Lindenia* Selys

   2

2. Males
   - Females

   3

3. S₈ and S₉ with foliate expansions. Superior appendages closely apposed, curved in a dorso-ventral plane. Inferior appendages at most half the length of the superiors.

   *Paragomphus* Cowley

   - S₈ and S₉ without foliate expansions. Superior appendages separated at their base, often divaricate. Inferior appendages more than half the length of the superiors

   4

   - Superior appendages divaricate, pointed. Inferior appendages notched, divaricate.

   *Onychogomphus* Selys

5. Sternite of S₈ without particular modifications around and distal to vulvar scales, at most transversely ribbed.

   *Gomphus* Leach

   - Sternite of S₈ with a well-circumscribed, rounded or squared membranaceous area, and/or with median crests

   6

6. S₈ with a semicircular or angular field behind the valvules, but without median crests. Hind wing: at least two sectors descend directly from the anal vein to the wing margin between its base and the distal angle of d.

   *Paragomphus* Cowley

   - S₈ with a more or less well-defined semicircular field between the valvules, and with median sclerotized crests. Hind wing: cells subjacent to anal vein, between its base and the distal edge of d, organized as a closed anal field of 2–3 cells or at least so different in shape from lower cells that no direct vertical sectors between the anal vein and the wing margin are formed.

   *Onychogomphus* Selys

Genus *LINDENIA* Selys, 1840

*Monogr. Libellul. Eur.*, p. 74

Type Species: *Aeshna tetraphylla* Vander Linden, 1825.

Large gomphids. Wings with d composed of 2–4 cells; an anal field of 3–5 cells in hind wing. Membranula present, large, dark brown. Pt long. Wings sometimes suffused with amber. Legs black with yellow stripes, robust. Synthorax partly pruinose. Abdominal segments 7 and 8 with lateral foliate expansions in both sexes. Males: app. sup. filiform; inferiors short, triangular. Female with vulvar scales short, forked. No particular modifications on sternite of S₈.


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Gomphidae: *Lindenia*

Figs. 204–208: Male gomphid wings
Odonata of the Levant

Lindenia tetraphylla (Vander Linden, 1825)
Figs. 204, 209–214

Aeshna tetraphylla Vander Linden, 1825: 32.
Vanderia tetraphylla — Kirby, 1890: 78.

Type Locality: Lake Averno near Naples, Italy.

Male
Mouth parts yellow; labrum, clypeus, frons greenish. In aged specimens, clypeus and frons darkened. Frons with a basal black stripe. Vertex black around ocelli and with strongly raised, bilobed brownish or olivaceous crest. Occiput and pronotum black.
Synthorax green-yellow, very heavily marked with black anteriorly. In young specimens, carina and an obliquely placed lunule yellow. In aged males, front of

Figs. 209–211: Lindenia tetraphylla (Vander Linden, 1825)
209. male terminalia, lateral view; 210. the same, ventral view;
211. female, vulvar valvules
Gomphidae: Lindenia

Synthorax entirely black. Sides greenish with broad black bands, covered by blue pruinosity. Legs black with yellow stripe on femora. Wings: costa yellow, rest of venation black. Pt long, brown with thick black margins. Membranula present on both pairs of wings, brown, with paler margins. d traversed, 3–5 celled. Some basal amber, especially in cubital space of hind wing, the latter deeply angulate at its base. Anal field well defined, 3–5 celled. In old specimens, the whole wing sometimes suffused with amber. Abdomen uniformly black in old specimens. In tenebras an oblong yellow median patch extends on the dorsum of S2–7. Sides of S1–2 and S7–10 brownish-yellow. Oreilettes with denticles. Foliate expansions brown, directed posteriorly. Appendages: superiors about twice as long as S10, straight. Inferiors shorter than S10, triangular. Accessory genitalia: lam. ant. shallowly excavated; ham. ant. pointed, with subapical spine; ham. post. complex (Fig. 213) larger. Vesica small, inconspicuous, hidden under ham. post.

Figs. 212–214: Lindenia tetraphylla (Vander Linden, 1825); male, accessory genitalia
212. ventral view; 213. hamulus 1; 214. a–b. hamulus 2

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Odonata of the Levant

Female
As male, but clearer, and abdomen not constricted. Dorsum of S₂ with median yellow streak; S₁ clear brown with black markings near ending; a conspicuous white spot on its flanks. S₃₋₋₁ black, with dark yellow markings. S₁₀ black with clear lateral spots. Foliate expansions brown. Styli dark and pointed, longer than S₁₀. Vulvar scales simple, short.

Distribution: A lake species, on the wing between May and July, found in Italy, Yugoslavia, Albania, Greece, the Caucasus(?), and Transcaucasian states of the U.S.S.R., the Caspian Basin, Iran, Afghanistan, Baluchistan, Iraq, Saudi Arabia, the Levant, Egypt. In the Maghreb, it has been found with certainty in N.E. Algeria only. Recently, a migratory movement of this species, involving great numbers of specimens, was reported from Jordan by Schneider (1981). Israel (Locality records): Hula (1), Gonén (1), Sedé Neheyma (1), Karé Deshe (7), Gesher (7), Deganya (7).

Genus Gomphus Leach, 1815

Edinburgh Encyclopaedia, 9:137

Type Species: Libellula vulgarissima Linnaeus, 1758.
Size moderate. Colour yellow marked with black. Head robust, frons angulate, never with a median depression; occiput simple. No oreillettes on rear of head. Wings with dense reticulation, tornus angulate in male, membranula reduced. Anal lip absent. d entire. Pt of moderate length, usually somewhat swollen in the middle. Appendages simple, the superiors divaricate, apically pointed. Inferiors broadly but shallowly bifid, their two branches divaricate like the superiors. Vesica spermatidis with a very strongly developed basal segment. Female: valvules simple, the sternite of S₆ not modified by sclerotized crests, at most transversely ribbed.
Distribution: Europe, N. Africa, Asia, N. America

Key to the Species of Gomphus
(Figs. 205, 215–248)

1. Black antehumeral and carinal stripes merge in front and posteriorly to enclose an elongated, ellipsoidal yellow spot. Gomphus flavipes lineatus Bartenev

- Black antehumeral and carinal stripes run parallel and do not merge to isolate a frontal yellow spot on the synthorax 2

2. Legs largely yellow.
   Male: S₁₀ with mid-dorsum at least partly yellow. Ham. post. strongly developed, their top rounded and flattened, but without a strong anterior hook. Basal segment of vesica spermatidis very strongly developed, bulb-shaped, yellow with black base-line.

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Gomphidae: Gomphus

Female with continuous mid-dorsal yellow streaks on abdomen. Vulvar scales short and blunt apically. Their base on $S_8$ with a lateral swelling on either side. Vertex with a horn behind each lateral ocellus.

*Gomphus davidis* Selys

Legs largely black.

Male: $S_{10}$ black. Ham. post. with strong anteriorly curved apical hook and interior swelling. Basal segment of vesica spermalis only moderately swollen, black.

Female: a discontinuous black line runs across the mid-dorsum of the abdomen, particularly on $S_{9-10}$. Vulvar scales rather short and blunt, no swellings at their base. Vertex without horn behind each lateral ocellus.

*Gomphus vulgarissimus schneideri* (Selys & Hagen)

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Figs. 215–217: *Gomphus davidis* Selys, 1887; abdomen

215. male, dorsal; 216. male, lateral; 217. female, dorsal
Odonata of the Levant

Figs. 218–219: Gomphus davidi Selys, 1887; synthorax
218. male; 219. female
Figs. 220–223: *Gomphus* spp., male appendages, dorsal and lateral views
220–221. *G. davidii* Selys, 1887;
222–223. *G. vulgarissimus schneideri* (Selys & Hagen, 1850)

Figs. 224–225: *Gomphus davidii* Selys. 1887; male
224. accessory genitalia; 225. hamuli, lateral view

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Figs. 226–228: *Gomphus* spp., females, vulvar scales
226. *G. davidii* Selys, 1887;
227. *G. flavipes lineatus* Bartenev, 1929;
228. *G. vulgarissimus schneideri* (Selys & Hagen, 1850)
Figs. 229–232: *Gomphus vulgarissimus* schneideri (Selys & Hagen, 1850); abdominal markings

229–230. male, dorsal and lateral views;
231–232. female, dorsal and lateral views
Figs. 233–236: *Gomphus vulgarissimus schneideri* (Selys & Hagen, 1850)

233. male; synthorax; 234. female, synthorax
235–236. male, accessory genitalia, ventral and lateral views
Figs. 237–241: *Gomphus flavipes*, males
237. synthorax;
238–239, *G. flavipes flavipes* (Charpentier, 1840), abdomen, dorsal and lateral views;
240–241, *G. flavipes lineatus* Bartenef, 1929; abdomen, dorsal and lateral views
Figs. 242–248: *Gomphus flavipes lineatus* Bartenev, 1929; male, terminalia, dorsal, lateral and ventral views
245–246. accessory genitalia, ventral and lateral views;
247. hamulus 2; 248. hamulus 1
Gomphus davidi Selys, 1887
Figs. 215–221, 224–226


Type Locality: Damascus, Syria.

Male
Mouth parts, face anteriorly yellow. A narrow black line between frons and clypeus. Base of frons, vertex black, occiput yellow.

Pronotum yellow, marked with black. Synthorax yellow, with broad carinal black stripe, broad antehumeral black band about midway between carinal and humeral stripe, and black stripe on humeral suture, about as wide as or slightly narrower than antehumeral stripe. Lateral synthoracic sutures rather narrowly marked with black.

Legs yellow, with black stripes on the tibiae, and on the femora of the first and second pairs. Femur of the third pair entirely yellow, or with finest black stripe.

Wings as for genus. Pt light brown.

Abdomen bright yellow marked with black. Mid-dorsal yellow stripes continuous over the whole length of the abdomen. S₁₀ always with a mid-dorsal black spot, rest yellow.

Appendages: superiors rather long and finely pointed, apex with inner margin straight, but outer margin concave, so that the tips of the appendix are slightly divaricate. In side view the appendix is angulate at the level of its constriction. App. inf. deeply and widely emarginate, apex upturned. App. sup. yellow in terenals, turning brown in later life. Accessory genitalia: lam. ant. moderately emarginate; ham. ant. small, black, scoop-shaped, indented; ham. post. strongly developed, with broad base, and a flattened, rounded apex with a small tooth. Vesica spermalis with a very strongly developed sperm reservoir, largely yellow coloured, with sides partly black, somewhat hollowed-out anteriorly to accommodate the backwardly curved apical segment of the vesica, set with stout golden hairs around the excavation.

Female
Head coloured as in male. Vertex with two outwardly pointing horns behind the lateral ocelli. Occiput wider than in male. Synthoracic black stripes somewhat narrower than in male. Wings, legs as in male. Abdomen yellow marked with black, but a continuous mid-dorsal, broad yellow stripe is present along its entire length. Styli yellow. Vulvar scales short, with broadly rounded tips. Their base on S₄ with a swelling on either side.


Distribution: The south-east Mediterranean coast of Turkey, Syria, the Lebanon, Jordan, Israel. This is possibly the only true Gomphus that occurs in the Jordan Valley. Capture dates range between March and June. A running-water species.

Israel (Locality records): Hulata (1), Lake Hula (1), ‘Ein Jalabina (1), Wadi Fari‘a (6), ‘Ubeidiya (7), Bet Yeraḥ (7), Binyamina (8).
Odonata of the Levant

Gomphus vulgatissimus schneideri (Selys & Hagen, 1850)
Figs. 222–223, 228–236

Gomphus forcipatus, non Onychogomphus forcipatus (L.), Schneider, 1845:114.
Gomphus vulgatissimus race of G. schneiderii —. Selys, 1887:29.
Dumont, 1977b:144.
Gomphus vulgatissimus schneideri —. St. Quentin, 1964a:423.

Type Locality: Kellemsches (Gelemish), western Anatolia, Turkey.

Male

Mouth parts yellow; labrum fringed with black and with black median virgule. Clypeus yellow with black margin. A basal black stripe at suture between frons and clypeus. Frons yellow, vertex black, occiput yellow. Legs black. Pt dark brown, almost black. Synthorax yellow, marked with black. Antehumeral band wide, frequently confluent with broad humeral band near its upper end. Remaining lateral synthoracic sutures more narrowly marked with black.

Abdomen black, marked with mid-dorsal yellow stripes. These spots, however, not continuous across the different segments, but interrupted near the base and end-rings and reduced to a basal elongated spot on S7–9, S10 and sometimes also S9 uniformly black. Well-developed lateral yellow markings occur on S1–3 and S7–10. Appendages black. Apex of superioris abruptly constricted; external and internal margins with about the same degree of concavity. In side view, an angulation at the level of the constriction. Inferiors hollowed-out, with upturned apex. Genitalia entirely black. Lamina deeply hollowed-out, with pointed invagination. Ham. ant. small, apically serrated. Ham. post. strong, with broad base, internal margin swollen and produced, and external apex a strong, anteriorly turned hook. Vesica spermatis with semicircular sperm reservoir, truncated anteriorly, notched apically, black coloured.

Female

Colours on head and thorax as in male. Vertex hollowed-out behind the ocelli, with two lateral tubercles but no horns. Abdomen yellow, copiously marked with black on the sides. Mid-dorsal yellow stripe continuous or almost so on S1–7, more reduced on S8–10. Legs black, but femora partly yellow. Vulvar scales rather long, about 1/2 of S9, broad, with rounded apex and no swellings at their base on S9.


Distribution: A spring and early summer species, found in Greece, Anatolia, the Caucasus, Iran, northern Iraq. Also recorded, under G. simillimus, from Lake Homs, Syria, and probably still occurring in the Lebanon. Not yet found in the Jordan Valley. This might be another species limited on its southern boundary by the Nehring line.

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Gomphidae: Gomphus

Gomphus flavipes lineatus Bartenev, 1929
Figs. 227, 240-248

Gomphus f. lavipes var. lineatus Bartenev, 1929:61 (lapsus calami).
Stydrus (Gomphus) lineatus —. Schmidt, 1961:412.

Type Locality: Poti, Georgian S.S.R.

Male
Mouth parts, genae, labrum, clypeus, frons yellow or green-yellow. A robust black stripe present between frons and clypeus, and at base of frons. Vertex greenish behind ocelli, separated from greenish occiput by a black transverse bar.
Pronotum yellow and black. Synthorax: carina yellow, flanked by a humeral stripe which widens anteriorly, and narrowly or broadly fuses both here and near the alar sinus with the black antehumeral stripe, to enclose an elongate yellow or greenish spot. Antehumeral stripe equidistant from carinal and humeral black stripes. Lateral synthoracic black markings narrow, green-yellow colour dominant. Legs black, flexor side of femora yellow.
Wings hyaline, Pt brown.

Abdomen: a fairly continuous dorsal yellow stripe, flanked by broad black bands, on S2-8. Black stripes contract on S7-8, so that sides of S8-10 are largely citron yellow. Dorsum of S10, to a minor degree of S9, yellow, with reduced brown markings. App. sup. brown, forcipate, finely pointed. App. inf. deeply emarginate, with yellow base and dark brown apices. Genitalia: lam. ant. squared, very narrowly and shallowly cleft; ham. ant. small, blade-shaped, tip rounded; ham. post. longer, knife-shaped, acutely pointed, curved anteriad. Vesica spermaralis with large, yellow-coloured sperm reservoir. In side view, a black spot at the base of the reservoir.

Female
Head as in male, but black stripe between clypeus and frons much narrower. Vertex hollowed-out in its centre, and with two lateral tubercles behind the lateral ocelli. Synthorax, legs, wings as in male. Abdomen with a continuous yellow stripe on the dorsum, broadened to a wide spot on S9, S10 yellow with two minute brown dots at the base of the segment. Sides of S7-10 bright citron yellow. Vulvar scales less than half the length of S9, broad-based, massive, with obtuse apex. Wing base sometimes slightly suffused with amber.

Measurements (mm): Male. Total length 44-49; abdomen 32-36. Female. Total length 47-51; abdomen 34-36.
Odonata of the Levant

Distribution: From the south-west coast of Anatolia to Iran and northern Iraq, and southwards extending into Syria. Probably also in the Lebanon and parts of Jordan. Not yet found in the Jordan Valley. A riverine species, with capture dates ranging from May till August.

Genus ONYCHOGOMPHUS Selys, 1854

*Bulletin Acad. r. Belg., Ser. 2, 21:30*

Type Species: *Libellula forcipata* Linnaeus, 1758.

Size medium, colour yellow marked with black and brown. Male with long, curved distinctly forcipate superior appendages; inferior appendages narrow, deeply bifid, closely apposed. Wings with tornus angulate; an anal field of 2–3 cells is present in most species. In females, and in males of *O. flexuosus*, this may be less distinct, and consist of cells only slightly larger than the underlying ones. Entire. Legs short. Male genitalia: vesica with basal segment never deeply hollowed-out. Ham. ant. forked. Ham. post. variously shaped, pointed. Females with vulvar scales rather short, pointed or rounded, sometimes with sclerotized swellings at their base, and with sclerotized ridges on the floor of S3 behind the valves.

Distribution: Africa, Europe, and Asia.

Three species are regional, all with comparatively narrow ranges. Two more (one of which comprises at least three different subspecies) occur in Anatolia.

*Note*

Selys, in his various writings, has not associated the correct females with the males of three regional species. In particular, Selys' type of *Onychogomphus macrodon* female is a female of *O. lefebvrei*; the keys and descriptions offered here have therefore been based on new topotypical material.

*Key to the Species of Onychogomphus*  
(Figs. 206, 249–277)

1. Males  
   - Females

2. App. inf. as long as app. sup., simple, without swellings or inflexions. App. sup. curved inwards almost at right angles slightly more than half their length. A central "finger" at the level of the inward bend. Sperm reservoir of the vesica not modified to accommodate its own top segment, i.e. simply overlying the reservoir.
   - App. inf. shorter than app. sup., and either with a deep inflexion or with a swelling. App. sup. gently curved inwards well apical to their middle, and without a "finger". Sperm reservoir of vesica shallowly excavated to accommodate its own top segment

3. App. sup. with a single subapical spine. App. inf. S-shaped, with a lateral spine at the level of their inflexion. St.9 without well-defined central black markings, at most with diffuse
Gomphidae: Onychogomphus

Figs. 249–251: Onychogomphus spp.
249–250. *O. lefebvrei* (Rambur, 1842); synthorax, male and female;
251. *O. flexuosus* (Schneider, 1845); male synthorax

brown dots. Sperm reservoir erect with apical U-shaped invagination to accommodate tip of its apical segment; the latter long and narrow.

**Onychogomphus flexuosus** (Schneider)
App. inf. with a strong swelling; their tips pointed, but without apical spine. App. sup. with an external row of spines between the level of their inward bend and close to their tip (the row, however, not reaching the top of the appendix). *S* 7–8 with a mid-dorsal black spot. Reservoir of vesica spermatis erect, with two wing-shaped outgrowths on top, against which its broad and short apical segment rests.

**Onychogomphus macrodon** Selys
Figs. 252–255: *Onychogomphus lefebvrei* (Rambur, 1842)
252–253. male, terminalia, dorsal and lateral views
254. female, head; 255. female, valvulae
Gomphidae: Onychogomphus

4. Oreillettes on rear of head; a very deep hole at the base of the frons, in front of the anterior ocellus.  
   - No oreillettes on rear of head; base of frons in front of anterior ocellus at most somewhat depressed

5. Strong black markings on dorsum of S7-9; a shallow depression in front of the anterior ocellus; occiput wide and short; floor of S9 in front of vulvar scales with two V-shaped crests, connected by a mid-ventral sclerotized ridge.  
   - No strong black markings on dorsum of S7-9, at most some diffuse brown spots. No depression on frons in front of anterior ocellus; occiput with two V-shaped crests that converge in one point.

Onychogomphus lefebvrei (Rambur)

Onychogomphus macrodon Selys

Onychogomphus flexuosus (Schneider)

Figs. 256–259: Onychogomphus spp., males, accessory genitalia, ventral and lateral views

256–257. O. lefebvrei (Rambur, 1842);
258–259. O. flexuosus (Schneider, 1845)
Figs. 260–265: Onychogomphus spp.; abdominal markings
260–261. *O. macrodon* Selys, 1887; male, dorsal and lateral views;
262–263. *O. macrodon*, female, dorsal and lateral views;
264–265. *O. flexuosus* (Schneider, 1845); male, dorsal and lateral views
Gomphidae: Onychogomphus

Figs. 266–271: *Onychogomphus* spp., male, terminalia, ventral, dorsal, and lateral views
266–268. *O. macrodon* Selys, 1887;
269–271. *O. flexuosus* (Schneider, 1845)
Fig. 272: *Onychogomphus flexuosus* (Schneider, 1845): female, valvulae

Figs. 273–274: *Onychogomphus macrodon* Selys, 1887; synthorax, male and female
Gomphidae: Onychogomphus

Figs. 275–277. *Onychogomphus macrodon* Selys, 1887
275–276. male, accessory genitalia, ventral and lateral views
277. female, valvulae
Odonata of the Levant

Onychogomphus lefebvrei (Rambur, 1842)

Figs. 249–250, 252–257

Gomphus lefebvrei Rambur, 1842:166. Selys & Hagen, 1854:37.
Gomphus forcipatus race lefebvrei —. Selys & Hagen, 1857:33.
Onychogomphus forcipatus lefebvrei —. St. Quentin, 1965:539.

Type Locality: Oasis of Bahrieh, Egypt.

Male


Synthorax yellow. Carinal black stripes separated, usually forming a closed loop with the antehumerals. This loop may, however, be open anteriorly, and reduced to two narrow stripes in "pale" populations. Lateral sutures narrowly black. Legs yellow with a black spot at the top of each femur, and a black stripe on the tibiae.

Wings: Pt light brown. Anal field composed of two cells.

Abdomen yellow, marked with black near the end-rings of segments 2–7. Apical segments slightly widened, dark yellow or brownish, with diffuse dark brown, rarely black markings. Superior appendages forcipate, strongly bent inwards slightly more than half their length; their tip spatulate but with an upper finger-like expansion near the level of the inward bend. Inferiors about as long as the superiors, narrow and deeply cleft, curved upwards. Accessory genitalia: lam. ant. swollen, slightly invaginated; ham. ant. well developed, deeply forked; ham. post. erect, triangular, with a fine internal apical point, turned anteriorly, and a tuft of long yellow hairs.

Vesica spermalis with sperm reservoir flat, flusk-shaped; the elongated apical segment ("glans") simply overlying it. Apical flagellae of glans very long.

Female

Head entirely yellow to base of frons. Ocellar area black. Vertex yellow, with two lateral swellings. Occiput yellow. Rear of eyes with a narrow medial black band, rest yellow. A pair of yellow ocelliltes present on the back of the eyes, lateral to the occiput. The frons, immediatly in front of the anterior ocellus, with a very conspicuous, deep hole (in which the apices of the app. su. of the male are accommodated during tandem formation and copula). Legs, wings, and synthorax as in male. Abdomen cylindrical throughout, yellow marked with black. Vulvar scales strongly developed, rounded, with hairy margins, and with a deep and broad invagination almost down to their base. Base produced into tubercles. Floor of Sx with two ridges, U-shaped, broadly touching each other medially, the inner, narrower ridge slightly but consistently protruding.

Gomphidae: Onychogomphus

Distribution: Anatolia, Iran, Afghanistan, Iraq, Syria, the Lebanon, Jordan, Israel, and Egypt. While the type locality is in Egypt, no recent records from that country have become available. In Israel, the species has been found between April and June, mainly in the northern part of the country.

Israel (Locality records): Wadi Qurcin (1), Ein Jalabina (1), Banias River (1), Mt Tabor (2), Nahal Daliyya (3), Wadi "Auja (13).

Onychogomphus flexuosus (Schneider, 1845)

Figs. 251. 258–259, 264–265, 269–272


Type Locality: Kellemisch (Gelemish), western Anatolia, Turkey.

Male

Mouth parts yellow; front of frons diffusely black. Ocellar region black. Vertex yellow, lateral tubercles more depressed than in O. lefebvrei. Occiput yellow, flat, narrower but longer than that in O. lefebvrei.

Dorsum of synthorax with carinal and antehumeral stripes forming a closed, narrow loop that may be narrowly open anteriorly. Lateral sutures marked with black on a greenish background. Legs yellow with a black patch on top of the femora. Tibiae yellow.

Wings: Pt light brown with thick black margins. Anal field not well defined, but usually cells immediately subjacent to anal vein larger than lower-level cell. Abdomen straw-yellow, marked with black near the end-rings and the top third of S3-6; apical segments widened, with diffuse markings that vary with age. Appendages: superiors long, their tips turned downwards over the inferiors. Tips rounded, with small subapical spine. Inferiors comparatively wide, closely apposed, apically upturned. In side view, they are distinctly and deeply indented at about 1/3 of their length. A short spine is found at the level of the indentation. Accessory genitalia: lam. ant. slightly invaginated; ham. ant. forked, but less deeply than in O. lefebvrei; ham. post. with an apical, upturned hook. Vesica spermaris with sperm reservoir strongly raised, and with apical shallow, U-shaped invagination to hold the glans. The latter long and narrow, with short flagella.

Female

Head, thorax, wings, legs coloured as in the male. No trace of a depression on the frons in front of the anterior ocellus. Abdomen cylindric, marked with black on S2-7 as in the male; ultimate segments with diffuse dorsal dark markings. Vulvar scales short, rounded, shallowly excavated; their base not swollen. Floor of S8 with two arched, sclerotized ridges that touch in a medial point, the inner one not protruding.

Odonata of the Levant

Distribution: Anatolia, Iran, Afghanistan, Iraq, Armenian S.S.R., Syria, the Lebanon, northern Israel. The species has not yet been recorded from Jordan, expect Wadi Mujib, and seems to reach the limit of its southward extent in the Dead Sea Valley. Capture dates range between May and July.
Israel (Locality records): Massada (7); Jericho (13).
Also recorded from Wadi Mujib (Naḥal Arnon; 13) in Jordan.

Onychogomphus macrodon Selys, 1887
Figs. 260–263, 266–268, 273–277


Type Locality: Beirut and Antakya (but holotype lost).

As stated in Dumont (1977b), Selys' male holotype could not be located in the Brussels Museum, and all females associated by Selys with the type turned out to be O. lefebvrei. Selys himself, understandably, states that he found it almost impossible to separate the females convincingly. Clearly, the reason for this was that no true females of O. macrodon were available to him. Females were first collected by E. Schmidt (1954a), but not fully described. The description given below is based on a couple from Schmidt's collection, kindly donated by S. Asahina.

Male
Head greenish with faint black markings at the base of the labrum and of the frons. Top of frons medially depressed, with a triangular black marking. Vertex and occiput yellow.
Synthorax with carinal and antehumeral stripes dark brown, on a straw-yellow background. Humeral and other lateral synthoracic sutures black. Legs yellow, with black patches at the top of the femora, and a black line on the tibiae.
Wings: Pt brown. Anal field made up of two cells.
Abdomen ochraceous, marked with black on S_{2-4} as in O. flexuosus. S_{5-7} with a median black marking, S_{9} with two rather diffuse markings. Appendages: superiors long, their tips bent ventrally, with a series of subapical external spines. Inferiors shorter, their apex upturned, with a very robust sub-basal thickening on each appendix. Accessory genitalia: lam. ant. rather deeply excavated; ham. ant. forked; ham. post. rather short, with broad base and upright apical tooth. Vesica spermalis: sperm reservoir upright, with two lateral wings and a depression between them to accommodate the short and broad apical segment. Flagella rather short.

Female
Head as in male, with a black stripe at the suture between frons and clypeus. Top of frons depressed in the middle, showing a shallow circular imprint in front of the anterior ocellus. A triangular black spot extends into the depression of the frons. The
vertex is a flat crest, produced over the lateral ocelli. Occiput yellow, wide and short. Rear of head without ocellillets. Synthorax green. Black markings more reduced than in the male. The same remark holds true for the black markings on the legs. Abdominal segments 2–8 light yellow, sparsely marked with black. Distal half of $S_2$, $S_3$ and $S_4$ with large mid-dorsal black spot. $S_5$ entirely yellow; styli yellow. Vulvar scales with angular margins, rather short, shallowly emarginate. No swellings are found at their base. Floor of $S_5$ with two arched crests, rather widely separated, but united by an extra longitudinal crest.

**Measurements (mm):** Male. Total length 50–52; abdomen 36–37. Female. Total length 50; abdomen 35.

**Distribution:** The range of this little known species seems to be limited to the valleys of the rivers Orontes, Litani, and Jordan. Capture dates range from March to May. Israel (Locality records): Sedê Nehemya (1), Deganya (7), Bitanya (7), 'Ubeidiya (7).

**Genus PARAGOMPHUS** Cowley, 1934

*Entomologist*, 67: 201

(nomen novum for *Mesogomphus* Förster, 1906, preoccupied in Pisces)

**Type Species:** *Gomphus cognatus* Rambur, 1842.

Size small to medium, with body green or yellow to ochraceous, marked with brown or black. Abdomen with foliations on $S_5$ in males only. Wings: triangles entire and almost identical in forewing and hind wings. No anal field in hind wing. Male: appendages long, unbranched, slender, aposed, curved downwards. Inferiors much shorter, broad, curved upwards. Vesica spermalis with sperm reservoir deeply excavated, horse shoe-shaped, hiding the "glans", which has long and curled apical flagella. Female: vulvar scales short, very shallowly excavated medially. Floor of $S_5$ with a semicircular or angular ridge. Field included by this ridge smooth or longitudinally ribbed.

**Distribution:** Africa, Asia and most of the Mediterranean basin. Two species are regional. In addition, an Oriental species, *P. lineatus* (Selys), reaches eastern Anatolia, while an endemic of north-eastern Africa, *P. pumilio* (Selys), reaches the Nile Delta.

**Key to the Species of Paragomphus**

(Figs. 208, 278–297)

1. Large species (over 50 mm total length). Synthorax profusely marked with black, including the lateral sutures.
   Male: ham. ant. fork-shaped; ham. post. tapering apically into a blunt hook, curved anteriad and inwards. App. sup. not constricted; app. inf. gently narrowing towards their apex, not angularly constricted.
   Female: semicircular field on floor of $S_5$ with lateral and apical thickenings and expansions.

*Paragomphus sinaticus* (Morton)
Odonata of the Levant

Smaller species (less than 45 mm). Synthorax diffusely marked with black; lateral sutures either unmarked or with faint brown markings.

Male: ham. ant. forcipate, but with an internal apical process; ham. post. broadened apically, almost hammer-shaped, with elongate black comb. App. sup. constricted slightly distal to the apex of the app. inf.; app. inf. with lateral, angular subapical process.

Female: semicircular field on floor of S₄ simple, without thickenings.

Paragomphus genei (Selys)

Figs. 278–281: Paragomphus sinaiticus (Morton, 1929)

278–279. male abdomen, dorsal and lateral views;
280. female abdomen; 281. valvulae
Figs. 282–285: *Paragomphus sinaicus* (Morton, 1929); male
282–283. Appendages in lateral view;
284. Appendix inferior; 285. Synthorax
Figs. 286–287: Paragomphus sinaicus (Morton, 1929); male, accessory genitalia, ventral and lateral views
Figs. 288–292: *Paragomphus genei* (Selys, 1841); male
288–291. abdomen, dorsal and lateral views;
288–289. light form; 290–291. dark form;
292. synthorax
Figs. 293-297: *Paragomphus genei* (Selys, 1841)
293. female, valvulae;
294-297. male;
294. appendages, lateral view; 295. appendix inferior;
296-297. accessory genitalia, ventral and lateral views
Paragomphus sinaiticus (Morton, 1929)

Figs. 276–277

Mesagomphus sinaiticus Morton, 1929:60.

Type Locality: Wadi Feiran, Sinai Mountains.

Male

Abdomen ochraceous marked with black; on S8–9 these black markings more diffuse. Foliations bright ochraceous. Appendages much longer than S90, robust, not constricted but tapering gently towards their apex. Two to three small black apical spines. Inferiors curved upwards near the base, but with broad flat apical sector set with spinules and with an external subapical spine. In ventral view, the appendix is seen to narrow gently from the level of its inflexion onwards. Accessory genitalia: lam. ant. deeply hollowed-out; ham. ant. simply forked; ham. post. with rather broad base, apically constricted and produced into a blunt, inwardly and anteriorly bent tooth. Vesica spermale with reservoir deeply excavated; glans long, with long flagella.

Female
Head, thorax, wings and legs as in the male. Abdomen cylindrical, sparsely marked with black. Some rhomboidal mid-dorsal markings on S1–4 appear typical of the species. Terminal segments reddish-brown. Styli light yellow, their tips divergent. Vulvar scales rather massively built, very slightly indented medially. Semicircular field on floor of S5 with lateral and posterior thickenings.

Measurements (mm): Male. Total length 50–53; abdomen 36–38. Female. Total length 51; abdomen 32.

Distribution: Sinai mountains, and Air mountains (Niger). Waterston (1980) erroneously synonymizes this species with P. lineatus (Selys) from India, and reports specimens from Saudi Arabia under that name. It seems almost certain that the specimens from the Red Sea hills (Al Hijaz) captured at Jebel Shammar near Kaybar in April really belong under P. sinaiticus.

Capture dates range from April till September. A stagnant-water species.
Sinai (Locality records): Wadi Feiran (22), Wadi Isla (22), Wadi Talh (22).
Odonata of the Levant

Paragomphus genei (Selys, 1841)
Figs. 288-297

Onychogomphus genei —. Selys & Hagen, 1854:17; Selys & Hagen, 1857:311.
Onychogomphus Hageni Selys, 1871:15.
Onychogomphus hagenii —. Selys, 1887:28
Mesogomphus Hageni —. Ris, 1909:27; Ris, 1913:468; Ris, 1921:344; Morton, 1924:36.
Paragomphus (Mesogomphus) genei —. Schmidt, 1938:147.
Paragomphus hageni —. St. Quentin, 1965:540.

Type Locality: Sicily (loc. typ. of P. hageni is Egypt).

Male
Head entirely pale yellow, or with some diffuse black markings at base of frons and around ocelli.
Synthorax green with diffuse anterior markings (a complete loop between carinal and antehumeral bands is rare). Lateral sutures brownish. Legs yellow, with fine black stripe near the top of the femur, spines black.
Wings as for genus. Pt yellow to brown.
Abdomen green or ochraceous, variously marked with black and/or brown: two extreme forms are shown in Figs. 288-291. Appendages: app. sup., seen laterally, with a constriction slightly behind the tip of the app. inf. Inferiors curved dorsad, with three to four apical spines. In ventral view, the sides constrict angularly slightly before the apex. Accessory genitalia: lam. ant. shallowly excavated; ham. ant. fork-shaped, with lower point of the fork blunt and an inner apical process on the upper branch of the fork; ham. post. widening apically, hammer-shaped, with a strong black apical crest produced into a forwardly pointing spine. Vesica spermatica: reservoir deeply hollowed-out; glans broad and swollen, flagella rather short.

Female
Colour pattern as in the male. Abdomen cylindrical. Styli long and pointed, yellow.
Vulvar scales triangular, indented medially. Floor of S5 with a U-shaped crest, of the same width throughout.


Distribution: The whole of Africa, including the Maghreb countries, Egypt, Saudi Arabia, the Levant, and reaching the limit of its northern extent in the Orontes Valley near Antakya. Also known from some major Mediterranean islands, such as Sicily and Sardinia.

Israel (Locality records): Haifa (3), Wadi Fari'a (6), Binyamina (8), Buteicha Swamps (7), Deganya (7), Wadi Qilt (12), ‘Ein Duyuk near Jericho (13). Capture dates range from March to September.
Family CORDULEGASTERIDAE

Large robust dragonflies, coloured black and yellow in both sexes. Head large, eyes meeting in a point, in females sometimes narrowly separated. Labium apically bifid for about one-third of its length; lateral lobes very large. Frons raised above the level of the vertex and sometimes of the occiput. Occiput small, triangular, but continued on rear of head between the eyes. Legs robust, long. Wings variously shaped. Hind wing with base angulate in male, rounded in female. Membranula present. Nodus at centre of wing or distal to it. are not broken in Palaearctic representatives. d similar in all wings, traversed. Anal loop present, short, composed of about 10 cells. An anal triangle of about 3–6 cells is found in the male only. Abdomen cylindrical, more tumid at base, and dilated from S5 onwards. Males with lateral oreilles. Anal appendages: superiors about as long as S10, tapering towards their apex, divericate, twisted along their long axis and dorso-ventrally compressed, armed with two strong ventral spines. Inferiors quadrate, with apex shallowly emarginate. Accessory genitalia: lam. ant. inconspicuous; ham. ant. strongly developed; ham. post. smaller, tortuous, sickle-shaped. Vesica with sperm reservoir raised posteriorly, with horseshoe-shaped top.

Females with a large ovipositor, composed of two very long valves projecting from the sternite of S6, closely apposed to form an apically narrowing furrow. In the basal half of the furrow lie a couple of stylets pertaining to S6. The ovipositor extends well beyond the tip of the abdomen. Oviposition takes place while the female hovers in a vertical position. The long furrow-shaped "sting" bores holes in sand or mud under shallow water, and eggs are pushed into these holes one by one by the internal stylets. The species breed in running waters.

Distribution of the family: Europe, Asia, North Africa (the Atlas Mountains), and North America

One regional genus.

Genus CORDULEGASTER Leach, 1815

*Edinburgh Encyclopaedia*, 9:136

Type Species: *Libellula Boltoni* Donovan, 1807.

Characters as for the family.

One regional species.

*Cordulegaster insignis insignis* Schneider, 1845

Figs. 298–301

*Cordulegaster insignis* Schneider, 1845: 114. Selys, 1887: 34.

*Cordulegaster insignis* amasina. Morton, 1915a: 284; Fraser, 1929: 113; Schmidt, 1954a: 81.

*Cordulegaster insignis insignis* — Morton, 1915a: 284; Fraser, 1929: 112; Dumont, 1977b: 150.
Figs. 298–301: Cordulegaster insignis insignis Schneider, 1845; abdomen
298–299. male, dorsal and lateral views; 300. female, lateral view;
301. male terminalia, lateral view

Type

Male

Labrum yellow; tarsal yellow; yellow; yellow; Synthorax

Limb details

Wing venation

Abdominal segments

Coloration

Transverse bands

Measurements

Distribution

Description

See above

Subspecies

See above

Genus

Odonata of the Levant

Dragonia
**Aeschnidae**

Type Locality: Kellemisch (Gelemish), western Anatolia, Turkey.

**Male**
Synthorax: dorsum black with two oblique cuneiform yellow spots. Sides black with two broad yellow bands, and a third yellow streak, often incomplete, between them.
Legs black.
Wings: costa yellow. Pt elongate, brown or black. Anal field not more than 4–5 cells. d entire or with one cross-vein.
Abdomen black, marked with large, medially confluent yellow spots on top of each segment, and two small lunules near the base of the segments. S₉ and S₁₀ with small yellow lateral markings only. Appendages: superiors brown-black, parallel, progressively tilted at an angle to one another distally, acutely pointed, their sub-tip deeply indented so that the apices are slightly turned inwards. Ventrally, a strong external basal spine is largely hidden by the apical folds of S₁₀. A second, smaller spine is implanted internally at about 1/4 of the base of the appendix. App. inf. squared, medially indented, with a couple of small upturned hooks on either side. Genitalia as for family.

**Female**
Coloration as in male, but black margins around labrum wider, and a diffuse transverse black bar on the frons. Abdomen cylindrical, ovipositor entirely black.
*Measurements (mm): Male.* Total length 65–70; abdomen 50–55. *Female.* Total length 63–67; abdomen 49–55.
Distribution: The nominal subspecies occurs in south western and central Anatolia, but probably not in the Pontic area nor in eastern Anatolia, where two vicariant subspecies live. It is also known from Syria and from the Lebanon, where it has definitely been recorded in the Litani Valley. Although the latter river might constitute the southern limit of its range, it is possible that this rivulet-dwelling species lives on streamlets draining Mount Hermon. The species is on the wing from May till September.

**Family AESCHNIDAE**

Dragonflies of moderate to large and very large size, variable in coloration, but non-metallic. Eyes widely contiguous. Occiput very small, inconspicuous. Labium with middle and lateral lobes about equal in size; middle lobe with a slight median incision at the most. Wings long, base of hind wing in males angulate, or even excavated. d equal in all wings, traversed. Anal loop present. Anal triangle in male
**Odonata of the Levant**

usually composed of 3 cells. Membranula well developed. Pterostigma elongate. Legs moderately long, robust. Abdomen in males with oreillettes, constricted at $S_9$, thereafter cylindrical to its tip. Abdomen swollen at its base in female, gradually tapering thereafter. Anal appendages long but variable in shape. Ovipositor in female complete, often augmented by modifications of ventrum of $S_{10}$ (dentigerous plates), never projecting beyond $S_{10}$.

Distribution: A large, cosmopolitan family.

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**Key to the Genera of Aeschnidae**

(Figs. 3, 15, 18, 20–22, 23b, 28, 302–333)

1. Anal triangle absent. Hind wing rounded in both sexes
   - Anal triangle present. Hind wing angulate at base in male, rounded in female
2. $S_{4-8}$ of abdomen with longitudinal supplementary ridges on the sides. Superior appendages of males not pointed. Two rows of cells between $Cu$ and $A$ in hind wing at origin.
   - Anax Leach
   - $S_{4-8}$ of abdomen without longitudinal supplementary ridges on the sides. Superior appendages of males sharply pointed. Three rows of cells between $Cu$ and $A$ in hind wing at origin.
   - Hemiaeschna Selys
3. Cross-veins present in basal space of wing, proximal to arc. Pt short, only slightly longer than wide.
   - No cross-veins in basal space of wing, proximal to arc. Pt long, always several times longer than wide
4. Wings saffron yellow, with an amber patch near the base of hind wing. $R_3$ making an abrupt angle at level of distal corner of pterostigma. Occiput extremely small.
   - Anaciaeschna Selys
   - Wings hyaline, no basal coloured spot on hind wing. $R_3$ not abruptly curved under pterostigma. Occiput readily visible.
   - Aeshna Fabricius

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**Genus ANAX Leach, 1815**

*Edinburgh Encyclopaedia*, 9:137

Type Species: *Anax imperator* Leach, 1815.

Aeschnidae: Anax

appendages: superiors much longer than \( S_{10} \), broadly lanceolate, with inner apices rounded, a small external apical spine, and a strong dorsal ridge. Inferior appendages much shorter, broad and quadrate or tapering towards their apex, armed with a few robust spines. Female appendages much shorter than the male’s superiors, lanceolate. Ovipositor relatively small. Dentate plate set with fine short spines.

Distribution: Cosmopolitan. Three species occur in Israel and surrounding countries, a fourth one in Saudi Arabia.

**Key to the Species of Anax**

(Figs. 15, 302–309, 311, 314–315)

1. Synthorax turquoise-blue-green; sides marked with broad black stripes.  
   - Synthorax grass green, blue-green or pale brownish, without lateral black stripes
     - 2

2. Wings always hyaline. Synthorax grass green or blue-green. Wings: membranula white at base, grey on top. Male with abdomen azure blue, marked with dorsal black. App. sup. completely rounded at their tip. Inferiors about 1/3 the length of superiors, rectangular, without distal spines. Females: abdomen green turning blue-green from \( S_{1} \) onwards. Occiput without tubercles.
   - Anax immaculifrons Rambur
   - Synthorax brownish, often with light violet sheen. Wings: membranula clear grey. Male: \( S_{2} \) and base of \( S_{3} \) azure blue, changing to blue-green from \( S_{2} \) onwards. The whole dorsum with dark brown markings. App. sup. with external apical spine. App. inf. very short, rounded, with numerous spines along apical margin. Female coloured as male, but darker. Occiput with two tubercles.
     - Anax imperator Leach
     - Anax parthenope (Selys)

   - 2

4. Ovipositor divided into 4 parts. Synthorax green or blue-green, without lateral black stripes.  
   - Synthorax brownish, often with light violet sheen. Wings: membranula clear grey. Male: \( S_{2} \) and base of \( S_{3} \) azure blue, changing to blue-green from \( S_{2} \) onwards. The whole dorsum with dark brown markings. App. sup. with internal apical spine. App. inf. very short, rounded, with numerous spines along apical margin. Female coloured as male, but darker. Occiput with two tubercles.
     - Anax parthenope (Selys)
Figs. 302–307: *Anax* spp., male terminalia, dorsal and lateral views

302–303. *A. immaculifrons* Rambur, 1842;
304–305. *A. imperator* Leach, 1815;
306–307. *A. parthenope* (Selys, 1839)
Aeschnidae: Anax

Figs. 308–310: Abdominal markings
308. Anax immaculifrons Rambur, 1842; male;
309. A. imperator Leach, 1815; male;
310. Hemianax ephippiger (Burmeister, 1839); male
Figs. 311–313: Head structures in various aeshnids
311. Occipital area of *Anax parthenope* (Selys, 1839); female;
312. Head of *Aeshna affinis* Vander Linden, 1820; male;
313. Occiput of *Hemianax ephippiger* (Burmeister, 1839); female
Figs. 314–316: Aeschnid wings

314. *Anax imperator* Leach, 1815; forewing;
315. *A. imperator*, basal half of hind wing (shaded area: two rows of cells between A and Cu);
316. *Hemianax ephippiger* (Burmeister, 1839); basal half of hind wing (shaded area: three rows of cells between A and Cu)
Anax imperator Leach, 1815

Figs. 304–305, 309, 314–315

Aeschna formosa Vander Linden, 1823b:158.
Aeschna (Anax) formosa —. Selys, 1839:387.
Anax formosus —. Rambur, 1842:182; Martin, 1908:9.

Type Locality: “England”.

Male
Synthorax grass green with sutures finely brown. Legs black, femora brown on flexor side of apical half to two-thirds.
Wings hyaline, costa yellow. Pterostigma long and narrow, bright ochraceous. Membranula pure white.
Abdomen azure blue, with longitudinal mid-dorsal black markings over its entire length. Anal appendages: superiors blackish-brown, robust, shaped as in Fig. 304. Inferiors less than half the length of superiors, squared, bearing two strong apical spines on each side. Accessory genitalia: lamina mediately cleft, with finely pointed anteriorly directed spine; ham. ant. with broad base and U-shaped apex, the opening of the “U” directed inwards, both hamular openings closely apposed; ham. post. small, lanceolate.

Female
Similar to male, but with abdomen shorter and more cylindrical. Venational details of wings as in male. Wings very rarely tinted with pale yellow. Abdomen greenish, with black markings of males replaced by reddish-brown ones. Only sutures between segments black. Anal appendages dark reddish-brown, about 3 times as long as S10, with outer border straight, finely pointed apically. Inner border strongly convex, tapering from base to apex. Styli comparatively short.

Measurements (mm): Male. Total length 70–75; abdomen 54–57. Female. Total length 66–71; abdomen 50–53.
Distribution: Western and Central Europe, the whole of Africa, Asia Minor and extending eastwards to the north-western provinces of India. Found throughout Israel and Sinai, probably perennial in Sinai.
Israel (Locality records): Dan (1), Buteicha Swamps (7), Deganya (7), ‘Ubeidiya (7), Hadera (8), Rosh Ha’Tayin (8), Qishon marshes (5), Tel Aviv (8), Nahal ‘Arugot (13), ‘En Gedi (13), ‘En Avedat (17), Sedé Boqer (17).

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Aeschnidae: Anax

*Anax parthenope* (Selys, 1839)
Figs. 306–307, 311

*Aeschna (Anax) parthenope* Selys, 1839: 389.

Type Locality: Lake Averno, Naples, Italy.

**Male**
Head: labium and labrum deep yellow, sometimes with a black border fringing the labrum. Face and frons pale olivaceous, changing to reddish-brown or blackish on top of frons. Base of frons narrowly black. Occiput green-yellow, fringed with black. Legs black, femora reddish-brown.
Wings hyaline, enflamed with yellow or light brown, this tinge becoming darker with age. Pterostigma reddish-brown, long and narrow, overlying three cells. Costa yellow, membranula pale grey, almost white. d in forewing larger and narrower than in hind wing, made up of 4–6 cells in forewing, and usually one cell less in hind wing.
Abdomen: S1 olivaceous brown, with a sub-basal black spot on each flank. S2 turquoise blue, with a transverse sub-basal black ridge and a minute black stripe midway, S9-10 with a dark brown longitudinal series of markings, as in *Anax imperator*. S10 sometimes entirely devoid of black, bluish. Anal appendages: superioris robust, narrowing apically, and with external spine. Inferiors very short, rounded, with about 12 robust spines on each outer corner. Accessory genitalia as in *A. imperator*.

**Female**
Similar to male, except for crest of frons, which is totally unmarked; blue colour on S2 more confined to the dorsum of the segment; the sides and the base of S1 creamy white. Anal appendages dark reddish-brown, as long as the superiors of the male, lanceolate, ribbed. Ovipositor as for genus.

**Measurements (mm): Male**. Total length 64–68; abdomen 47–49. **Female**. Total length 62–67; abdomen 46–48.

Distribution: Southern Europe and North Africa; eastwards reaching Kashmir, southwards reaching India. Occurs throughout Israel and Sinai, mostly on standing water, and almost all year round.

Israel & Sinai (Locality records): Dan (1), Hula (1), Sede Nehemya (1), Qishon marshes (5), Deganya (7), Rosh Ha‘Ayin (8), Jerusalem (11), ‘En Gedi (13), Yero‘jam (17), HaMakhtesh HaGadol (17), Et Tur (23).
Anax immaculifrons Rambur, 1842
Figs. 302-303, 308


Type Locality: “India”.

Male

Labium pale ochraceous, labrum greenish-yellow, broadly fringed with black. Face and frons pale blue-green, with narrow black line at base of frons. Occiput blue. Synthorax blue-green on dorsum, blue on alar sinuses; carina finely black. Sides turquoise, with broad brown-black humeral stripe covering most of episternum, and an extremely broad band on Su2 extending anteriorly to level of meso-metathoracic suture. Ventrum black. Legs black.

Wings hyaline, slightly tinted with saffron yellow. Pt brown, rather short (covering not more than 3 cells). Membrana bicolorous, white at base, dark brown at top. In forewing longer than in hind wing, composed of 5-6 cells in forewing, 4-5 in hind wing.

Abdomen: S1 entirely brown-black. S2 turquoise blue with black sutures and a mid-dorsal isolated bat-shaped marking. S3-5: basal half turquoise with pink sheen, distal 1/3 to 1/2 black. S6-10 largely brown. Anal appendages: superiors long, pale brown to ochaceous, widened at about 1/3 of their base, apically pointed. Inferiors slightly less than half the length of superiors, tapering towards their apex, which is notched and has one or two small spines on each side. Accessory genitalia as for genus.

Female

Very similar to male, but turquoise blue replaced by pale greenish-blue on synthorax and base of abdomen. Black markings often fringed by reddish-blue, and segment I reddish instead of brown. Anal appendages blackish-brown, short. Ovipositor short, as for genus.

Measurements (mm): Male. Total length 80-85; abdomen 55-60. Female. Total length 81-86; abdomen 58-60.

Distribution: India, Sri Lanka, Pakistan. Not recorded from Iran, but recently found in Anatolia (Dumont, 1977b), and also on the isle of Rhodes (Fisher, pers. comm.). First reported from the Levant by Martin (1909, 1926) at Beit-Meri near Beirut. Morton (1924) found another specimen near Beirut. Israel (Locality records): Two records, both males, are available: Wadi Qurein, (1; 3.V.1955), and Qusiyia, 10 km S. of Khushniya (18; 3.VI.1973).

A riverine species that breeds only rarely in stagnant water.
Genus **HEMI\(\text{A}\)NAX** Selys, 1883

*Bull. Acad. r. Belg., Ser. 3, 5: 723*

(Cyrotoma Selys, 1871, preoccupied in Coleoptera)

Type Species: *Aeschna ephippiger* Burmeister, 1839.

Dragonflies of large size, coloured brown, yellow and blue. Eyes broadly contiguous, occiput very small. Frons angled but not crested. Wings of moderate length, their base rounded in both sexes. Membranula well developed. Pt elongate, narrow. d elongate and much longer in forewing than in hind wing. No subtriangle. No anal angle. Anal loop quadrangular, composed of 3–4 rows of cells, about 15 in number. R₃ sharply curved under Pt; Rs₁ and Ms₁ deeply concave, even angulate. Basal space not traversed, arc angulate. No orellettes on S₂. No lateral supplementary ridges on S₈–₁₀. Accessory genitalia of male and ovipositor of female as in *Anax*. One species.

**Hemianax ephippiger** (Burmeister, 1839)

Figs. 310, 313, 316, 321–322

*Aeschna ephippiger* Burmeister, 1839: 840.
*Aeschna mediterranea* Selys, 1839: 391.
*Anax mediterranea* — Selys, 1840: 120.
*Anax senegalensis* Rambur, 1842: 190.
*Hemianax ephippiger* — Selys, 1883: 723; Selys, 1887: 36.

Type Locality: Madras, India.

**Male**

Mouth parts yellow; labrum with black fringe. Frons yellow. Frontal crest with black base. Base of frons lined with black, thickened medially. Occiput yellow. Synthorax palest brown or olivaceous, sutures not marked with black except on infra-episterna. Legs black, base of femora brown and inner side of femora of first pair clear yellow.

Wings hyaline, or partly enumped with pale amber. Hind wing with basal amber patch. Pt golden, long and narrow. Membranula white on top and along its free borders, dark grey elsewhere.

Abdomen bright ochraceous, marked as follows: S₁ and sides of S₂ pale greenish-yellow. Dorsum of S₂ largely azure blue, with narrow black sutures. Some blue still on dorsum of S₁. Most of S₃ and S₄–₇ bright brownish with longitudinal mid-dorsal black stripe, as in *Anax*, but narrower. In addition, a small black spot is found on the sides of S₃–₇, lengthening to a stripe from S₅ onwards, and becoming confluent with mid-dorsal black band. Clear parts of S₈–₁₀ yellow, especially S₁₀; Anal
Odonata of the Levant

appendages: superiors dagger-shaped, finely pointed, with a mid-dorsal rib and strong subapical hump. Inferiors somewhat less than half the length of superiors, triangular, upper surface covered with strong, imbricate spines. Accessory genitalia: spine on lam. ant. rather strong; base of ham. ant. very broadly built; otherwise, as in Anax. Female

Coloured almost exactly as male, but azure blue on dorsum of S2 more restricted and ground colour of abdomen deeper brown. Appendages as long as in the male, deep brown with darkened margins, lanceolate. Ovipositor small, as in Anax. Measurements (mm): Male. Total length 65–70; abdomen 52–56. Female. Total length 63–69; abdomen 47–50.

Distribution: S. Europe, occasionally reaching W. and C. Europe, and extending to India in the east, to the whole of Africa in the south. A notorious migrant that is often found in large swarms in absolute desert country. Mass migrations in Egypt were recorded by Williams (1925, 1926); the species breeds in shallow, often temporary waters, and is thus preadapted to life in arid environments. Larval development may be as short as 90 days (Gambles, 1960). Found throughout Israel and Sinai almost all year round, except during the coldest months.

Israel & Sinai (Locality records): “Beth Gordon”, Deganya A (7), Hadera (8), Be’er Sheva’ (15), Jerusalem (11), Wadi Masri near Elat (14), Elat (14), Nahal Zin (17), Isma’iliya (20).

Genus ANACIAESCHNA Selys, 1878

**Musc. zool. Mus. Dresden, 3:317**

Type Species: *Aeschna jaspidea* Burmeister, 1839.

Dragonflies of large size, variously coloured, with wings always more or less deeply tinted with yellow. Eyes broadly contiguous, and occiput very small. Wings long, rather pointed at apices, base of hind wings angulate in the male. Pt long and narrow. Basal space entire. d in forewing slightly longer than that in hind wing. Subtriangle defined, traversed by a single cross-vein. Hypertrigone traversed. Anal triangle present. IR3 forked at level of proximal end of Pt. Oreillettes present on S2 in males. Superior anal appendages long and slender, convex. Females with rather short ovipositor.

Distribution: Europe, Asia, N. America, Africa.

One regional species

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Aeschnidae: Anaciaeschna

Anaciaeschna isoeceles antehumeralis (Schmidt, 1950)
Figs. 317–318, 325–326

Libellula quadrifasciata var. β isoeceles Müller, 1767: 125.
Aeschna rufescens Vander Linden, 1825: 27. Selys, 1883: 729; Selys, 1887: 37.
Anaciaeschna isoeceles humeralis (sic) — St. Quentin, 1965: 542.

Type Locality: Tschilfik, Anatolia.

Male
Mouth parts, face entirely ochraceous. Crest of frons finely bordered with brown-black. Occiput yellow.
Synthorax transparent brown; narrow citron yellow antehumeralis, slightly widened apically. Humeral suture and Su2 narrowly black, widened on infra-episternum. A broad yellow streak on mesepisternum 2; metepisternum 3 entirely yellow. Legs: femora chocolate brown, tibiae black.
Wings: Pt light ochraceous. Membranula large, brownish, slightly clearer at its base. Anal triangle 3–4 celled, covered by a bright amber patch. Other venational characters as for genus.
Abdomen: ground colour brown, with olivaceous sheen on top third of segments. S1 and S2 with mid-dorsal bright yellow stripe; sides of both segments including oreillettes greenish-yellow. Abdomen constricted at S1. Dorsum of all segments with fine tranverse black stripe, black end-rings, and 2–4 diffuse brown spots. A mid-dorsal black stripe on S3 and top of S5. Sides of S4–9 more greenish, with a diffuse dark brown marking. Appendages: superiors brown, with dark interior margin and tip, elongate, apically pointed, the apex tumid outwardly, and a keel on the apical third. Inferiors triangular, just under half the length of superiors. Accessory genitalia: lam. ant. with strong, posteriorly directed spine, reaching as far as ham. ant., with tip forceps-shaped and an anterior spine. Modified margin of tergite 2 narrow.

Female
Colours as in male. Antehumeralis usually not widened. Appendages brown, shorter than superiors of male. Ovipositor rather short but robust.
Distribution: The nominal subspecies is found in North Africa, the Iberian Peninsula, Western and Central Europe; ssp. antehumeralis occurs in Greece and Anatolia, and reaches the Jordan Valley.
Locality records: Lake Hula (1), Menara (Metulla) (1), Gonén (1), Wadi Qurein (1), Dan (1), Kefar Rittim (2), Kefar Masaryk (4).
Figs. 317–320: Aeschnid wings
317. *Anaciaeschna iscoele antehumeralis* (Schmidt, 1839), male, base of hind wing; 318. same species, wing tip
319. *Caliaeschna microstigma* (Schneider, 1845), male, base of hind wing (shaded area: basal space traversed by cross-veins); 320. same species, wing tip
Figs. 321–322: *Hemianax equiperiger* (Burmeister, 1839), male, terminalia, dorsal and lateral views

Figs. 323–326: Aeschnids, male terminalia, dorsal and lateral views

323–324. *Caliaeschna microstigma* (Schneider, 1845);
325–326. *Anactiaeschna isoetes antehumeralis* (Schmidt, 1839)
Genus AESHNA Fabricius, 1775
Systema Entomologica, p. 424

Note
The origin of the term Aeshna Fabricius is unknown; possible derivations that have been proposed are all speculative. Therefore, no emendation is possible, and the widely used Aeschna is invalid. However, the letter c should be preserved in combinations such as Anaciaeschna and Caliaeschna, which are posterior to (and followed) the erroneous spelling Aeschna but are valid in themselves.

Type Species: Libellula grandis Linnaeus, 1758.
Distribution: A large genus, with many species all over the world. Five species occur in Anatolia; one, possibly two, reach the Jordan Valley.

Key to the Species of Aeshna
(Figs. 18, 20–22, 28, 312, 327–332)

1. Sides of synthorax clear blue, turning green ventrally (males) or green all over (females), with all sutures rather broadly marked with black. Male: app. inf. about half the length of app. sup.; app. sup. with sub-basal ventral hump; lam. ant. with very long spine, reaching beyond ham. ant.
   Aeshna affinis Vander Linden
   - Sides of synthorax brown, with two yellow streaks; sutures narrowly marked with brown-black. Male: app. inf. well over half the length of app. sup.; app. sup. without sub-basal ventral hump; lam. ant. with short spine, barely reaching ham. ant.
     Aeshna mixta Latreille
Aeschnidae: Aeshna

327 328

329 330

Figs. 327–330: Aeshna spp., male, terminalia, dorsal and lateral views
327–328. A. mixta Latreille, 1805;
329–330. A. affinis Vander Linden, 1820
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Figs. 331–332: *Aeshna* spp., lateral view of synthorax
331. *A. affinis* Vander Linden, 1820;
332. *A. mixta* Latreille, 1805

*Aeshna mixta* Latreille, 1805
Figs. 327–328, 332

*Aeshna mixta* —. Morton, 1924:40. Fraser, 1936:130; Dumont, 1977b:152.

Type Locality: Environs of Paris, France.

*Male*
Mouth parts ochraceous, labrum with black on apex and fine black base. Clypeus and frons light olivaceous. Frons marked with a black “T” on top. Vertex and occiput yellow.
Synthorax transparent, brownish. All sutures narrowly black. Antehumeral band narrow, greenish-yellow, often reduced to a basal spot. Sides with two broad greenish-yellow bands, one on mesepimerum and one on metepimerum, the former tending to narrow, the latter expanding above. Small additional yellow spots may be present between these bands. Legs black, base of femora clear brown.

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Aeschnidae: Aeshna

Wings hyaline. Pt brown. Membranula white, light brownish at free margins. Anal triangle narrow, 3-celled. d of equal size and shape in all wings, 3–4-celled. IR3 forked well before proximal edge of Pt, especially in hind wing.

Abdomen with ground colour reddish-brown or black, marked with a mosaic of blue and green spots. Ocelli small, triangular. Appendages: superiors brown or black, 2 1/2 times as long as S10, narrow at base, then lanceolate, ending in a fine point. Inferiors narrowly triangular, with apex slightly curled up, about 2/3 the length of the superiors. Genitalia: lam. ant. moderately cleft, with a pair of strong spines, turned posteriorly, their tip not reaching the ham. ant.; ham. ant. small, forceps-shaped, without anterior spine; ham. post. lanceolate. Vesica spermatica with sperm reservoir hollowed-out anteriorly, accommodating broad glands. Margins of tergite of S2 sinuous but little differentiated.

Female

Similar to male, except for the abdomen, which is tumid and not constricted at S5, and the green-yellow spots which replace the blue-coloured ones in the male. Anal appendages lanceolate, as long as the superiors of the male. Ventrum of S10 set with numerous minute spines. Ovipositor well developed.


Distribution: Europe, North Africa, Asia Minor and Central Asia, reaching Kashmir in the east.

Israel & Sinai (Locality records): Qishon marshes (5), Gesher (7), Suez Canal (20).

Aeshna affinis Vander Linden, 1820

Figs. 312, 329–331


Aeshna affinis —. Selys, 1887:37; Martin, 1908:42.

Type Locality: Bologna, Italy.

Male

Mouth parts and face green or blue. Labrum with fine black base and virgule. Suture between frons and clypeus narrow and black. Top of frons marked with black “T”. Vertex and occiput green or blue.

Synthorax transparent, green or blue, brownish in front, with short antehumeral stripes. Sutures broadly marked with black, especially the lower half of the meso-metathoracic suture. No yellow streaks. Legs black, base of femora brown.

Wings: Pt dark brown, d in forewing slightly longer than that in hind wing, 3–4-celled. Anal triangle narrow, 3-celled. Membranula white. IR3 forked at level of proximal edge of Pt or slightly basal to it.

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Abdomen with ground colour brown, extensively marked with blue. Appendages: superiors black, narrow at base, widened and lanceolate, apically pointed. A ventral hump present at the level where the appendix widens. Inferior appendix narrow, triangular, about half the length of superiors. Accessory genitalia: lamina deeply cleft, long and finely pointed, with posteriorly directed spine that extends over the ham. ant.; ham. ant. as for genus, anteriorly pointed; ham. post. lancet-shaped. Sperm reservoir hollowed-out anteriorly. Glans triangular. Oreillettes small. Margins of S₂ not modified.

Female

As male, but blue colours replaced by green and yellow. Anal appendages relatively short, shorter than superiors in male. Ovipositor fairly robust.


Distribution: The Mediterranean basin, and extending eastwards as far as Turkestan. The citation from Israel in Dumont (1977b) is erroneous. No definite record from the Levant is as yet available, although the species is likely to occur here.

Genus CALIAESCHNA Selys, 1883

Bull. Acad. r. Belg., Ser. 3, 5:30

Type Species: Aeschna microstigma Schneider, 1845.

The genus is monotypic, but close to the Oriental Cephalaeschna.

Caliaeschna microstigma (Schneider, 1845)

Figs. 319–320, 323–324, 333

Aeschna microstigma Schneider, 1845:113.
Caliaeschna microstigma — Selys 1883:739; Selys, 1887:37; Morton, 1924:40; Dumont, 1977b:151.

Male

Mouth parts clear yellow; labrum broadly fringed with black. Clypeus and frons light blue, frons raised and produced into a median point, with a fairly wide anterior black patch. Occiput blue.

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Aeschnidae: Caliaeschna

Synthorax brown, with dark blue, comma-shaped antehumerals, and two broad green or light blue lateral bands; sometimes a narrow vertical blue stripe between these oblique bands, and a triangular blue spot between the wings. Legs black, femora brown.

Wings hyaline, venation as for genus.

Abdomen narrow, strongly constricted at S₂. Ocelli®tes very large. Abdomen deep brown, marked with blue. Anal appendages: superiors long, apically rounded, constricted at their base, with a ventral sub-basal hump. Inferiors triangular, their tip curled upwards, slightly exceeding half the length of the superiors. Accessory genitalia: margin of tergite of S₂ forms a posteriorly produced plate; lam. ant. with a vertical, upright blunt spine on each side; ham. ant. with massive base and internal foliate process; ham. post. short, rounded. Vesica spermatis with reservoir produced into a point between and behind the top of the lamellae of tergite 2. Glans with long, foliate flanges.

Fig. 333. Caliaeschna microstigma (Schneider, 1845), male, markings on abdominal segments 1–3, dorsal view

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Odonata of the Levant

Female
Colours as in male, but spot on front of frons sometimes light brown not black. Abdomen not constricted at S_3, tumid, with green-yellow dots instead of blue ones. Styli black, as long as S_{10}. Ovipositor massive, reaching tip of S_{10}. Floor of S_{3} triangularly raised.
Measurements (mm): Male. Total length 52–59; abdomen 39–44. Female. Total length 57–70; abdomen 41–45.
Distribution: From Montenegro to Afghanistan, including northern Iraq, Syria, the Lebanon, Jordan. A running-water species that occurs in the upper reaches of the Jordan River and its tributaries in Israel, between May and October. Israel (Locality records): Dan (Tel el Qadi; 1), Hulata (1), Banias (1).

Family LIBELLULIDAE

Dragonflies of small to large size; coloration variable, occasionally metallic. Eyes always confluent, vertex well developed. Labium with middle lobe very small, not fissured, and lateral lobes very large. Wings variable in shape and width; base of hind wing always rounded in both sexes. d in forewing elongate along the breadth of the wing, usually traversed, always situated well distal to level of arc. d in hind wing elongate in the long axis of the wing, and usually situated at the level of arc or only slightly distal to it. Membranula present, occasionally reduced. Antenodal veins usually numerous, those of the costal space continuous with those of the subcostal space, the last one incomplete in some genera. Primary antenodals indistinguishable from the others. Anal loop elongate, L-shaped. Abdomen cylindrical, triquetral or depressed. S_{2} without oreillettes and segment 10 without a keel. Anal appendages simple and rather generalized throughout the family. Only one pair of hamuli present. Genital lobe well developed. Vulvar scales small, rarely elongated.

Key to the Genera of Libellulidae
(Figs. 25–26, 334–445)

1. Thorax and abdomen with a dark metallic sheen, which may extend uniformly over the body, or alternate with yellow non-metallic markings. Wings partly coloured or hyaline
   2
2. Thorax and abdomen variously coloured, but never metallic. Wings variable
   3
      Zygonyx Hagen
      4
   4. Hind wings widened and with a large dark basal metallic patch. Smaller insects, well under 4 cm in length. Body uniformly metallic black.
      Rhyothemis Hagen
      5
   5. arc at or distal to an_{2}. Last an in forewing complete. Medium- to large-sized species. Adults, especially males, often blue pruinose
      5

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Libellulidae

- arc between an1 and an2. Last an in forewing complete or incomplete. Size and colour variable
- Hind lobe of pronotum small. Base of hind wing with dark brown spot.

Libellula Linnaeus

- Hind lobe of pronotum large, erect, fringed with long hairs. Base of hind wing without coloured spot
- Vertex grooved. Clypeus narrower than frons, i.e. face narrowing downwards.

Orthetrum Newmann

- Vertex rounded. Clypeus broader than frons, i.e. face widening downwards.

Nesiothemis Longfield

- Last an in forewing complete
- Last an in forewing incomplete
- Less than 10 an in forewing
- More than 10 an in forewing
- Hind lobe of pronotum large, erect, fringed with long hairs. Small insects with abdomen swollen and dilated in its front half (S1-4), cylindrical and slender in its rear half (S5-7).

Acisoma Rambur

- Eye contact long. Hind lobe of pronotum small, usually naked. Small to moderately sized insects, with abdomen not noticeably swollen in its front half
- Wings completely hyaline. Wing venation whitish. Subtrigone in forewing consisting of one cell only. Marginal reticulation of wing consisting of a limited number of relatively large cells. Rspl in both pairs of wings short, not more than 5-6, usually 4 cells in length. Small, dark coloured insects.

Selysiothemis Ris

- Hind wing with a brown basal spot. Wing venation dark. Subtrigone in forewing consisting of a minimum of 3 cells. Marginal reticulation of wings a close reticulum of relatively small cells. Rspl more than 7 cells long. Ochraceous-brown coloured insects.

Urothemis Brauer

- Discoidal field (i.e. cell rows projecting beyond d) in hind wing at least slightly expanded at wing margin
- Discoidal field in hind wing parallel or contracted at wing margin
- Discoidal field starting with two rows of cells. Hind lobe of pronotum moderately large to very large, fringed with long hairs. Small, dark coloured insects
- Discoidal field starting with three rows of cells. Hind lobe of pronotum small
- Distal tip of anal loop well exceeding distal tip of d. Abdomen in both sexes strongly swollen in its front half (S1-4), contracted and slender afterwards

Acisoma Rambur

- Distal tip of anal loop not exceeding distal tip of d. Abdomen cylindrical in females, slightly depressed at its base, somewhat triquetral at the end in males.

Dipecodes Kirby

- Males bright red or ochraceous, females ochraceous with amber spot at base of hind wings, and a reduced spot on the forewings. Frons with a deep sulcus, dividing it into two very oblique horse shoe-shaped halves. Vertex low, rounded. 7-14 an.

Crocothemis Brauer

- Males dark coloured, brown-black or sometimes dark red. Females brownish. Wing spot, when at wing base, very large and dark brown or black or traversing wing as a band between N and Pt. Females may have hyaline wings. Frons with a shallow sulcus. Vertex high, narrow. 6-8 an.
**Odonata of the Levant**

14. Hind lobe of pronotum large, erect, fringed with long hairs. Moderately large to small species, with ground colour red or ochraceous. **Sympterus** Newman  
   - Hind lobe of pronotum small 15

15. d in forewing and hind wing on same level. Hind wing not conspicuously broadened at its base. Pt of same length in all wings. **Trithemis** Brauer  
   - d in forewing 3 or more cells distal to d in hind wing. Hind wing conspicuously broadened at base. Pt in forewing longer than that in hind wing. **Pantala** Hagen

**Genus ORTHETRUM** Newmann, 1883

*Entomologist's mon. Mag.*, 1:511

Type Species: *Libellula coerulescens* Fabricius, 1798.

Robust dragonflies, of variable size. Frons crested, wider than clypeus. Vertex with a groove. Hind rim of pronotum large, erect, emarginate medially, hairy. Legs of moderate length, claw spines at base or middle of claw. Abdomen variously shaped, often more or less constricted at S3. Lam. ant. usually erect; hamuli species specific. Vesica spermatis with a flagellum and flanges (alae). Vulvar scales little developed. Females with sides of S8 more or less foliated. Wings long, hind wing broader than forewing. Nodus situated distal to the middle. d in forewing just beyond that in hind wing, and d in hind wing situated at level of arc. arc at an2 or beyond it. Sectors of arc arise from a common stem. 10–20 an, the last one complete. R3 strongly bisinuous. Discoidal field in forewing beginning with 3 rows of cells, expanding to 4 or more at wing margin. Anal loop well developed, closed, its distal angle 3 or more cells beyond distal angle of d. Membranula large. Males and sometimes females at maturity covered by a blue pruinosity (except in *O. sabina*; moreover, in the Oriental region, many males are dark red).

Distribution: Cosmopolitan.

Nine species are regional. From Anatolia, 9 species are also known, but 2 are different from those found in the Levant and in Sinai.

**Key to the Species of Orthetrum**  
(Figs. 334–355)

1. Membranula dark brown or black 2  
   - Membranula white or pale grey 7

2. At least a trace of basal amber on hind wing 3  
   - No basal amber on hind wing 4

3. Base of abdomen (S1–2) bulbously swollen, abruptly constricted at S3. No pruinulence in male, appendages yellow. **Orthetrum sabina** (Drury)  
   - Base of abdomen expanded but not bulbously swollen, gently constricted over the entire length of S3. Mature males at least in part blue pruinose; appendages dark 5

4. Small species, with total length less than 4 cm. **Orthetrum teniolatum** (Schneider)  
   - Large species, total length exceeding 5 cm. **Orthetrum trinacria** (Selys)

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6. Male: hamuli with anterior hook broad, turned outwards, posterior hook forms a ridge ending apically in a hirsute ridge below and external to the anterior hook.
   Female: vulvar opening constricted, with thickened lateral margins.

**Orthetrum chrysostigma** (Burmeister)
- Male: hamuli with anterior hook back-turned, acute at tip. Posterior hook a sinuous ridge, ending in a blunt tubercle behind and opposite to the anterior hook.
- Female: vulvar opening wide, with thickened base.

**Orthetrum brachiale** (P. de Beauvois)
- R₃ distinctly sinuous
- R₃ almost straight, slightly sinuous in females only. **Orthetrum ransonneti** (Brauer)

8. One row of cells between Rs and Rspl.

9. Two full rows of cells between Rs and Rspl, or at least several cell doublings

**Orthetrum aniceps** (Schneider)
- Females (and non-pruinosecent males as well) with thick mid-dorsal black stripe across the abdomen. Males: lam. ant. with long hairs; lob. gen. rounded. Hamuli: anterior hook small, outwardly turned, pointed. Posterior hook ending in a hirsute ridge below and external to the anterior hook; cleft between them shallow and narrow.

**Orthetrum taeniolatum** (Schneider)
- Females without a mid-dorsal black stripe on the abdomen; only carina blackened. Males: lam. ant. with short hairs; lob. gen. rounded. Hamuli: anterior hook strong, outwardly turned, pointed. Posterior hook rounded, well posterior to and below anterior hook; cleft between them deep and wide. **Orthetrum brunneum brunneum** (B. de Fonscolombe)
Odonata of the Levant

Figs. 334–337: _Orthetrum_ spp., males, accessory genitalia, lateral view

334. _O. aniceps_ (Schneider, 1845);
335. _O. brachiale_ (Palisot de Beauvois, 1805);
336. _O. chryrostigma_ (Burmeister, 1839);
337. _O. brunneum brunneum_ (B. de Fonscolombe, 1837)
Figs. 338–341. *Orthetrum* spp., males, accessory genitalia, lateral view

338. *O. sabina* (Drury, 1770);
339. *O. trinacria* (Selys, 1841);
340. *O. ransonneti* (Brauer, 1865);
341. *O. taeniolatum* (Schneider, 1845)
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Figs. 342–345: Orthetrum abbotti Calvert, 1892; male
342. head, dorsal view; 343. hind wing; 344. accessory genitalia, ventral view; 345. the same, lateral view
Libellulidae: Orthetrum

Figs. 346–350: Orthetrum spp., vulvar area of females

346. O. brunneum brunneum (B. de Fonscolombe, 1837);
347. O. ransonneti (Brauer, 1865)
348. O. chryssostigma (Burmeister, 1839)
349. O. taeniolatum (Schneider, 1845)
350. O. anceps (Schneider, 1845)
Figs. 351–352. *Orthetrum* spp., apical half of hind wings

351. *O. bruneum brunneum* (B. de Fonscolombe, 1837);
352. *O. aniceps* (Schneider, 1845)

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Fig. 353. *Orthetrum sabina* (Drury, 1770), male,
base (S₁₋₃) of abdomen
Orthetrum brachiale (Palisot de Beauvois, 1805)

Fig. 335

Libellula brachialis Palisot de Beauvois, 1805:171.

Type Locality: Kingdom of Oware, Benin, southern Nigeria.

Male
Mouth parts greenish, middle lobe of labium and sometimes margins of lateral lobes black. Labrum greenish, with darkened margins and virgule. Clypeus and frons greenish. Frontal shield darkened.
Synthorax green; carinal black stripe very narrow; antehumeral band black, incomplete. Humeral suture narrowly black. Black stripes on inf2 and on lower half of meso-metathoracic division. Legs black. Basal half of femora with yellow streak.
Wings: Pt large; brown costal edge thick, black. Always two rows of cells in Rspl.
Subcostal cross-veins yellow. Membranula dark brown, its base clearer. Always some amber in the hind wing, immmediately bordering the membranula.
Abdomen black, with yellow lateral spots on S4-6; S7-9 usually entirely black. S10 black or with traces of yellow. Mature specimens with pale blue pruinosity. lam. ant. massive, not bifid at apex, with short hairs. Hamuli broad, with anterior hook turned posteriorly, acute at tip. Posterior hook a sinuous ridge, ending in a rounded tubercle behind the tip of the anterior hook. Genital lobe rounded or rectangular, heavy. Vesica with small sperm reservoir, hardly visible. Apical segment with large flanges and long flagellum.
Female
As male, but not pruinoscent at maturity. Vulvar aperture wide, with central crest and lateral swellings. Styli yellow.
Odonata of the Levant

Measurements (mm): Male. Total length 45–50; abdomen 30–33. Female. Total length 45–49; abdomen 29–32.

Distribution: Throughout continental Africa south of the Sahara. The species is included in this fauna on evidence of a single citation (Förster, 1909), not confirmed subsequently, from Sinai: Feiran Oasis (22), Wadi Hibran (22) and between Et Tur and Gebel el Hammam (22), March–April. Confusion with O. chrysostigma may have occurred, but the presence of the species in the area cannot be a priori excluded.

Orthetrum chrysostigma (Burmeister, 1839)
Figs. 336, 348

Libellula barbaraselys, 1849:117.

Type Locality: Tenerife, Canary Islands.

Male
Mouth parts yellow; face and frons greenish, frontal shield darkened.
Synthorax brownish-green, with narrow black antehumeral, black humeral suture, and an oblique, cream-yellow streak on mesepimerum, bordered by diffuse brown. S_{u_2}

Wings: Pt of medium size, brown, costal and radial borders thickly black. Subcostal cross-veins yellow. One or two rows of cells in Rspl. Membranula dark brown. Base of hind wing amber, sometimes reduced to a trace in the basal space only.

Female
As male, but less black on synthorax, and legs entirely brown. No lateral black spots on abdomen, except on S_{3–9}. Vulvar opening complex, constricted, angulate at the sides, with sinuous lateral folds.

Distribution: Most of Africa, including the Sahara where it is one of the commonest dragonfly species. The larva is pre-adapted to arid conditions in being able to aestivate in damp sand. The species extends through the Arabian Peninsula and the Levant to Iran, Anatolia, Iraq, Afghanistan. It is present in the Oriental region as a distinct
Libellulidae: Orthetrum

subspecies — O. chrysostigma luzonicum (Brauer). In Israel and in Sinai, it is one of the most widespread Anisoptera. In Sinai, it is probably perennial.

Israel & Sinai (Locality records): Sedé Nehemía (1), Kefar Blum (1), Kefar Hittim (2), ‘Akko (4), Nahalal (5), Tiberias (7), Tabigha (7), Bet She’an (7), Migmál (7), Lake Kinneret (7), ‘Ubeidiyya (7), ‘En Gév (7), Bitanya (7), ‘En Yeru (7), Umm Junni (7), Yarmouk River (7), Ḥadera (8), Hartuv (10), Aqua Bella (11), Wadi Qilt (13), Nahal ‘Arugot (13), ‘En Gedi (13), ‘Ein Duyuk (13), ‘Ein el Tureba (13), Nahal Dawid (13), Wadi Fari’a (13), Jericho (13), ‘En Avedat (17), Quseima Oasis (17), Yeruham (17), Wadi Hibrán (22), Wadi Lubrena (22), Wadi Isla (22), Wadi Feiran (22), Wadi Gharandal (22), Et Tur (23), ‘Ein el Furtaga (23), Abu Rudeis (23).

Orthetrum aniceps (Schneider, 1845)
Figs. 334, 350, 352

Note
This taxon has alternatively been named O. aniceps (Schneider) and O. ramburi (Selys) in the literature. Hagen (1861), who was the first revisor, decided that one of the types was a female of O. brunneum, and therewith dismissed the name. However, W. Schneider (1985d) re-examined both type specimens, and found that the second female is the same species as O. ramburi, but predates it by three years. The repeated use of the name aniceps for this taxon, until the 1950s, rules out the possibility of considering it a nomen oblivum.

Libellula aniceps Schneider, 1845: 111.
Libellula Ramburi Selys, 1848: 16.
Libellula gracilis Selys, 1887: 15.
Orthetrum ramburi —. Hagen, 1863: 195; Selys, 1887: 14.
Orthetrum aniceps —. Morton, 1924: 41; Morton, 1929: 60; Fraser, 1936: 295; Schmidt, 1938: 147; Schneider, 1985d: 97.

Type Locality: Marmaris, Turkey.

Male
Clear brown-ochraceous at emergence, with only end-rings of segments black, soon turning olivaceous, but quickly invaded by a blue pruinosity, covering the whole body. Mouth parts and face of same colour, shield of frons turning dark olivaceous in old specimens.

Legs brown in tenerals, entirely black at maturity.

Wings: Pt of moderate size, brown; subcostal cross-veins yellow. One row of cells in Rspl, rarely one or two cell doublings. At emergence, the wings may be suffused with
Odonata of the Levant

amber, sometimes as far as the nodus, but this recedes completely within the next day or two. At maturity, no trace of amber is left. Membranula pure white in western Mediterranean and North African populations. In Anatolia and in the Levant, occasional specimens have a grey or light brown membranula. In specimens from Iran and Afghanistan, a brown membranula is the rule. Indian populations have, again, a white membranula.

Accessory genitalia: lam. ant. erect, pointed, bifid apically. Hamuli with anterior hook narrowly pointed, small, above the level of the posterior hook, outwardly pointed. A deep embayment between anterior and posterior hook. The latter a rounded ridge, variable in width with rounded tip. Genital lobe rounded. Appendages brown in juveniles, black in adults. Vesica spermatis with long, rounded flanges and a flagellum.

Female

More robustly built then male. Pt longer. Abdomen brown at maturity, slightly pruinose. Usually a trace of amber at base of the hind wing. Vulvar aperture: lips strongly swollen, produced medially into a tubercle, so that the vulvar opening appears as a U-shaped invagination between the two lips.


Distribution: North Africa, the Levant, Anatolia, the Balkan coasts and the major Mediterranean islands, but not on the Iberian Peninsula (except perhaps the extreme south). Extending east as far as Afghanistan and India. Extremely common in the Levant. Replaced in Europe by O. coerulescens (Fabricius) with which introgression appears possible in S. Spain and in the Balkans.


Orthetrum abbotti Calvert, 1892
Figs. 342–345


Type Locality: Mount Kilimanjaro, Kenya.

Male

Mouth parts yellow, labium with central black line. Clypeus and frons greenish. Frontal shield darkened. A thick black line at base of frons. Synthorax green, with narrow black sutures, soon invaded by azure blue pruinosity. Legs black, base of femora yellow.

Wings: Pt relatively large, dark yellow; subcostal veins yellow; one row of cells in Rspl, occasionally one or two cell doublings. Membranula dark, hind wing with basal amber.

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**Libellulidae: Orthetrum**

Abdomen: in juveniles $S_5$–$S_7$ broadly yellow dorsally, black laterally; $S_8$ black with yellow lateral stripe; $S_9$ almost completely black. Anal superior appendages straight, black. Accessory genitalia: lam. ant. deeply bifid at apex, with short spines and few hairs. Hamuli: anterior hook long, bent over backwards, finely pointed, with tip turned outwards. Posterior hook a sinuous ridge, rounded posteriorly, much lower than anterior hook. Genital lobe rounded or squarish.

**Female**

Head like male. Vulvar aperture simple, triangular, lips slightly swollen laterally. One of the smallest species of *Orthetrum*.


Distribution: Most of Africa south of the Sahara.

A single male was found in Wadi Mujib (Nahal Arnon), Jordan, on 17.VIII.1941 (leg. H. Bytinski-Salz) (Dumont, 1977d). It was exceptionally small; total length 30.5 mm; abdomen 20.5 mm.

**Orthetrum taeinolatum** (Schneider, 1845)

Figs. 341, 349

*Libellula taeinolata* Schneider, 1845:111. Hagen, 1863:195; Selys, 1887:17.


Type Locality: Kellemisch (Gelemish), western Anatolia, Turkey.

**Male**

Mouth parts yellow, face darkening towards frons. Base of frons with a black line. Synthorax brown, with creamy antehumeral line and a similar stripe on mesepimerum and metepimerum. Thoracic sutures narrowly black. Legs brown, turning black and pruinoscent blue in later life.

Wings: Pt small, rusty, bordered by thick black veins. Subcostal cross-veins yellow. One row of cells in Rspl, but cell doublings frequent, and a complete double row of cells may exceptionally occur. Membranula white in teneral, tending to become brown in mature specimens. Mature males completely blue pruinoscent.

Young males have a light brown abdomen, with characteristic mid-dorsal black stripe on $S_2$–$S_5$. Additional black basal streaks are found on $S_4$–$S_6$. Accessory genitalia: lam. ant. short, but robust, apically bifid, set with long hairs. Hamuli: anterior hook prominent, triangular, bent slightly backwards. Posterior hook with apical ridge lower and more external than in *O. chrysostigma*, opposite to tip of anterior hook.
Odonata of the Levant

Female
Coloured as teneral male, but creamy stripes on synthorax less evident, sometimes not visible at all. Vulvar aperture narrow, U-shaped, with margins thickly swollen. A rather small species.


Distribution: Eastern Mediterranean islands, Anatolia, Iran, Iraq, Saudi Arabia and, across the Red Sea, Egypt, Sudan and Somalia. The main range of the species is, however, in India. It is also rather widespread in the Levant.

Israel (Locality records): Migdal (7), Bet Zera' (7), Aqua Bella (11).

Orthetrum ransonneti (Brauer, 1865)
Figs. 340, 347

Libellula gracilis Selys, 1887:15.

Type Locality: Oasis of Et Tur, Sinai.

Male
Head uniformly pale ochraceous; synthorax and abdomen brown, without markings, except thoracic sutures and end-rings of segments. Legs brown.

Wings: Pt relatively small, ochraceous. Subcostal cross-veins black. One row of cells in Rspl. Membranula narrow, white, very finely bordered with brown. No basal amber.

At maturity, this robust species turns entirely pruinaceous blue, and the legs become black.

Accessory genitalia: lam. ant. not bifid at apex, with a few long hairs. Hamulus a triangle, with anterior hook broad at base, and tips turned outwards. Posterior hook no more than a broad basal swelling. Genital lobe large, more or less rectangular, set with long hairs.

Female
Coloured as the male in teneral condition. Vulvar aperture prominent, with deep and wide U-shaped central invagination and strongly swollen sides.

A large and robust species.


Distribution: A species typical of arid and hyperarid areas, found in Egypt, Sudan, the Tibesti mountains (Chad Republic), the Hoggar and Air mountains (Algeria and Niger), and the Libyan desert. In Asia it extends from Sinai, probably through Saudi Arabia and eastern Jordan, to eastern Anatolia, Iran, and Afghanistan.

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Israel & Sinai (Locality records): ‘Ein Murra ['En Avedat] (17), ‘En Gedi (13), Qadésh Barnéa' (17), HaMakhtesh HaGadol (17), El Tur (23). Capture dates range from April to September.

Orthetrum brunneum brunneum (B. de Fonscolombe, 1837)

Figs. 337, 346, 351

Libellula anceps Schneider, 1845:111 (texte Hagen, 1863).
Orthetrum brunneum —. Ris, 1910:189; Morton, 1924:41; Gadeau de Kerville, 1926:80; Schneider, 1981a:140.

Type Locality: Provence, France.

Male
Teneral male with head uniformly pale brown. At maturity clypeus and frons grey-blue. Legs brown, black at maturity.
Synthorax clear brown, with short antehumerals, and two clear lateral stripes on the epimeres. Thoracic suture black.
Wings with Pt brown, subcostal cross-veins yellow, and two rows of cells in Rspl. No trace of wing amber. Membranula pure white, rather broad.
Abdomen brown, with black end-rings, a pair of cuneiform black spots in front of the end-rings, a narrow black carinal stripe, and black stripes at the sides of the abdomen. At maturity, thorax and abdomen entirely blue pruinose. Accessory genitalia: lam. ant. small, very shallowly bifid, bearing very short hairs. Hamuli prominent anterior hook with an incursion at about half its length, apex upright and tip turned outwards. Posterior hook a semicircular crest, rounded, lying well below apical hook. Genital lobe rounded, hairy.

Female
As the teneral male; sides of S3 rather strongly foliuate. Vulvar aperture reminiscent of that of O. ransonneti.


Distribution: Found all around the Mediterranean Sea, North Africa, West and Central Europe, the Balkans. Extremely common in Anatolia and in the Levant. May–August.

Israel & Sinai (Locality records): Tiberias (7), Gesher (7), Hartuv (10), Bethlehem (11), Jerusalem (11), Aqua Bella (11), Jericho (13), Quseema Oasis (17), ‘En Avedat (17), Ramat Magshimim (18), Mount Hermon (19), Wadi Talh (22).

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Orthetrum sabina (Drury, 1770)
Figs. 338, 353

Lepthemis sabina —. Brauer, 1866:104.
Libellula ampullacea Schneider, 1845:110.
Orthetrum sabina —. Morton, 1924:42; Andres, 1928:30; Schmidt, 1938:148; Dumont, 1977b:158.
Orthetrum sabina ampullacea —. St. Quentin, 1965:543 (lapsus calami).

Type Locality: "China".

Male
Mouth parts yellow, face grey, with front of frons black. Legs black, flexor side of femora with long yellow streak.
Synthorax green, with black carina, black antehumerals, humeral suture broadly black and sinuous, and Su₂ equally black. Between these sutures are located two additional oblique black stripes, and a third one behind Su₂. However, there is considerable variation in the degree of development of these stripes, especially the hind one. In very old specimens, the synthorax may turn largely brown, leaving no more than a yellow-green stripe on the mesepimerum.
The wings have a fairly large ochraceous Pt, two rows of cells in Rs₁, the apices sometimes narrowly envenomed in old specimens, and a large dark brown membranula with adjacent amber in the hind wing.
The abdomen is green-yellow and black, with typically 4 dorsal and 2 lateral green spots on S₂, lateral spots on S₃-₆, S₇-₉ entirely black, S₁₀ greenish-yellow and appendages whitish-yellow, but all these may become obliterated with age, leaving only the superior appendages yellow. In side view, S₁-₂ are bulbously swollen, constricted distally. S₃ is very narrow and cylindrical; the abdomen widens again at S₇-₉ but much less strongly than at its base. Accessory genitalia: lam. ant. with a very conspicuous tuft of long reddish hair, not bifid at its apex. Hamulus massive, with anterior hook small, surmounted by a ridge that runs anterior to it. Genital lobe rounded, hairy.

Female
Coloured much like the male, but generally paler. Vulvar aperture with lips widened at sides. Styli yellow.

Distribution: North-east Africa, and most of Asia, reaching Australia.
Locally common in Israel and Sinai. May–August.
Israel & Sinai (Locality records): Hula (10), Haifa (3), Bet She’an (7), Rosh Ha’Ayin (8), Sabkhat el Bardawil (20), Et Tur (23), Abu Rudeis (23).
Libellulidae: Nesciothemis

Orthetrum trinacria (Selys, 1841)

Fig. 339

Libellula brevii Rambur, 1842:48.
Lepthemis trinacria — . Selys, 1887:11.

Type Locality: “Sicily”.

Male

Labium and labrum yellow. Frons with black basal line, and a black line in central groove.
Thorax greenish with thin black antehumeral and sutural lines. Legs black.
Wings: Pt long and yellow. Subcostal cross-veins yellow. Rspl with two rows of cells.
No basal amber. Membranula dark.
Abdomen long and slender. S1-2 in lateral view swollen, constricted towards base of S3. Unlike in O. sabina, the constriction continues on S3. In juveniles abdomen yellow, copiously marked with black on carina, sides, and end-rings. Anal appendages long, black. At maturity, thorax and abdomen coated with blue pruinosity. Anterior lamina bifid at apex, with spines and hairs. Hamulus rather like in O. sabina with anterior hook small, surmounted by a ridge. Genital lobe rounded. Vesica spermalis with slender apical alae.

Female

Much like the immature male. Legs yellow, with black stripes. Styli black, exceptionally long, about twice the length of S10. Foliations inconspicuous, vulvar aperture with lips widened laterally.
A large species, with very long and slender abdomen.

Measurements (mm): Male. Total length 54–59; abdomen 40–44. Female. Total length 53–58; abdomen 38–42.

Distribution: Most of Africa, including many sites in the Sahara and the Maghreb countries, Egypt, the Levant, and Anatolia. Most of the major Mediterranean islands. Israel (Locality records): Sedé Neḥemya (1), Rosh Pinna (1), Ḥula (1), Kerach (7), Rosh HaʿAyin (8).

Genus NESCOIOTHMS Longfield, 1955


Type Species: Orthetrum farinosum Förster, 1898.

Closely related to Orthetrum, from which it differs (Figs. 354–355) in having the vertex rounded; the frons short in depth in front and with two oval depressions; the
clypeus wider than the front of the frons (measured in a vertical direction); the posterior lobe of the pronotum deeper than wide or as deep as wide; the anterior lamina low, hook-shaped and short; the genital lobe very small and inconspicuous; and the vesica spermaralis devoid of a flagellum and flanges.

One species is regional.

Nesciothemis farinosum ( Förster, 1898)

Fig. 356


Type Locality: Komatipoort, Transvaal, South Africa.

Male
Labium yellow, moderately darkened. Labrum black with yellow margins. Clypeus, frons, and vertex dark, shiny.
Synthorax with carina broadly yellow, humeral suture narrowly black, intermediate space chocolate brown. Sides of synthorax green. Legs greenish-yellow.
Wings: Pt long, ochraceous between thick black nervures; 2 rows of cells in Rspl.
Membranula white, with brown margins. No trace of basal amber. Tips of wings slightly enfumed.
Abdomen brown, end-rings of segments black. Some lateral black stripes, especially on the distal half of the abdomen. At maturity, all these colours and markings disappear below a blue pruinescence. Accessory genitalia: lam. ant. backturned; posterior hook large, massive, rounded. Genital lobe very small, elongate. Reservoir of vesica spermaralis emerging between the two lobi; apex without flanges or flagellum.

Fig. 356: Nesciothemis farinosum (Förster, 1898); male, accessory genitalia, lateral view
Libellulidae: Libellula

Female
Coloured as the teneral male, but Pt even larger, and tips of wings distinctly clouded. Vulvar aperture wide, flat, lips slightly swollen dorsally. Styli black. Foliation on S₈ well developed.


Distribution: Widely distributed over continental Africa, and occasionally found in Egypt. No records from Israel or Sinai, but a citation from Suez (Morton, 1929) suggests that the species might occur in the Sinai desert.

Genus LIBELLULA Linnaeus, 1758
Systema Naturae, 10th ed., p. 543

Type Species: Libellula quadrifasciata Linnaeus, 1758.

Distribution: Europe, Central and Northern Asia, Japan, and North America.
Two species are regional. A third, migratory one (L. quadrifasciata L.) is widespread in Europe and North America, and has been found in north Anatolia but not yet in the Levant.

Key to the Species of Libellula
(Figs. 357–360)

1. Forewing with a very fine amber streak between Cu and A, and some amber between Sc and R + M, not exceeding level of arc. Hind wing with brown coloured spot along the membranula, not exceeding level of arc.
   Abdomen rather triangular, not markedly depressed. Libellula pontica (Selys)
   Forewing with dark brown streak extending between Sc and A from wing base to base of d. Hind wing with broad triangular, brown spot between Sc and wing margin, reaching midway between wing base and N, not including d.
   Abdomen wide and markedly depressed. Libellula depressa (Linnaeus)
*Odonata of the Levant*

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Figs. 357–358: *Libellula* spp.
357. *L. pontica* (Selys, 1887), female;
358. *L. depressa* Linnaeus, 1758; male.

Type L
Libellulidae: Libellula

Figs. 359–360: Libellula spp., male, accessory genitalia, lateral view
359. L. depressa Linnaeus, 1758; 360. L. pontica (Selys, 1887)

Libellula pontica (Selys, 1887)
Figs. 357, 360

Libellula fulva race pontica Selys, 1887: 12.
Libellula consplicata Schneider, 1845: 110.

Type Locality: Lake Hula, Israel.

Male
Mouth parts bright ochraceous. Clypeus olivaceous. Frons rusty.
Synthorax dull olivaceous, hairy. Legs brown, darkened outwardly.
Wings: Pt black. Main veins reddish, cross-veins yellowish or black. Base of forewings with fine outer streak in subcostal and in cubital area, basal to arc. Hind wing with similar amber in subcostal space, and small basal wing spot: cells filled in with brown, nervures amber. Membranula white. Wing tips hyaline.
Abdomen triangular, reddish-brown, with narrow carinal black. Appendages reddish.
Accessory genitalia: lamina depressed; hamuli with strong inner anterior hook, pointed, curved posteriad, and rounded posterior outer hook. Genital lobe small, longish, somewhat twisted and hollowed-out. Adult males may become pruinose blue on abdomen.

Female
Coloured as the male, but carinal black stripe on abdomen wide, especially on S7–9.
Vulvar aperture: lips triangularly produced around U-shaped invagination, the bottom of which presents 2 secondary tubercles. Floor of S7 under the U triangularly produced backwards.

Odonata of the Levant

Distribution: Anatolia, N. Iraq, Iran, Syria, the Lebanon, and reaching N. Israel. Israel (Locality records): Lake Hula (1), Jabal Jarmak (Har Meron, 1), Meron (1), Sedé Nejemya (1), Dan (1), Benot Ya'aqov bridge on Jordan River (1), Qishon plain (5).

Note
This species is an eastern vicariant of the European Libellula fulva Müller, from which it differs in minor characters only, so that it is often considered as a subspecies of the latter.

Libellula depressa Linnaeus, 1758

Figs. 358–359


Type Locality: “Southern Sweden”.

Male

Female
Differs from the male in that the abdomen is even more depressed and not pruinose. Dorsum centrally brown, this colour triangularly narrowing from base towards tip, covering the whole breadth of the segment at the base, not more than a carinal stripe at the apex. Sides broadly yellow. Styli as long as S 10, brown. Vulvar aperture: lips strongly swollen, vulvar opening broadly U-shaped.


Distribution: A spring species, found in Europe, Asia Minor, Syria, the Lebanon. It reaches the limit of its southern extent in Lebanon: Beirut (Morton, 1924). Specimens have, however, been collected from Mount Hermon, Birkat Naqar (19), 22.VI.1971 (Leg. J. Kugler), and from Newe Ativ (19).
Genus SYMPETRUM Newman, 1833

Entomologist's mon. Mag., 1:511

Type Species: *Libellula vulgaris* Linnaeus, 1758.

Rather small dragonflies, coloured yellow, brown or reddish with black markings, and wings hyaline or marked with brown and yellow. Pronotum with very strongly developed posterior collar, fringed with long hairs. Legs long and slender. Abdomen cylindrical or triquetral in cross-section, $S_8$ not dilated in the female. Genitalia variable and species-specific in both sexes. Wings relatively short and broad, reticulation rather open. d in forewing narrow, traversed. D in hind wing situated at base of arc. Sectors of arc shortly fused in forewing, but with longer fusion in hind wing. arc situated between an, and an2. Distal antenodal cross-vein incomplete. 7–9 antenodals. Discoidal field with 3 rows of cells throughout, contracting near wing margin. Rspl with 1 or 2 rows of cells. Membranula moderately large.

Distribution: Europe, Central and Northern Asia, and North America.

Five, possibly six species are regional. No less than 11 species occur in Anatolia.

*Key to the Species of Sympetrum*

(Figs. 361–388)

1. A broad stria traverses both wing pairs in the area of pterostigma.

   - No brown stria across the wings in their apical third

   **Sympetrum pedemontanum** (Allioni)  

   2

   - Legs entirely black.

   **Sympetrum sanguineum** (Müller)  

   3

   - Legs largely yellow or black with external yellow stripe

   **Sympetrum foncolombei** (Selys)  

   4

   - Hind wing with only a trace of basal amber. Vulvar aperture of female not or only very shallowly hollowed-out medially

   **Sympetrum meridionale** (Selys)  

   5

   - Synthorax copiously marked with black

   **Sympetrum decoloratum sinaticum** Dumont

   6

   - Both sexes: a black dorso-lateral stripe on $S_2$–$S_3$. Male: hamuli with inner hook small, depressed, shorter than outer hook. Ventral angle on app. sup. well defined; tip of app. inf. reaching well beyond it.

   Female: vulvar aperture broad, shallowly excavated medially, but only slightly prominent in side view.

   **Sympetrum striolatum striolatum** (Charpentier)
Figs. 361–365: Sympetrum meridionale (Selys, 1841)
361. synthorax, lateral view; 362. male appendages, lateral view;
363. male accessory genitalia, lateral view;
364–365. vulvar area and terminalia, female, ventral and lateral views
Libellulidae: *Sympetrum*

Figs. 366–369: *Sympetrum fonsecolmbei* (Selys, 1837)
366. synthorax, lateral view; 367. male appendages, lateral view;
368. male accessory genitalia, lateral view;
369. female terminalia and vulvar area, ventral view
Figs. 378–382: *Sympetrum striolatum striolatum* (Charpentier, 1840)

378. synthorax, male; 379. male terminalia, lateral view;
380. male accessory genitalia, lateral view;
381. female terminalia and vulvar area, ventral view; 382. the same, lateral view
Figs. 383–385: *Sympetrum sanguineum* (Müller, 1764)
383–384. female terminalia and vulvar area, ventral and lateral views; 385. male accessory genitalia, lateral view

Figs. 386–388: *Sympetrum pedemontanum* (Allioni, 1766)
386–387. female terminalia and vulvar area, ventral and lateral views; 388. male accessory genitalia, lateral view

*Type Location*

**Male**
Head: laterally flanked by a conspicuous black spot
Wings: hyaline

**Abdomen:** broad black band

**Appendages:** rounded and elongate

**Female**
Even pale

**Measurements:** S₂ and S₃ length 35

**Distribution:** east as Kfar Hadera (Israel)
Libellulidae: Sympetrum

Sympetrum meridionale (Selys, 1841)
Figs. 361–365

Libellula meridionalis Selys, 1841:245.
Diplex meridionalis — Brauer, 1868:370; Gadeau de Kerville, 1926:80.

Type Locality: Island of Sardinia, central Mediterranean.

Male
Head: labium yellow, labrum ochraceous, clypeus greenish, frons ochraceous. Base of frons with a black stripe.
Synthorax olivaceous or green-yellow with very reduced black markings. Carina often flanked by a dorsally narrowing stripe on either side; antehumeral stripes brown, rarely absent. Humeral sutures and Su; only very narrowly black, with a dense-shaped black spot on their upper third only. Legs bright yellow except for internal (flexor) surface, which is black.
Wings hyaline, with a trace of basal amber. Membranula white or grey, bordered by a conspicuous black nervure. Pt brown.
Abdomen yellow to brilliant red on dorsum, according to age. End-rings black. S1 with broad black basal stripe. Paired black dots on each segment. Anal appendages red.
Appendages: tips of inferiors just surpassing the level of the ventral angle in the superiors. Accessory genitalia: lam. ant. excavated, low. Hamuli: outer branch long, rounded at tip, inner branch even longer, acutely pointed at tip, upright. Genital lobe elongate, hairy.

Female
Even paler than the male. Ground colour more yellow or ochraceous than red. Basal lateral stripes on S1–9 narrow. A narrow carinal black stripe, somewhat widened on S2 and S3 only. Styli ochre-coloured.


Distribution: South Europe, North Africa and, through Asia Minor, extending as far east as Kashmir. A summer species, relatively common in the Levant. Not found in true desert country. April–September.
Israel (Locality records): Nazareth (2), Qishon marshes (5), Migdal (7), Deganya (7), Hadera (8).
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*Sypetrum fonscolombei* (Selys, 1837)
Figs. 366–369

*Libellula fonscolombei* Selys, 1837: 23.
*Libellula fonscolombii* — Selys, 1840: 49; Hagen, 1863: 196.
*Libellula erythronota* Schneider, 1845: 111.
*Dipact fonscolombei* — Brauer, 1866: 104; Gadeau de Kerville, 1926: 80.
*Sypetrum fonscolombii* — Selys, 1887: 9.

Type Locality: Aix-en-Provence, France.

**Male**
Labium yellow, labrum ochre, later turning red. Clypeus greenish, frons reddish-brown. A broad black stripe at base of frons. Vertex and occiput yellow, with reddish sheen. In mature specimens, the whole face turns bright red.
Synthorax greenish, with reddish-brown sheen in mature specimens, coated with long hairs. Usually no antehumeralis. Sutures marked with black, a long black streak on meso-metathoracic suture. Legs black, external (extensor) surface with bright yellow stripe.
Wings: main veins yellow in tenerals, red in adults. Base of all wings with amber, forming a medium-sized spot on hind wing. Membranula white or pale grey.
Abdomen bright ochraceous at first, turning blood red at maturity. Some black on the dorsum of S.1 and top and sides of S.2. Dorsum of S.6.4 also with carinal and lateral black stripes. In mature specimens, basal lateral stripes may extend to S.2-4 and to S.8. In desert environments, however, very pale forms may occur, in which only the dorsum of the segments turns red, the sides remaining pale yellow. Anal appendages long and slim, yellow, later bright red. Accessory genitalia: lam. ant. very low, shallowly excavated, black. Hamuli small, with broad, short outer ramus, and much shorter pointed inner ramus. Genital lobe yellow, elongate, hairy.

**Female**
Ground colour as that of the juvenile male, rarely turning red. Abdomen more copiously marked with black; a basal black stripe at the sides of the abdomen runs posteriad, gradually narrowing along its course. A second series of black stripes occurs on the flanks, and extends from S.6.4, while it is vestigial on S.1. A carinal black spot present on S.6.5 and S.7, and a fine line on S.10. Vulvar aperture reminescent of an Orthetrum: only slightly projecting laterally, the lips are swollen, and a deep U-shaped invagination is found in the centre.


Distribution: South and East Europe, occasionally reaching Western Europe. The whole of Africa, and extending into Asia as far east as Kashmir. Very widely distributed in the Levant. April–October.
Libellulidae: Sympetrum

Israel & Sinai (Locality records): Dan (1), Bet Zera' (7), Gesher (7), Rosh Ha'Ayn (8), Ashqelon (9), Jerusalem (11), Nizzana (15), Birkat Ram (18), Wadi Feiran (22), Wadi Tayiba (23).

Sympetrum decoloratum sinaicum Dumont, 1977
Figs. 370-377

Sympetrum decoloratum Selys, 1884:35. Ris, 1911:629 (pars).
Sympetrum decoloratum —. Le Roi, 1915:614; Ris, 1911:645; Lacroix, 1924:219; Morton, 1924:43.

Type Locality: Oasis of Tozeur, Tunisia.

Male
Face yellow, frons somewhat darkened. Some black at base of vertex. Synthorax olivaceous, marked with black on sutures as in Fig. 372. Antehumeral diffused or absent. Stripe on meso-metathoracic suture narrow. Legs yellow, flexor side black.
Wings: venation dark brown, costa lighter. No more than a trace of amber at the base of the wings.
Abdomen yellow, turning reddish-brown with pale sides, marked with lateral black stripes as in Fig. 370. A distinct dorso-lateral stripe on S 2-3. No mid-dorsal black markings on S 5-9. Accessory genitalia: lamina depressed. Hamuli small, with outer branch broad at base, slightly tapering towards apex, rounded. Inner branch short, curved, pointed. Genital lobe rounded, somewhat elongate. Appendages: superiors bright ochraceous. Tips of inferiors black. Inferiors extending well beyond the ventral angle in the superiors.

Female
Straw-coloured like the teneral male, but antehumeral at least vestigial, and sides of abdomen more copiously marked with a (partially) double row of black stripes (Fig. 371), and mid-dorsal black markings on S 5-9 present. Vulvar aperture: not prominent laterally, slightly raised, with straight or shallowly concave posterior margin.
Distribution: The nominal subspecies (type locality: Tartum) is found in eastern Anatolia, part of the Caucasus, Iran, Turkestan, Afghanistan and probably also elsewhere in Central Asia. Ssp. sinaicum extends from southern Tunisia and the Algerian Sahara, through Libya and Egypt, to Sinai. In the west, it probably reaches the Iberian Peninsula, although it has not yet been recorded from Morocco.
The nominal subspecies is smaller and both subspecies appear to be separated by a gap across the ‘Arava, Jordan, Litani and Orontes Valleys, but possibly the species
Odonata of the Levant

has been overlooked in intermediate localities. Specimens in the collection of “Beth Gordon” (Kibbutz Deganya A) identified as S. decoloratum by Erich Schmidt (Bitanya, 15.V.1931), if confirmed, would support this hypothesis. Flight records range from May to September.

Sinai (Locality records): Wadi el Arbain (22), Gebel Katharina (22).

**Sympetrum striolatum striolatum** (Charpentier, 1840)

Figs. 378–382

*Libellula striolata* Charpentier, 1840: 78; Schneider, 1845: 112; Hagen, 1863: 196.

*Diplax striolata* —. Gadeau de Kerville, 1926: 79.

*Sympetrum striolatum* —. Selys, 1887: 10; Ris, 1911: 631; Morton, 1924: 43; Schmidt, 1961: 427; St. Quentin, 1964c: 50; St. Quentin, 1965: 544.


Type Locality: “Silesia”.

**Male**

Mouth parts yellow; face greenish, totally unmarked. A black bar between frons and vertex (yellow), not descending along the margins of the compound eyes. Occiput brown-yellow.

Synthorax: front brown, with yellow elongated antehumeral stripes in teneral, later obliterated as the front of the synthorax turns uniformly brown or reddish-brown. S$_1$ and S$_2$ broadly black, and intermediate anastomosing black markings on a bright yellow background as in Fig. 378. Legs: tibiae yellow, flexor sides darker than extensor sides. Flexor side of femora black, extensor side with fine yellow stripe.

Wings with base narrowly and diffusely clouded with amber. Membranula white. Pt brown.

Abdomen brown, later bright red, with black dots near the top of each segment. A basal line along the abdominal segments, and lateral stripes on S$_{6-9}$. Appendages ochre-coloured, later turning red. Superiors with ventral angle weakly developed, lined with a row of black spines. Inferiors ochre-coloured as well, with their tip at the level of the ventral angle in the superiors, or only very slightly beyond it. Accessory genitalia: lamina low. Hamuli with outer branch apically tapering but blunt. Inner branch long, upright, finely pointed at its apex, the latter slightly curved backwards. Genital lobe massive, rounded.

**Female**

Coloured somewhat like the teneral male, but all colours more dull and less contrasting (e.g. the side of the synthorax with olivaceous rather than yellow tinges). Abdomen brownish with a basal lateral black stripe and fine lateral black streaks that widen towards the terminal segments. No dorso-lateral black streaks on S$_1$–3. A fine carinal black stripe and fine lateral black streaks that widen towards the terminal.
segments. No dorso-lateral black streaks on $S_{2-3}$. A narrow carinal black stripe, widening on $S_{8-9}$. Vulvar aperture very broad, prominent in side view, with shallow median excavation.


Distribution: The Maghreb countries, Europe and, across Anatolia, eastwards as far as Kashmir. In Central Asia, a distinct subspecies ($S. s. pallidum$) is found. Anatolian records refer to the nominal subspecies and are summed up in Dumont (1977b). Locality records: The species has been recorded from pine-woods at Brummana, the Lebanon (Gadeau de Kerville, 1926) and recently also from Qusbiya (18).

**Sympertrum sanguineum** (Müller, 1764)

Figs. 383–385


*Diplax sanguinea* — Brauer, 1868:720.

*Sympertrum sanguineum* — Meyer-Dör, 1874:328; Selys, 1887:9; Ris, 1911:643; Morton, 1924:43; St. Quentin, 1964c:50; Dumont, 1977b:160.

Type Locality: “Denmark”.

**Male**

Mouth parts and face clear in young specimens, turning red at maturity. Labrum with fine black margin and rudimentary black virgule. A broad black band at the base of the frons.

Synthorax brownish, hairy, reddish at maturity, rather heavily marked with black especially along humeral suture. No antehumerals, but anterior margin of pronotum and synthorax very broadly black. Legs entirely black, except for their extreme base.

Wings: venation black. A well-defined amber spot at the base of the hind wing, reaching the cubital cross-vein. Membranula white or light grey.

Abdomen ochraceous, later turning bright red. $S_{8-9}$ with narrow carinal black markings, sides with black streak from $S_{9}$ onwards, but tending to extend on ventrum rather than on sides. Appendages brown, turning red. Inferiors short, their tip at the level of the angle in the superiors. Accessory genitalia: lamina depressed. Hamulus with broad base. External ramus rather long, rounded; internal hook longer, slightly tumbid at base, very sharply hooked. Genital lobe rounded, longish.

**Female**

Coloured like the teneral male; front of synthorax often brown or olivaceous, sides yellow or green. Flanks of abdomen with a single broad basal stripe. Vulvar aperture produced into a slightly bifid point.

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Distribution: Most of Europe, North and Central Asia, North Africa. In eastern Anatolia and the Caucasus, a distinct subspecies, S. s. armeniacum (Selys), is found. May–October.
Israel (Locality record): Hula (1).

Sympetrum pedemontanum (Allioni, 1766)
Figs. 386–388

Libellula pedemontana Allioni, 1766: 194.
Diplax pedemontana —. Brauer, 1868: 720.
Sympetrum pedemontanum —. Meyer-Dür, 1874: 328; Selys, 1887: 975; Bodenheimer, 1937: 231;

Type Locality: Area of Torino, Italy.

Male
Mouth parts yellow, central lobe of labium at times black. Face greenish. Base of frons broadly black.
Front of synthorax brown, sides greenish-yellow. Spot on upper part of humeral suture thickened, on meso-metathoracic suture narrow or absent. Legs black.
Wings with close apical reticulum, and transverse black band, the outer margin of which touches the proximal end of Pt. Some basal wing amber present. Membranula white.

Female
Coloured as the teneral male, but contrast between brown front and yellow sides of synthorax stronger, and base of segments with very broad black band, extending to ventrum of segments. S₈–₉ with carinal black stripe. Vulvar aperture: lip produced laterally; medial opening U-shaped with oblique walls. Floor of S₉ produced backwards, tip rounded.
A small species.

Distribution: Most of Europe, North and Central Asia. Recorded by Selys (1887) from several localities in Anatolia, and by Akramowski (1948) from the Armenian S.S.R. No precise records from the Levant are available, but its occurrence as far south as the Jordan Valley is conceivable. June–September.
Genus *Crocothemis* Brauer, 1868


Type Species: *Libellula servilia* Drury, 1770.

Moderately-sized, robust dragonflies. Males coloured uniformly red, females brownish. Pronotum with small posterior lobe. Legs rather short. Abdomen depressed. Wings hyaline or partly coloured at base. Reticulation close, d in forewing narrow, usually traversed; in hind wing with base at arch, usually entire. arc situated between an. and an2. Distal antenodal cross-vein incomplete. 14 an. Discoidal field begins with 3 cell rows, divergent at wing margin. Pt and membranula large. Accessory genitalia of male: lamina depressed; base of hamuli rectangular, with outer branch narrowing distally in side view, foliate in ventral view; inner hook strongly curved, with one to several apical and subapical spines. Genital lobe elongate oval, bent over backwards. Females without foliations on S8, vulvar valves long.

Distribution: Africa, Europe, Asia and Australia. Recently also found in the south of the U.S.A. (introduced?). Two species are regional.

**Key to the Species of Crocotethmis**

(Figs. 389–403)

1. Small species, with abdomen rather narrow (2.5–3 mm in width) and Pt under 3 mm in length. Lateral carina of abdomen with relatively few denticles, e.g. S3 with 10–12 denticles. Abdomen of male deep red, with at least traces of black lateral lines on some segments. Interior branch of hamulus visible in lateral view. Genital lobe elongate. Female with vulvar scales scoop-shaped, massive, reaching near to the tip of S9.

   *Crocotethmis sanguinolenta arabica* Schneider

   - Large species, with abdomen depressed (over 3 mm in width), and Pt over 3 mm in length. Lateral carina of abdomen with more denticles, e.g. S3 with 17–22 denticles. Abdomen of male deep red, without any black, except on carina of S9–9. Interior branch of hamulus not visible in lateral view. Genital lobe rounded or squarish. Female with vulvar scales scoop-shaped but short, rarely emerging beyond S9.

   - Wing apexes smoky; costal and subcostal fields suffused with yellow. Male: inner branch of hamulus with a single apical hook. Vesica spermatheca with prominent apical vesicle, with upturned apex. Female: valvulae vulvae with a basal swelling, directed apically.

   *Crocotethmis servilia* (Drury)

   - Wing apexes, costal and subcostal fields hyaline. Male: inner branch of hamulus with bifid apex. Vesica spermatheca with median apical vesicle largely hidden behind protruding lateral walls of basal capsule. Female: valvulae vulvae with weakly developed basal swelling, pointing posteriad.

   *Crocotethmis erythraea* (Brulle)
Figs. 389–390: Crocothemis spp., males
389. C. erythraea (Brulle, 1832);
390. C. servilia (Drury, 1770)
Figs. 391–392: *Crocothemis erythraea* (Brullé, 1832), male, accessory genitalia, ventral and lateral views.

- 393. *C. servilia* (Drury, 1770);
- 394. *C. sanguinolenta* (Burmeister, 1839);
- 395. *C. erythraea* (Brullé, 1832)
Figs. 396–397: Crocothemis sanguinolenta arabica (Schneider, 1982), male, accessory genitalia, ventral and lateral views
Libellulidae: Crocothemis

Figs. 398–401: Crocothemis spp., female, terminalia and vulvar area, ventral and lateral views
398–399. C. servilia (Drury, 1770);
400–401. C. erythraea (Brullé, 1832)
(after Schneider, 1984)

Figs. 402–403: Crocothemis sanguinolenta arabica (Schneider, 1982), female, terminalia and vulvar scales, ventral and lateral views
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**Crocothemis erythraea** (Brullé, 1832)
Figs. 389, 391–392, 395, 400–401

*Libellula erythraea* Brullé, 1832: 102.

Type Locality: Messenia, Greece.

**Male**
Labium ochraceous to reddish. Face, frons, vertex orange to red.
Thorax brown to red. Legs ochraceous or brown.
Wings hyaline, venation reddish. An amber patch at base of hind wing, almost reaching an, and down almost to anal angle. Pt long, yellow or brown.

**Female**
Coloured as teneral male, yellow when immature, brown or olivaceous when mature.
Vulvar valvulae erect, triangular, pointed posteriorly, but rather short, not extending beyond S9. A weakly developed basal, lateral swelling points posteriorly.
Measurements (mm): **Male**. Total length 37–43; abdomen 21–28. **Female**. Total length 36–42; abdomen 21–28.

Distribution: Africa, Southern Europe, Asia Minor, and the Levant. In South-East Asia occurs *C. servilia* (Drury), which is closely related to *C. erythraea*. A dwarf subspecies from Iraq was described by Morton as *C. erythraea chaldaeorum*. *C. erythraea* is very common in Israel, on various types of waters. March–October.
Israel & Sinai (Locality records): Lake Hula (1), Hulata (1), Sedé Nehemya (1), Gonén (1), Ma'agan Mikha'el (4), 'Akko, (4), Nahalal (5), Deganya (7), Tabigha (7), Bet She'an (7), Tel Aviv (8), Rosh Ha'ayin (8), Hadera (8), Qiryat 'Anavim (11), 'En Gedi (13), 'En Avedat (17), Et Tur (23), Gebel Katharina (22).

**Crocothemis servilia** (Drury, 1770)
Figs. 390, 393, 398–399

*Libellula servilia* Drury, 1770: 112.
*Crocothemis servilia* — Brauer, 1868: 737; Lohmann, 1981: 113; Schneider, 1985b: 82.

Type Locality: “China”.

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**Male**
Colored more reddish.
Wings reddish or amber.
Abdomen brown or amber.
**Female**
Colored as male.

**Male**
Labium ochraceous to reddish. Face, frons, vertex orange to red.
Thorax brown to red. Legs ochraceous or brown.
Wings hyaline, venation reddish. An amber patch at base of hind wing, almost reaching an, and down almost to anal angle. Pt long, yellow or brown.

**Female**
Coloured as teneral male, yellow when immature, brown or olivaceous when mature.
Vulvar valvulae erect, triangular, pointed posteriorly, but rather short, not extending beyond S9. A weakly developed basal, lateral swelling points posteriorly.
Measurements (mm): **Male**. Total length 37–43; abdomen 21–28. **Female**. Total length 36–42; abdomen 21–28.

Distribution: Africa, Southern Europe, Asia Minor, and the Levant. In South-East Asia occurs *C. servilia* (Drury), which is closely related to *C. erythraea*. A dwarf subspecies from Iraq was described by Morton as *C. erythraea chaldaeorum*. *C. erythraea* is very common in Israel, on various types of waters. March–October.
Israel & Sinai (Locality records): Lake Hula (1), Hulata (1), Sedé Nehemya (1), Gonén (1), Ma'agan Mikha'el (4), 'Akko, (4), Nahalal (5), Deganya (7), Tabigha (7), Bet She'an (7), Tel Aviv (8), Rosh Ha'ayin (8), Hadera (8), Qiryat 'Anavim (11), 'En Gedi (13), 'En Avedat (17), Et Tur (23), Gebel Katharina (22).

**Crocothemis servilia** (Drury, 1770)
Figs. 390, 393, 398–399

*Libellula servilia* Drury, 1770: 112.
*Crocothemis servilia* — Brauer, 1868: 737; Lohmann, 1981: 113; Schneider, 1985b: 82.

Type Locality: “China”.

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**Male**
Color more reddish.
Wings reddish or amber.
Abdomen brown or amber.
**Female**
Colored as male.

**Male**
Labium ochraceous to reddish. Face, frons, vertex orange to red.
Thorax brown to red. Legs ochraceous or brown.
Wings hyaline, venation reddish. An amber patch at base of hind wing, almost reaching an, and down almost to anal angle. Pt long, yellow or brown.

**Female**
Coloured as teneral male, yellow when immature, brown or olivaceous when mature.
Vulvar valvulae erect, triangular, pointed posteriorly, but rather short, not extending beyond S9. A weakly developed basal, lateral swelling points posteriorly.
Measurements (mm): **Male**. Total length 37–43; abdomen 21–28. **Female**. Total length 36–42; abdomen 21–28.

Distribution: Africa, Southern Europe, Asia Minor, and the Levant. In South-East Asia occurs *C. servilia* (Drury), which is closely related to *C. erythraea*. A dwarf subspecies from Iraq was described by Morton as *C. erythraea chaldaeorum*. *C. erythraea* is very common in Israel, on various types of waters. March–October.
Israel & Sinai (Locality records): Lake Hula (1), Hulata (1), Sedé Nehemya (1), Gonén (1), Ma'agan Mikha'el (4), 'Akko, (4), Nahalal (5), Deganya (7), Tabigha (7), Bet She'an (7), Tel Aviv (8), Rosh Ha'ayin (8), Hadera (8), Qiryat 'Anavim (11), 'En Gedi (13), 'En Avedat (17), Et Tur (23), Gebel Katharina (22).
Libellulidae: Crocothemis

Male
Coloured as *C. erythraea* from which it differs only in the characters stated in the key.

Female
Coloured as *C. erythraea* from which it differs in the characters stated in the key. Dimensions: Japanese specimens are large, up to 5 mm. Usually longer in total length than *C. erythraea* but examples from continental Asia seem not to differ from it in size.

Distribution: Tropical and subtropical Asia. The ranges of *C. erythraea* and *C. servilia* meet and overlap in Anatolia, possibly Iraq, and in Jordan (and Syria?).

Locality records: The only record from the Levant so far is given by Schneider (1985b); oasis of El Azrak, Jordan, 1 male, 27. V. 1980.

**Crocothemis sanguinolenta arabica** Schneider, 1982

Figs. 394, 396–397, 402–403

*Libellula sanguinolenta* Burmeister, 1839: 859.
*Crocothemis sanguinolenta* — Brauer, 1868: 737; Ris, 1911: 535; Morton, 1924: 42.
*Crocothemis sanguinolenta arabica* Schneider, 1982: 25.

Type Locality: Cape of Good Hope, South Africa.

Male
Face, legs and body yellow to ochraceous, later turning bright red. Sides of synthorax more brownish.

Wings hyaline, in old specimens with a tendency to become smoky near the apices. Venation reddish. Pt reddish-brown. Hind wing with basal amber extending to an₁ or an₂ and down to anal angle.

Abdomen bright scarlet. Incomplete black lines occur on dorsal and lateral carina of abdomen. Lateral carina with about 10–12 spines per segment on S₄-₅. Accessory genitalia: lamina and hamuli as in *erythraea*, genital lobe elongate.

Female
Coloured as the immature male, but becoming darker at old age, and black stripes on dorsal and lateral carinae of abdomen more prominent than in the male. Vulvar valves very long, projecting beyond S₁₈.

Distribution: Afrotropical.

Locality records: Morton (1924) mentions 3 males in Ris' collection from the “Dead Sea”, June 1918. I found specimens on Wadi Mujib (= Nahal Arnon) in June 1978, while 3 males are in the collection of Tel Aviv University, labeled Arnon River (13), 17.VIII.1941 (2 δ δ) and 5.VII.1941 (1 δ) (leg. Bytinsky-Salz.)

The specimens seen were all rather small, with total length 28–31 mm; abdomen 18–20 mm.
Genus *Brachythemis* Brauer, 1868


Type Species: *Libellula contaminata* Fabricius, 1793.
Medium-sized dragonflies, with rounded frons, small prothoracic hind lobes, robust synthorax. Legs rather long. Hamuli of male with long hook. S₅ in female not foliated. Vulvar valvules long. Wings short, broad, rounded. Arc proximal to an₅, 6–7 an; last an incomplete. R₃ very slightly curved. Discoidal field with parallel margins throughout its course. d in forewing free or crossed, in hind wing entire. Membranula rather large.
Distribution: Africa and Asia.
Two regional species.

*Key to the Species of Brachythemis*
(Figs. 25, 404–413)

1. Males: wings traversed by a broad black band with base at N and top 1–2 cells proximal to Pt. Females rarely with wings banded, but with Pt bicolorous (base clearer than tip). Male genitalia: hamuli with outer branch depressed, inner branch a strong, upright hook. Genital lobe set with a small number of strong stiff hairs. Female: valvules triangular, apically rounded, with V-shaped invagination. *Brachythemis leucosticta* (Burmeister) Males: brown wing spot extending from wing base to N or 1–2 cells beyond N. Females with Pt uniformly yellow or brown. Male genitalia: hamuli with outer branch swollen, rounded, and inner branch an oblique hook. Genital lobe set with numerous fine long hairs. Females: valvules triangular, apically pointed, with U-shaped invagination in the middle. *Brachythemis fuscopalliata* (Selys)
Libellulidae: Brachythemis

Figs. 404–405: Brachythemis leucosticta (Burmeister, 1839)
404. teneral male; 405. aged female
Odonata of the Levant

Figs. 406–411: *Brachythemis* spp.

406. *B. leucosticta* (Burmeister, 1839), male accessory genitalia, lateral view;
407. the same, male, anal appendages, lateral view;
408. the same, female, terminalia and vulvar area;
409. *B. fuscopalliata* (Selys, 1887), male, accessory genitalia, lateral view;
410. the same, male appendages, lateral view; 411. the same, female, vulvar lips
Figs. 412–413: *Brachythemis fuscopalliata* (Selys, 1887)
412. teneral male; 413. fully coloured male
Odonata of the Levant

Brachythemis leucosticta (Burmeister, 1839)
Figs. 404–408


Type Locality: Durban, South Africa (but also cited are Egypt and Senegambia).

**Male**
Mouth parts, face, clypeus, frons pale yellow in teneral males, tending to blacken with age.
Synthorax yellow, with elaborate black markings (Fig. 404), progressively coated with black pruinescence. In very mature males, synthorax entirely velvet blue-black. Legs yellow marked with black. In old specimens, only back surface of tibiae yellow.
Wings: venation yellow. Pt clear yellow, apex darkened in teneral males, mainly because C and R are yellow in basal 2/3, black in top 1/3 of Pt. Membrane creamy in teneral, dark grey in mature specimens. Wing spots barely visible in teneral, soon expanding and darkening to form four complete wide brown patches, basally extending to N, apically to 2 cells proximal to Pt.
Abdomen yellow, with one mid-dorsal and two sub-lateral rows of black stripes. Basal black stripes on S2, S3, and on lateral carina of S4–5. At later age, the abdomen turns darker, eventually becoming uniformly black. Appendages: superiors strongly curved, dark brown. Accessory genitalia: lam. ant. moderately raised, with short hairs. Hamuli prominent; outer branch depressed, slightly hollowed out, and the inner branch forming a strong, backwardly curved, upright hook. Genital lobe rounded, set with a small number of strong, stiff hairs.

**Female**
Strongly resembles the teneral male in head and synthorax. The hind wings often have basal amber, while Pt tends to darken with age, and become strongly bicolourous. In senescent females, it may become uniformly dark again. Wing spots either do not develop at all, or remain rudimentary. Abdominal markings differ from those in the male in that the mid-dorsal streaks are wider and the sublateral streaks narrower, split up into a series of elongated spots. Styli brownish, with black tips. Old females show a tendency towards melanism, though to a lesser degree than males. Vulvar aperture: valvules triangular, rounded apically, with a V-shaped invagination in the middle. Floor of S5 broadly rounded posteriorly.

**Measurements (mm): Male.** Total length 36–40; abdomen 20–24. **Female.** Total length 35–39; abdomen 20–23

Distribution: Africa and the Levant; rare in Anatolia, but one of the most common dragonflies of the Jordan Valley.

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Libellulidae: Brachythemis

Israel & Sinai (Locality records): Hula (1), Dan (1), Sedé Nejemia (1), Rosh Pinna (1), Migdal (7), Tabigha (7), Na‘al Samakh (7), Bet She’an (7), Kinneret (7), Deganya (7), Tiberias (7), Bitanya (7), Bet Yera‘el (7), Tel ‘Amal [Nir David] (7), Ashdot Ya‘aqov (7), Hadera (8), Rosh Ha‘Ayin (8), Et Tur (23), Sharm esh Sheikh (23).

Brachythemis fuscopalliata (Selys, 1887)
Figs. 25, 409–413

Trithemis fuscopalliata Selys, 1887:23.

Type Locality: Samawa, lower Iraq.

Male
Mouth parts yellow, face green. With age, the clypeus and frons turn dark brown. Teneral males with synthorax dark olivaceous. In front, antehumeral visible as an inverted “V”. Lateral suture of synthorax clearly marked in black. Legs olivaceous, later brown, with exterior surface black.
Wings: Pt bright yellow. Membranula dark grey. A massive brown wing spot extends on all four wings from base to nodus or 1–2 cells beyond N in forewing, 3 cells beyond N in hind wing.
Abdomen brown, with end-rings broadly black, a black longitudinal carinal stripe, and a double sublateral stripe on each side. These markings quickly obliterated by a dark brown, uniform colour. Superior appendages light brown, strongly curved; inferiors almost black. Accessory genitalia: lam. ant. with numerous very long hairs; hamulus with external ramus swollen, rounded, and inner ramus an oblique, posteriorly directed hook. Genital lobe more deeply hollowed-out at base anteriorly than posteriorly, set with numerous long, fine hairs.

Female
Paler and smaller than the male, but otherwise with similar markings. Black striae on synthorax better visible and carinal stripe on abdomen wider. Styli yellow with black tips. Vulvar aperture: valvules broadly rounded, with a V-shaped invagination in the middle. Floor of S1 rounded but strongly tapering towards its tip.


Distribution: Iraq, south-east Anatolia, Syria, and northern Israel. Levantine capture data range from May to August. The species occurs in stagnant and slow-running waters.

Israel (Locality records): Lake Hula (1).
Genus ACISOMA Rambur, 1842
Insectes Neuropteres, p. 26

Type Species: Acisoma panorpoides Rambur, 1842.
Dragonflies of small size, coloured blue marked with black, and with a characteristic shape of the abdomen. Head small, eyes only just meeting. Pronotum with large hind margin, fringed with long hairs. Thorax narrow, small. Legs rather long, slim. Genitalia of male small and inconspicuous. Vulvar scales of female long, oval, projecting obliquely. Wings short, rather broad, reticulation rather open. in forewing entire, in hind wing with base at arc, entire. Sectors of arc petiolated over a long distance. Arc between an1 and an2, 7–9 an, the distal one complete or incomplete. Discoidal field beginning with 2 rows of cells, widening towards wing margin. Rspl with 1 row of cells. Membranula small. Pt relatively large.
Distribution: Asia and Africa.
One species.

Acisoma panorpoides ascalaphoides (Rambur, 1842)
Fig. 414

Acisoma ascalaphoides Rambur, 1842: 29.
Acisoma panorpoides ascalaphoides —. Ris, 1909–1919: 458; Andres, 1928: 32.

Type Locality: “Madagascar”.

Male
Labium whitish-ochre, sometimes with black medial lobe; labrum with fine black basal line and virgule. Clypeus and frons blue-green or pale blue. Frons with broad basal black band, continued laterally along the eyes.
Synthorax light blue, green-blue or pale green, with a complicated pattern of anastomosing black spots and streaks on sutures and on plates between sutures. Legs black with pale external stripes. Femora of first pair pale on flexor surface.
Wings hyaline, a trace of amber at base of hind wing. Pt pale yellow.
Abdomen markedly swollen on S4, abruptly constricted on S5, narrow and cylindrical on S6–10. Superior appendage white on dorsum, black below. Appendix inferior black. A series of black spots on the dorsum of S1–5, S6–7 black with lateral blue spot; S8–10 black. Accessory genitalia: lamina small; hamuli with exterior ramus long, narrow, apically rounded, internal ramus long, upright, hooked. Genital lobe very small, elongate.

Female
Similar to male. Face more greenish. Thorax green or olivaceous, blackish markings diffuse or even indistinct. Abdomen olivaceous or brown. End-rings, dorsal carina, and sides black. Vulvar aperture: valvules triangular, floor of S8 broadly rounded.

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Libellulidae: Acisoma

Fig. 414: Acisoma panorpoides ascalaphoides (Rambur, 1842), male, markings on synthorax and abdomen

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Odonata of the Levant

Wings: Pt dark yellow, between thick black veins.


Distribution: Africa south of Sahara. Known in Egypt from the oases of Kharga and Bahariyah; this species can therefore locally occur in Sinai.

Genus DIPLACODES Kirby, 1899

Trans. zool. Soc. Lond., 12:263

Type Species: Libellula lefebvrei Rambur, 1842 (or, in fact, its synonym Libellula tetra, over which lefebvrei has page priority).

Small dragonflies, with small head, short eye contact, rounded frons, a medium to large hind ridge of the pronotum, and rather small synthorax. Legs moderately long. Accessory genitalia of male not prominent. Vulvar scales of female elongate. Wing short, wide, with rather open venation. d in forewing only slightly distal to d in hind wing. Sectors of arc shortly fused in forewing, this fusion longer in hind wing. arc proximal to an, 6–9 an, the last one incomplete. d in forewing composed of 2–3 cells, in hind wing entire. R₄ nearly straight. Rs₁ with 1 row of cells. Discoidal field with 2 rows of cells, only slightly expanding towards the wing margin.

Distribution: Asia, Africa, Southern Europe.

One regional species.

DIPLACODES lefebvrei (Rambur, 1842)

Figs. 415–416

Libellula lefebvrei Rambur, 1842: 112.
Libellula morto Schneider, 1845: 112.
Libellula flavistyla Rambur, 1842: 117.
Diplacinia flavistyla — Selys, 1887: 22.

Type Locality: Oasis of Bahariyah, Egypt.

Male

Mouth parts, face, frons, vertex black; frons above with violet sheen.

Synthorax and legs black at maturity, yellow in tenerals.

Wings hyaline, hind wing with basal yellow (teneral) or deep brown (mature) spot. Membranula white or greyish. Pt yellow to dark brown.

Abdomen slightly swollen at base, black with pale yellow lateral spots: a couple on S₂–₄, becoming more like striae on S₅–₇. An elongate spot at base of S₈, small spots on 230
Libellulidae: Diplacodes

S₉. All these, however, obliterated by black pruinosity at maturity. Anal appendages yellow. Accessory genitalia: lam. ant. low, with U-shaped excavation; hamulus a rectangular block with broad, rounded apex and with smaller inner upturned hook. Genital lobe elongate, tip broader than base, rounded.

Female

Like the teneral male, with mouth parts yellow, frons above with a black basal line. Synthorax and abdomen yellow, marked with black. Styli yellow. Vulvar aperture simple, only slightly produced, very shallowly excavated medially. Floor of S₉ broadly rounded, slightly produced over S₁₀.

A small species, but fairly variable in size.


Figs. 415–416: Diplacodes lefebvrei (Rambur, 1842)
415. male, accessory genitalia, lateral view;
416. female, terminalia and vulvar lips (scales)

Distribution: The whole of Africa, reaching the Iberian Peninsula in the west and Anatolia in the east. Common in the Levant.

Israel & Sinai (Locality records): Lake Hula (1), Hadera (8), En Gedi (13), Wadi Tayiba (23).
Genus TRITHEMIS Brauer, 1868

Type Species: Libellula aurora Burmeister, 1839.
Small to moderate-sized dragonflies, with abdomen red, or black with yellow markings, often pruinose. Head small, eye contact short. Pronotum with small, rounded hind lobe. Synthorax small to moderately large. Legs rather long and slim. Abdomen variable, slender or depressed in males, cylindrical in most females. Male accessory genitalia prominent. Hamuli always with a strong apical hook. Females without foliate expansions on S₃; vulvar valves very small. Wings moderately long to very long, fairly wide, d in forewing narrow or wide, situated slightly distal to d in hind wing. Arc proximal to an₂. Sectors of arc fused at their origin. Last an usually incomplete. 8–15 an. d in forewing traversed, in hind wing usually entire. Discoidal field composed of three rows of cells throughout. R₃ generally nearly straight. Rs₁ with two rows of cells. Pt small or large. Membranula medium-sized.

Distribution: Oriental and Afrotropical regions, with two species reaching Southern Europe.

Three species are regional, while a fourth one should be expected in Sinai. In his revision of this genus, Pinhey (1970) has shown that the internal genital apparatus of the female (the bursa copulatrix) is rich in diagnostic characters. Unfortunately, this study has remained an isolated example so far.

Key to the Species of Trithemis
(Figs. 26, 417-430)

1. Male
   - Female
2. Vulvar valves medially emarginate, deeply U-shaped
   - Vulvar valves very shallowly emarginate, almost straight
3. Abdomen brownish-olivaceous, with narrow sublateral black streaks, not broadly confluent towards top of segments. Membranula white to pale grey. Base of all wings usually with broad amber, extending to an₄ and beyond tip of d in hind wing.
   - Trithemis kirbyi Selys
     - Teneral: abdomen yellow, marked with broad black streaks, expanding towards top of segments and confluent across dorsum; dorsum of S₆-₁₀ largely or entirely black. In fully mature specimens, most of thorax and abdomen blue-black pruinose. Membranula dark brown. Base of hind wing with small, deep ochre-coloured spot.
   - Trithemis festiva (Rambur)
4. Abdomen at least slightly depressed, with segments 4-5 about twice as long as wide. Sides of abdomen not or only weakly and diffusely marked with black. Carinal black markings on S₁-₂ and S₈-₉ only.
   - Trithemis annulata (Palisot de Beauvois)
Libellulidae: Trithemis

Abdomen cylindrical, with $S_{4-5}$ about three times as long as wide. Sides of abdomen broadly marked with black on $S_{5-10}$, these streaks widening towards apex of each segment, often broadly confluent across their dorsum, and with or without carinal stripe across dorsum of abdomen. $S_{3-9}$ usually largely black. Trithemis arteriosa (Burmeister)

Hamuli triangular, gently tapering towards apex, apically hooked. A broad amber wing spot, roughly between wing base and midway to N on all four wings.

Trithemis kirbyi Selys

Hamulus abruptly constricted at about 2/3 of its length, with sickle-shaped apex. A wing spot at the base of the forewings

Wing spot on hind wing rather small and dark, brownish. At maturity, most of thorax and abdomen blue-black. Teneral yellow and black, marked as the female. Frons blue metallic.

Trithemis festiva (Rambur)

Figs. 417–420: Trithemis annulata (Palisot de Beauvois, 1805)
417. synthorax; 418. male terminalia, lateral view;
419. male accessory genitalia, lateral view;
420. female terminalia and vulvar lips, ventral view
Wing spot on hind wing clear, amber-coloured. Most of the body bright red, eventually covered by a purple sheen, or marked with black at the sides only. Frons yellow or with purplish metallic sheen.

7. Abdomen depressed (S₄-5 only twice as long as wide), yellow with diffuse carinal black markings in tenersals, bright red coated with purple pruinosity in adults. Frons yellow with narrow basal black bands in tenersals, with purple sheen in adults.

**Trithemis annulata** (Palisot de Beauvois)

Abdomen slender and cylindrical (S₄-5 about three times as long as wide), yellow, in tenersals marked with black as in the female, bright red in adults, never with purple sheen. Frons yellow, with rather broad black basal band. **Trithemis arteriosa** (Burmeister)
Libellulidae: Trithemis

Figs. 425–426: *Trithemis kirbyi* Selys, 1891
425. female terminalia and vulvar lips, ventral view;
426. male accessory genitalia, lateral view

Fig. 427: *Trithemis kirbyi* Selys, 1891; male
**Odonata of the Levant**

Figs. 428–430: *Trithemis festiva* (Rambur, 1942)
428. female terminalia; 429. vulvar lips, lateral view; 430. synthorax

**Trithemis annulata** (Palisot de Beauvois, 1805)
Figs. 417–420

*Libellula annulata* Palisot de Beauvois, 1805:69.
*Libellula rubinaris* Selys, 1841:244.
*Libellula haemaina* Rambur, 1842:84 (pars).
*Trithemis ramburii* Kirby, 1890:19.
*Trithemis scortecchi* Nielsen, 1935:375.

Type Locality: Oware, Nigeria.

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**Libellulidae: Trithemis**

**Male**
Mouth parts and face ochraceous. Frons with shallow median groove, a metallic purple sheen on top in fully mature individuals. In some specimens, the labrum turns black with age. Synthorax brownish, but pruinose dorsally, bright purple. Sides with black bands on the suture. Legs black, femora of first and second pairs yellow on flexor surface. Wing venation red. Pt from dark yellow to rusty in colour. Forewing without basal amber. Hind wing with an amber spot extending from an1 to the basal cells of the anal field. Membrane white or grey. Forewing with 10–11 an. Abdomen somewhat depressed, red, coated with purple pruinose at maturity. S2 with traces of dorsolateral black stripes; S3, S7 uniformly red; S8–9 with mid-dorsal black stripes on carina; S10 red. Anal appendages brown. Accessory genitalia: lam. ant. slightly produced, not bifid, bearing some rather short hairs. Hamuli robust, with broad base, constricted before their apex to produce a sickle-shaped, backturned hook. Genital lobe somewhat elongate, with apical and posterior hairs. Vesica spermialis compact, with rather short glans.

**Female**
Mouth parts and face entirely yellow; base of labrum with two isolated black spots. Frons with narrow black basal band. Synthorax with lateral black marking more expanded than in the teneral male, streaks often contiguous. Basal amber on hind wing generally more reduced than in male. Abdomen marked with black as in teneral males. Styli brown. Vulvar lips with shallow central depression. Bursa with dorsal sterigma bifid anteriorly, forming two twisted, divergent, tapering branches. Ventral sterigma ribbed, somewhat fan-shaped.

**Measurements (mm): Male.** Total length 32–38; abdomen 20–23. **Female.** Total length 32–35; abdomen 20–22.

**Distribution:** Africa, the main Mediterranean islands, S. Spain, S. Italy, Greece, S. Anatolia, the Levant. Fairly common and widespread in Israel and Sinai. Israel & Sinai (Locality records): Lake Hula (1), Montfort (1), Qiryat Shemonia (1), Malaha (1), Kefar Hittim (2), Haifa (3), ‘Akko (4), Ma’agan Mikha’el (4), Nahalal (5), Tiberias (7), Deganya (7), “Beth Gordon”, Deganya A (7), Umm Junni (7), Bitanya (7), Ashdot Ya’aqov (7), Bet She’an (7), HaJadera (8), Rosh Ha’Ayin (8), Nabi Rubin (9), Bethlehem (11), Wadi Qilt (13), Wadi Fari’a (13), Massada (13), Abu Rudeis (23). Also recorded from Wadi Mujib (13), Jordan.

**Trithemis arteriosa** (Burmeister, 1839)

Figs. 421–424

*Libellula arteriosa* Burmeister, 1839: 830.

*Libellula conjuncta* Selys, 1840: 121.

*Trithemis arteriosa syriaca* Selys, 1887: 23.
Odonata of the Levant


Type Locality: Port Natal, South Africa.

**Male**

Labium yellow or reddish, labrum entirely brown-red or red, with finest black fringe. Clypeus reddish-brown. Frons and vertex reddish, with slight purplish reflection. A broad black line between frons and vertex. Occiput brown.

Synthorax brown or reddish, with dorsal purple sheen. Four lateral black bands of variable width (Fig. 421). Legs black, inner surface of femora 1 and 2 brown.

Wings: venation bright red. Pt red, with broad black posterior and anterior borders. Basal amber present in forewings and hind wings, but variable in extent, sometimes reduced to a trace, sometimes reaching d, especially in hind wing. Membranula grey.

Abdomen thin, bright red with lateral black markings variable with age and with population. Superior appendages brown, black at maturity, but usually some red left near the base. Inferiors red, with black margins and tips. Accessory genitalia: hamulus with robust base, abruptly constricted before its apex, with strong sickle-shaped, posteriorly directed hook. Genital lobe long and narrow, slightly bent over apically, hairy. Anterior lamina triangular in side view, moderately developed. Vesica spermalis short and broad, with large apical segment but no flagellum.

**Female**

Mouth parts and face, including frons, entirely yellow. Antedypeus greenish. Vertex yellow, separated from frons by massive black stripe. Occiput yellow. Synthorax greenish-yellow or light brown, with faint antehumerals and lateral stripes as in male. Legs black; femora of first and second pair yellow on flexor surface. Wing venation brown; Pt brown, anterior and posterior borders black. Basal wing amber reduced to small spots. Styli black. Vulvar valves with shallow invagination, but usually deeper than in *T. annulata*. Bursa copulatrix with dorsal strigma narrowed anteriorly, well sclerotized, anteriorly with two detached, curved or angled, divergent, hirsute branches. Ventral plates curved.


Distribution: The whole of Africa, where it is one of the most common Anisoptera. Also in Saudi Arabia, Iran, Iraq, the Levant. February–October.

Israel & Sinai (Locality records): Montfort (1), Haifa (3), Mt Carmel (3), Gesher (7), Ashqelon (9), Bethlehem (11), Aqua Bella (11), 'En Gedi (13), Timna' (14), 'En Meroha (17), Wadi 'Auja (13), 'En Mor (17), 'En Avedat (17), Wadi Nasb (22), Gebel Katharina (22), Wadi Hibran (22), Wadi Feiran (22), Wadi Isla (22), Wadi Tal (22), Wadi Tala (22), Sharm es Sheikh (23), 'Ein el Furtaga (23).
Libellulidae: Trithemis

Trithemis kirbyi Selys, 1891
Figs. 425–427

Trithemis aurora Kirby, 1886:327 (pars).

Type Locality: “India”.

Male
Labium, labrum, clypeus, frons, vertex yellow with reddish sheen. Occiput deep yellow.
Synthorax olivaceous, with brown or reddish sheen. No dark carinal or antehumeral bands. Humeral suture with black streak on upper third. Black on sides of synthorax limited to Su2 and lower sector of meso-metathoracic suture. Legs reddish-brown, extensor surface of femora black.
Wings: venation red. Pt short, dark brown, almost black on upper surface of wing, clear yellow fringed by thick black veins on inferior wing surface. A large amber spot at the base of all wings, modally extending to an4-5, about midway between wing base and nodus. In hind wing, the spot may not extend to the wing base in the anal area. Often, distinctly clearer cells occur in the anal and basal wing zone.
Abdomen uniformly red, appendages red or deep brown. A short black carinal stripe on S6. Accessory genitalia: lam. ant. swollen, notched at apex; hamulus a long triangle gently tapering towards its hooked apex. Genital lobe long and rounded. Vesica spermatheca robust, with small apical segment and slender flagella.

Female
Mouth parts, clypeus, frons, vertex yellow or greenish-yellow. Wings as in the male, but wing spots variable. In forewing, they are often reduced to narrow streaks in the subcostal and cubital space. In India, a truly homochrome form exists alongside a form with the wing spots completely reduced, while in Africa homochrome forms are rare, except in Nigeria where they are dominant. Abdomen more robust than in the male, triquetral or somewhat depressed, olivaceous or brownish. S4 dorsally black, sublateral black stripes on S4-6, and mid-dorsal carinal black marks on S6-9. S10 largely black. Stylid brown or black. Vulvar valvules deeply hollowed-out medially, with lateral lips swollen. Bursa copulatrix: central stergma folded and bursal arms slender.


Distribution: Typical T. kirbyi (with wing fascia extending to an3-4) occurs in India; in Africa a form is found with larger wing spots (extending to an6-7), which is considered to be a separate subspecies (T. kirbyi ardens Ferstlacker). However, populations in the Maghreb countries, in the Sahara, and in Saudi Arabia present an intermediate wing spot (as described above). Until the status of all these forms is clearly settled, no subspecific status can be accorded to the North African and Middle Eastern form. T. kirbyi has not been recorded from Sinai, but Waterston (1980)
reports it from the Red Sea mountains near Jeddah, so that its occurrence further north appears reasonable (the species lives on the southern slopes of the Atlas Mountains, hence no climatic barriers exist).

**Trithemis festiva** (Rambur, 1842)

Figs. 428–430

*Libellula festiva* Rambur, 1842: 92.

**Type Locality:** Bombay, India.

**Male**


Synthorax black, coated with purplish pruinosecence. Legs black.

Wings hyaline with a cognac-coloured wing spot at the base of the hind wing. Membranula dark, with paler margins. Pt black.

Abdomen slim and triquetral in cross-section, black with bluish pruinosecence on S1–3. Anal appendages black. Teneral males have the synthorax and abdomen yellow, very copiously marked with black. Accessory genitalia: lam ant. rather small; hamuli massive, tip constricted, with small sickle-shaped hook. Genital lobe elongate, tapering to apex.

**Female**

Labium pale brown, middle lobe black. Labrum, face and frons dirty yellow, changing to dark brown on top of frons (non-metallic). Synthorax olivaceous or yellow, with a broad black humeral stripe, a carinal stripe that tapers to a point at the interalar sinus, an inverted Y-shaped stripe on mesepimeron, a narrow stripe on S6, and a short oblique stripe extending from S6 backwards across metepimeron. Legs black, anterior femora yellow on flexor surface. Wings as in male, but in adults the wing tips are broadly darkened, to as far as the proximal edge of Pt. Abdomen cylindrical, yellow, longitudinally marked with black on mid-dorsum on the end-rings of the segments and sublaterally. All these stripes are confluent at the ends of all segments, isolating yellow spots between them and eventually obliterating all yellow colour on S7–10. Styli black. Vulvar scales narrowly but deeply emarginate. Floor of S6 rounded, elongate, produced over S10.

**Measurements (mm): Male**

Total length 32–37; abdomen 22–27. **Female**

Total length 31–36; abdomen 21–25.

**Distribution:** India, Pakistan, Afghanistan, Iran, Anatolia, Cyprus, Samos, Rhodes. In the Levant it is found as far south as the Jordan Valley. May–November. Israel (Locality records): Deganya (7), Rosh Ha'Ayin (8), Jerusalem (11).

*Zygonyx torrida torrida* (Kirby, 1889)  
Fig. 431


Type Locality: Sierra Leone, western Africa.

**Male**

**Female**
Very much like the male, but abdomen more massively built. Wings often suffused with saffron. Frons with less metallic black in front than in male. Vertex reddish or ochreous.

**Measurements (mm): Male.** Total length 50–56; abdomen 35–38. **Female.** Total length 52–59; abdomen 38–41.

Distribution: Most of Africa, with relicts in the Maghreb countries. A distinct subspecies (*Z. torrida isis* Fraser) occurs in India. A stream-dweller that favours rapids and waterfalls. Flight period from March to October.

Israel (Locality records): Bet Qeshet (2), Deganya (7), ‘Ein Duyuk (13), ‘En Gedi (13), ‘Ein es Sultan (13), Jericho (13), Wadi ‘Auja (13), Wadi Fari’a (13), Wadi Qilt (13).
Fig. 431: Zygonyx torrida torrida (Kirby, 1889), male, accessory genitalia, lateral view

Genus RHYOTHEMIS Hagen, 1867
Stettin. ent. Ztg, 28:232

Type Species: Libellula phyllis Sulzer, 1776.
Medium-sized libellulids with small head, short eye contact, small rounded frons. Pronotum with hind lobe small and depressed. Synthorax small. Legs long, slender, with numerous fine tibial spines. Abdomen short and slender. Females without foliations on S9. Valvules small. Wings, especially hind wings, broad with coloured metallic spots. d in forewing free, large and rather broad, in hind wing 3–4 cells distal to that in forewing; sectors of arc fused at their origin. arc proximal to an2, usually closer to an1. Last an incomplete. R3 and Cu2 straight or only weakly curved. Discoidal field composed of 3 rows of cells, more or less parallel throughout. Pt small. Membranula large.
Distribution: Afrotropical, Oriental and Australian regions, extending to the Pacific islands.
One species is regional.
**Libellulidae: Rhyothemis**

**Rhyothemis semihyalina syriaca** (Selys, 1849)

Figs. 432-435


*Libellula syriaca* — Selys & Hagen, 1850: 305.

*Rhyothemis hemihyalina* Selys, 1887: 8.

*Rhyothemis syriaca* — Kirby, 1890: 6.

*Rhyothemis semihyalina* (Desjardins, 1835: 3). Morton, 1924: 44; Schmidt, 1938: 149.

*Rhyothemis semihyalina syriaca* — Dumont, 1975: 3.

**Type Locality:** “Syria”, but almost certainly Lake Hula area.

**Male**

Labium and face yellow or reddish-brown. Labrum black. Frons and vertex metallic violet. Body black. Sides of thorax and abdominal segments 1–4 dark rusty or black with metallic sheen, in older specimens covered with pale pruinosity. Wings hyaline, hind wing with broadened base, covered by an extensive metallic black spot, almost reaching to last an, leaving only a narrow hyaline fringe along the posterior wing margin. Pt very small, usually black.

Appendages black. Accessory genitalia: lam. ant. massive, trapezoidal in side view; hamuli apically hooked; genital lobe moderately developed.

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Fig. 432: *Rhyothemis semihyalina syriaca* (Selys, 1849), male (paratype)

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Figs. 433–435: Rhyothemis semihyalina syriaca (Selys, 1849)
433. hind wing;
434. male, accessory genitalia, lateral view
435. female, terminalia and vulvar lips, ventral view

Female
Very similar to male.


Distribution: Restricted to Lake Hula area (1) where the last known specimen was captured in 1950. Thus, the subspecies is almost certainly extinct. The nominal subspecies is distributed over Africa south of the Sahara, and had a relict population in northern Algeria (Lake Ouebira). In Lake Hula area, specimens have been collected between May and August. The species has a dancing flight, much like a butterfly, and must therefore have been rather conspicuous.

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Genus PANTALA Hagen, 1861
Synopsis Neuroptera N. Am., p. 141

Type Species: Libellula flavescens Fabricius, 1798.
Medium-sized libellulids, with a very large head, a small pronotum, and a robust synthorax. Legs long and slender. Wings long, hind wing very broad at base. d in forewing 2–3 cells distal to d in hind wing. Sectors of arc fused at origin; arc between $a_1$ and $a_2$; 13 an, the last one incomplete; d in forewing traversed. Discoidal field first 3 rows of cells, later 4–5, but contracted at wing margin. $R_2$ strongly bisinuous. Pt very short, longer in forewing than in hind wing. Abdomen cylindrical, dilated at base, constricted at $S_3$ in males. Anal appendages of males long and slender.
Distribution: Cosmopolitan, but most curiously very rare or lacking in Europe. One almost cosmopolitan species is regional.

Pantala flavescens (Fabricius, 1798)
Figs. 436–437

Libellula flavescens Fabricius, 1798:285.
Pantala flavescens —. Cabot, 1889:43; Selys, 1887:8; Morton, 1924:44; Andres, 1928:8; Dumont, 1977b:164.

Type Locality: “India”.

Male
Labium ochraceous, with darkened median lobe. Labrum ochraceous or brown. Face, frons, and vertex yellow, sometimes suffused with red.
Pronotum ochraceous and black. Synthorax hairy, greenish-brown, rather transparent. Sides greenish, often with brown spots on the sutures. Legs dark brown or black.
Wings hyaline. Broad hind wing with basal amber spot; rarely wing tops also suffused with amber. Membranula white. Pt light reddish brown, longer in forewing than in hind wing.
Abdomen cylindrical, tapering posteriorly, yellow to deep brown, or even red, with black mid-dorsal carinal band. Anal appendages long, reddish, black at apices. Accessory genitalia: lam. ant. small, triangular in side views; hamuli long and slender, with apical hook slightly turned outwards. Genital lobe rounded.

Female
Habitus as in male, but body colours less bright. Vulvar valvules fairly deeply invaginated, U-shaped, with lips swollen.

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Fig. 436: *Pantala flavescens* (Fabricius, 1798), female

Fig. 437: *Pantala flavescens* (Fabricius, 1798), male, accessory genitalia, lateral view

Urothemis

Figs. 438-4

*Urothemis*

**Type Locality**

*Male*
Labium olivaceous.

Pronotum bluish pr.

Brown of postmedian bands.

Wings hyaline.

Base of hamulus extending into cubito-anal lobe.

A black hamulus expands superior
Libellulidae: Urothemis

Distribution: Cosmopolitan, but extremely rare (if at all present) in Europe. A strong migrant, capable of covering continental distances, often encountered in deserts and on open sea.
Israel (Locality records): 'Ubeidiya (7; 13.X.1935) and 'En Gedi (13; 16.VIII.1957).

Genus UROTHEMIS Brauer, 1868
Verh. zool.-bot. Ges. Wien, 18:175

Type Species: Urothemis bisignata Brauer, 1868.
Moderately large species, with large head, wide frons and swollen vertex. Pronotum with hind lobe small; synthorax strongly built, with robust legs. Abdomen robust, depressed. Wings long, nodus situated about midway along their length. Hind wings with broadened base, d in forewing broad, situated somewhat distal to d in hind wing. Sectors of arc not or only shortly fused. arc proximal to an, 7–8 an, the last one complete. One row of cells in Rspl. Discoidal field with 3 rows of cells, not expanded at wing margin. Pt medium-sized. Membranula large. Male accessory genitalia: hamulus long and pointed. Female: S8 not foliate, valvules well developed.
Distribution: Afrotropical and Oriental regions.

Urothemis edwardsi hulae Dumont, 1975
Figs. 438–443

Urothemis edwardsi hulae Dumont, 1975:3.

Type Locality: Lake Hula, Israel.

Male
Labium yellowish; labrum yellow or reddish with blackened base. Anteclypeus olivaceous; postclypeus, frons, vertex dark green to black, partly with bluish sheen. Pronotum, synthorax and abdomen blue-black in mature specimens, covered by bluish pruinosity which eventually reaches wing base. Legs black; femora of first pair brown on flexor surface.
Wings hyaline or slightly suffused with amber, especially near their tips. Pt yellowish. Base of hind wing with a small brown spot, surrounded by some amber, not normally extending into subcostal space on the one hand, of beyond the level of the basal cubito-anal cross-vein on the other hand.
A black band on the mid-dorsum of the abdomen remains visible throughout life. It expands sharply near the top of each segment. Anal appendages dark brown. Superiors, in side view, widened at about half their length, with inferior hook.
Fig. 438: *Urothemis edwardsi hulæ* Dumont, 1975; female (paratype)

Fig. 439: *Urothemis edwardsi hulæ* Dumont, 1975; hind wing
Libellulidae: Urothemis

Figs. 440–443: Urothemis edwardsi hulæ Dumont, 1975
440. male, abdomen; 441. male accessory genitalia, lateral view;
442. male terminalia, lateral view;
443. female terminalia and vulvar scales, ventral view

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Teneral males differ in being paler, their abdomen being yellow or clear brownish, with a black longitudinal band. Accessory genalia: lam. ant. very small, with distinctive long hairs. Hamuli elongate, triangular, tapering towards their pointed and outwardly curved apex.

Female
Paler than the male. Mouth parts and face light yellow or green. Thorax greyish, with yellow flanks, and black spots at the sutures. Wing spot on hind wings as in the male.


Distribution: Restricted to Lake Hula (1) where specimens have been taken between June and November. A single female was collected at Jericho (13), 16.VIII.1942 (a migrant or a mislabeled specimen?). No specimens have been collected since 1952 (after the drainage of Lake Hula), and the subspecies is probably extinct, like *Rhyothemis semihyalina syriaca* with which it co-occurred. The nominal subspecies is widely distributed in Africa south of the Sahara, and was recorded once on Lake Oubeira, N.E. Algeria (loc. typ.).

Genus SELYSIOTHEMIS Ris, 1909
Catal. Collins Selys Longchamps, 9:37

The genus is monotypic.
Small dragonflies, with black non-metallic body-colours and colourless wings. Head relatively large; eyes broadly contiguous. Frons flattened in front, with deep median groove. Pronotum with small hind lobe. Synthorax small. Legs long and slender. Abdomen short, dilated at base, slightly constricted at $S_3$, then cylindrical to its tip. Wings short and broad, with open venation. $d$ in forewing broad, entire; in hind wing situated at arc, entire. Sectors of arc separated from their origin in forewing, shortly fused in hind wing. arc between $an_1$ and $an_2$ 5–6 $an$, the last one complete. Discoidal field with 2 rows of cells at origin, expanded at wing margin. Rspl with one row of cells. Pt very small. Membranula medium-sized. Wing venation whitish. Male accessory genitalia: lam. ant. depressed, broadly arched. Hamuli broadly triangular, apex with short curled hook. Genital lobe narrow, truncate. Female: sides of $S_4$ not foliate; vulvar valvules very small.

*Selysiotemis nigra* (Vander Linden, 1825)

Figs. 444–445


Urothemis nigra —. Selys, 1878:4; Selys, 1887:77.

Urothemis advena —. Selys, 1878:4; Selys, 1887:77.

Selysiotemis nigra —. Ris, 1897:48; Fraser, 1936:451; Schmidt, 1938:149; Dumont, 1977b:164; Schneider, 1981b:97.

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**Libellulidae: Selysiothemis**

![Diagram](image)

**Figs. 444-445: Selysiothemis nigra** (Vander Linden, 1825), male

444. terminalia, lateral view; 445. accessory genitalia, lateral view

**Type Locality:** Area of Naples, Italy.

**Male**

Head large, labium yellow, labrum dark brown or black. Face and vertex deep olivaceous. A black stripe present at the base of the frons. Synthorax hairy, dark olivaceous with black sutures, completely black in senescent specimens. Abdomen black, end-rings and sides dark brown. A greyish pruinosity develops on the abdomen and the base of the legs at maturity. Legs black. Appendages: superiors strongly arched, their apical part swollen, dark brown; inferiors black.

Teneral males differ in being paler: labrum yellow, synthorax greenish, abdomen pale green or brown with carinal black markings that widen to the top of each segment. Legs with basal half of the femora brown. Other characters as for genus.

**Female**

Coloured as the teneral male. Other characters as for genus.

**Measurements (mm): Male.** Total length 30–38; abdomen 21–26. **Female.** Total length 32–37; abdomen 22–25.

**Distribution:** An Irano-Turanian species that extends into North Africa, and descends deep into Sahara in its mountainous centre, much like *Orthetrum ransonneti*. The species is common in the eastern Mediterranean area, but becomes rare to exceptional in the west, where stable colonies are found on the Balearic Islands only (Comte-Sart, 1960). Records range between May and August.

Israel & Sinai (Locality records): Sedé Nehemya (1), Rosh Ha’Ayin (8), Golan (18), Wadi Tayiba (22), Et Tur (23).
MORPHOLOGY OF THE LARVAL STAGES

Between the hatching from the egg and the emergence of the adult, dragonfly larvae undergo a number of moults, in some species interrupted by a larval diapause, and variable in duration between a few weeks and five, perhaps even six, years. The very first instar or prorlarva is extremely short-lived, and has non-functional appendages. It moults within hours into the first active larval instar that immediately starts feeding. In a few cases only is the whole larval development known, and in many species nothing at all is known about the immature stages. Existing keys are therefore based on the terminal larval instar, which may differ considerably from the preceding instars. Identification of random samples of dragonfly larvae is therefore still a very cumbersome, if not impossible task.

In the Near East, in particular, a sizeable amount of work remains to be done, and the keys following this anatomical introduction must therefore be considered as a first approximation only. It is also quite likely that future approaches to dragonfly larval morphology will lead to the discovery of more reliable distinctive characters than those used today.

Head
Considerably less mobile than in the adult, but consisting of the same main parts. Compound eyes large but more depressed, ocelli present or absent. Occiput larger than in the adult, due to the existence of broad postocular extensions. Antennae relatively longer than in adults, composed of 3–7 segments, the modal number being 7. Clypeus and frons not yet individualized. Mouth parts raptorial as in the imago, except for the labium, which is differentiated into a characteristic prey-catching device, the mask. The mask is composed of a basal part, the submentum, connected by a hinge-joint to the apical prementum. The apex of the prementum is formed by a labial palp and a movable hook. The mask is flat in Zygoptera, Gomphidae and Aeshnidae, concave in Libelluloidea. The prementum is set with a number of setae and spines. These structures are useful for identification down to species level. The shape of the mandibles, and the number and arrangement of teeth on the mandibles are also important. The left and right mandibles are asymmetrical.

Thorax
The prothorax is comparatively larger than in adults; the synthorax is fused. The legs may present a basal outgrowth, the supra-coxal armature that is used in the identification of aeshnid larvae. The wings are visible as alar furrows, extending backwards over the dorsum of the abdominal segments, and growing longer with every moult.

1. Larva
   - Larva pyramidal

   1. Pair
      - Only
      - No al

   2. Antennae
      - Only
      - Antennae

   3. Prolonged
      - Prem

   4. Labium
      - Prem
Morphology of the Larval Stages

Abdomen

Ten distinct segments, and traces of an 11th one are present. S₁ is shorter than the subsequent ones that may or may not bear mid-dorsal spines. Spines may also occur at the posterior external angles of some or all segments in many Anisoptera. In Zygoptera, the abdominal apex bears three caudal lamellae – elongated, foliated, highly tracheolated structures with a respiratory function. Colour bandings, marginal setation or spinulation of these lamellae are diagnostic. In addition to these, larval Euphaeidae also have paired lateral abdominal gills. Anisoptera feature an anal pyramid composed of the following elements: a mid-dorsal epiproct (in males with a basal male appendix), a pair of lateral cerci (the future superior appendages), and a pair of ventro-lateral paraprocts.

The sex of a larva can be identified by the presence of a pair of small gonapophyses on the ventrum of S₂ in males, and by the conspicuous gonapophyses on the ventrum of S₉ in the females of Zygoptera, Aeshnidae and Cordulegasteridae. As stated before, all anisopteran males also possess a male projection at the base of the dorsal surface of the epiproct.

Key to Suborders

1. Larvae of elongated shape, slender, with abdomen terminated by three caudal lamellae.
   - Larvae relatively robust, less elongated, with abdomen terminated by a compact anal pyramid composed of five appendages.

   Zygoptera
   - Anisoptera

Suborder Zygoptera: Key to Families

1. Paired abdominal gills present on segments 2–8.
   - Only one genus and species:
     - Euphaeidae: Epallage fatime (Fig. 446) 2
   - No abdominal gills

2. Antenna: scapus half the length of the entire antenna. Prementum with a deep median cleft, about half depth of the entire prementum.
   - Only one genus: Calopterygidae
     - Calopteryx (Figs. 447–448)
   - Antenna: scapus less than 1/4 the length of the entire antenna. Prementum with median cleft narrow and much shorter than half the length of the prementum or absent 3

3. Prementum with a narrow and short median cleft. Movable hook with setae. Lestidae
   - Prementum without median cleft. Movable hook without setae 4

4. Labium with 4 premental setae, arranged in 2 groups of 2 each, implanted on a horizontal line (Fig. 454). Pronotum with two medio-lateral bosses.
   - One genus: Platycnemididae
     - Platycnemis (Figs. 454, 455)
   - Labium with a variable number of premental setae, implanted along an arched line. Pronotum without lateral bosses.
     - Coenagrionidae

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Family Lestidae: Key to Genera

1. Prementum abruptly constricted somewhat before half its length, parallel-sided thereafter
   (Figs. 451–453).
   - Prementum triangular
   2. Median cleft of prementum very shallow. Labial palpus deeply divided, with a strong
      medial hook and a wide outward portion, the later with inner hook and 10–12 crenations
      (Fig. 450).
      - Median cleft of prementum deeper. Outer part of divided labial palpus with strong inner
        hook and 2 smaller teeth along its free margin. (Fig. 449).
        - Lestes
          (minus L. viridis)
          2
          - Sympecma fusca

Family Coenagrionidae: Key to Genera

This key is provisional, unsatisfactory in many respects and requires extensive future revision.
Indeed, since numerous larvae in Agriocnemis, Pseudagrion, Ceriagrion and Ischnura still await
discovery and description, modifications of generic diagnoses may be expected as these forms
become known.

1. One pair of premental setae (Fig. 456).
   - More than one pair of premental setae
   2. Maximum 3 pairs of premental setae (Fig. 457).
      - Minimum 3, usually at least 4 pairs of premental setae
      3. Antenna with 6 segments (or 7th segment indistinct)
         - Antenna with 7 segments (Fig. 467)
         4
         5
   4. Full-grown larva around 9 mm long. Movable hook on labial palpus much shorter than
      strongly developed internal end-hook.
      - Full-grown larva 25–30 mm long. Movable hook of labial palpus much longer than
        end-hook (Fig. 462).
   5. Labium with 6–10 (3–5 pairs) premental setae (Figs. 459–461).
      - Labium with 8–12 (4–6 pairs) of premental setae (Figs. 463–469).

Pseudagrion*
- Ceriagrion*
- Agriocnemis
- Erythromma
- Coenagrion
- Ischnura

* Ceriagrion glabrum, from Central Africa, has one pair of premental setae (Corbet, 1956), but does
  not occur in the Jordan Valley.

Note
These key

Onychogomphus

1. Distal
   - Inner
   35 i
   - Distal

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Suborder Anisoptera: Key to Families

1. Prementum flat; labial palpi not crenated except in Caliaeschna microstigma 2
   - Prementum concave; labial palpi crenated 3
2. Antenna composed of 7 segments. A couple of bosses at the base of the prothoracic legs (precoxal armature: Fig. 485).
   - Antenna composed of 4 segments (Fig. 474). No precoxal armature. 4
   One genus and species: Cordulegaster insignis 5
   - Median lobe of prementum not cleft. Margin of labial palpi variably structured but never deeply serrated. 6
   - Median lobe of prementum not cleft. Margin of labial palpi not serrated. 7

Family Gomphidae: Key to Genera

1. Total length of full grown larva ca. 45 mm; larva robustly built, with broad abdomen (Figs. 470–471).
   - Total length of full grown larva not exceeding 30–35 mm; larva fusiform, with abdomen more slender (Fig. 472) 2
2. Distal margin of prementum straight (Fig. 473).
   - Distal margin of prementum more or less curved 3
   - Prementum: distal margin markedly convex. Labial palpus with inner margin smooth. Abdomen: lateral spines on S2–9, small mid-dorsal spines on S2–3 (Figs. 475–479). 4
   - Prementum: distal margin more or less straight. Labial palpus with inner margin more or less straight. Abdomen: lateral spines on S2–9, mid-dorsal spines on S2–3 (Figs. 475–479).

Paragomphus
3a. Apical segment of antenna very elongate. Distal margin of prementum medially pointed (Figs. 478–479).
   - Distal segment of antenna more stoutly built. Distal margin of prementum rounded (Figs. 476–477). 3b

P. genei

Note
These key characters are based on non-regional species; since the larvae of the three regional Onychogomphus are still unknown, this may affect the value of the key-characters.

Family Aeschnidae: Key to Genera

1. Distal margin of prementum without median cleft, its central zone angularly protruding. Inner margin of labial palpus rather grossly crenated. Full-grown larva smaller than 35 mm (Figs. 482–486).
   - Distal margin of prementum with a median cleft, its central zone straight or convex. Inner margin of labial palpus smooth or finely crenated. Full-grown larva well over 35 mm long 2

Caliaeschna
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2. Eyes not notably flattened on dorsum of head, their median posterior margin protruding posteriorly (Fig. 496b). Posterior rim of head angular. Total length of full-grown larva less than 4.5–5 cm
   – Eyes flattened on dorsum of head, their posterior margin straight. Outline of head more or less rounded. Total length of full-grown larva 4.5–5 cm or more

3. Ceri less than 2/3 the length of the paraprocts (Figs. 487–488, 495–496). *Aeschna*
   – Ceri 2/3 of the length of the paraprocts (Fig. 489).

4. Maximum width of prementum less than 70% of its length (prementum long) (Fig. 492).
   – Maximum width of prementum about 70% of its length (prementum short) (Fig. 494).

4a. Supra-anal lamina about as wide as long (Fig. 491). *A. imperator*
   – Supra-anal lamina wider than long (Fig. 492). *A. parthenope*

* Hemianax

Family Libellulidae: Key to Genera

Still undescribed are the larval stages of *Diplacodes lefebvrei* and *Acisoma panormoides*, of several of the regional *Orthetrum*, of *Brachythemis fuscopalliata*, of several *Trithemis*-species, and of *Sympetrum decoratum*. Further, *Urothemis edwardsii hulac* and *Rhyothemis semihyalina syriaca* became extinct before their larvae were discovered.

1. Larvae with hairy aspect (Fig. 497). Eyes small, with well-developed postocular lobes, giving the head a robust, rectangular aspect. Legs relatively short, the anterior pair widened. Lateral spines on *S₅-⁹* weakly developed
   – Larval surface smooth, not woolly in aspect. Eyes large, with postocular lobes relatively small, so that the anterior and posterior borders of the head are more rounded. Legs long and slender, the anterior pair not flattened. Lateral spines on *S₅-⁹* often robust

2. Mid-dorsal spines on abdomen small or absent. No such spines on *S₈*. Sides of head parallel (Fig. 499).
   – Mid-dorsal spines on abdomen robust. Always a spine on *S₈*. Sides of head slightly convergent (Figs. 497, 498).

3. No mid-dorsal spines on abdomen
   – Mid-dorsal spines on at least some abdominal segments

4. Total length around 20 mm. Lateral spines on *S₅-⁹* short, those on *S₉* not more than 1/4 of the length of that segment (Fig. 500: prementum).
   – Total length exceeding 25 mm. Lateral spines on *S₅-⁹* robust and long, those on *S₉* longer than the segment itself (Figs. 503–504).

5. Labial palpus with 4–5 setae; premental setae 12–16 in two rows (usually 7 + 7) (Fig. 505).
   – Labial palpus with 6 or more setae; 18 or more premental setae

* Sympetrum fonscolombei* (Fig. 501) may also key out here. It may be distinguished, at least from *Crocothemis erythraea* (Fig. 500), which has 10–11 setae on the labial palpus, by having 12–13 setae on its labial palpus.

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   - Labial palpus with 8 or more setae; premental setae otherwise arranged
   - More than 9 palpal setae
7. Eight palpal setae and about 20 premental setae (Figs. 508–509).
    - Articulation between prementum and mentum, when mask at rest, situated between
      second and third pair of legs; examples of prementum structures: Figs. 501–502.
8. Articulation between prementum and mentum, when mask at rest, situated at level of
   second pair of legs. Habitus and various structures: Figs. 510–511.

Trithemis

Zygonyx torrida

Selysiothemis nigra
Fig. 446: *Epallage fatime* (Charpentier, 1840), female, ventral view
(after Schneider 1984)
Morphology of the Larval Stages

Figs. 447-448: _Calopteryx syriaca_ Rambur, 1842
447. dorsal view; 448. pronotum
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Fig. 449: *Sympecma fusca* (Vander Linden, 1820), prementum
(after Conci & Nielsen, 1956)

Fig. 450: *Lestes viridis parvidens* Artobolevski, 1929
a. prementum, b. distal ending of labial palp, enlarged
(after Conci & Nielsen, 1956)

Fig. 451: *Lestes macrostigma* (Eversmann, 1836)
a. prementum; b. labial palp
(after Conci & Nielsen, 1956)
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Fig. 452: *Lestes barbarus* (Fabricius, 1798), prementum
(after Conci & Nielsen, 1956)

Fig. 453: *Lestes virens* (Charpentier, 1825), prementum
(after Conci & Nielsen, 1956)
Figs. 454–455: *Platycnemis* sp.
454. prementum;
455. head and pronotum
(note lateral bosses as in imago)

Fig. 456: *Pseudagrion* sp., prementum
(after Chutter, 1961)

Fig. 457: *Ceriagrion* sp., prementum
Morphology of the Larval Stages

Fig. 458: Ceriagrion glabrum (Burmeister, 1839)
a. habitus; b. prementum; c–d. caudal lamellae; e. mandibula
(after Corbet, 1957)
Figs. 459–462: Prementum of various coenagrionids
459. Coenagrion scitulum (Rambur, 1842); 460. C. puella (Linnaeus); 461. C. lindenii (Selys)
462. Erythromma viridulum (Charpentier); (after Conci & Nielsen, 1956)
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Fig. 463: *Ischnura fountainei* Morton, 1905; dorsal view
Figs. 464-468: Ischnura fountainei Morton, 1905

464. prementum; 465. labial palps;
466. median caudal lamella; 467. antenna;
468. a-b. left and right mandibles
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Fig. 469: *Ischnura elegans*, prementum
(after Conci & Nielsen, 1956)

Figs. 470–471: *Lindenia tetrathylla* (Vander Linden, 1825)
470. dorsal view; 471. prementum
(after Conci & Nielsen, 1956)
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Figs. 472–474: *Gomphus davidi* Selys, 1887
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Geographical Areas in Israel and Sinai

KEY

1. Upper Galilee
2. Lower Galilee
3. Carmel Ridge
4. Northern Coastal Plain
5. Valley of Yizre'el
6. Samaria
7. Jordan Valley and Southern Golan
8. Central Coastal Plain
9. Southern Coastal Plain
10. Foothills of Judea
11. Judean Hills
12. Judean Desert
13. Dead Sea Area
14. 'Arava Valley
15. Northern Negev
16. Southern Negev
17. Central Negev
18. Golan Heights
19. Mount Hermon
20. Northern Sinai
21. Central Sinai Foothills
22. Sinai Mountains
23. Southwestern Sinai