Key to the dragonflies of Turkey

including species known from Greece, Bulgaria, Lebanon, Syria, the Trans-Caucasus and Iran

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Introduction

Since the 1980s Turkey has become an increasingly popular holiday destination for birdwatchers. The mix of both familiar and exotic birds, good food, great historic sites and beautiful landscapes guarantees a tremendous vacation. Slightly more recently Turkey also has become a popular destination for odonatological trips. It is hoped that this interest will steadily increase, as there is still much to be learned about the dragonflies of Turkey.

Most Turkish species can be identified in the field using the field guide by DIJKSTRA & LEWINGTON (2006) or field guides written for central Europe (BOS & WASSCHER, 2004; BELLMANN, 1987). The main value of the present key is that it deals with additional species occurring in eastern and northern Turkey plus adjacent countries to the east and south of Turkey. This key is also more suited for identifying collected specimens as it uses mainly morphological characters.

The key

The structure of this key is largely based on that for European odonates in ASKEW (1988). Until the 1980s information on the identification of most non-European species occurring in Turkey and adjacent countries was only to be found in some dozens of scientific papers. In the work of Wolfgang Schneider, 'Systematik und Zoogeographie der Odonata der Levante unter besonderer Berücksichtigung der Zygoptera' (SCHNEIDER, 1986) and Henri Dumont, 'Odonata of the Levant' (DUMONT, 1991) much of the information on the identification of these species was condensed into single volumes. Besides these two publications Wolfgang Schneider and Henri Dumont wrote a large number of publications containing information on the identification of the odonates of this region. The key presented here is based largely on the information published by these two major contributors to the knowledge of dragonflies of southwest Asia and the Middle East.

Most of the figures in the key were redrawn from a various sources, the most important being DUMONT (1991), SCHNEIDER (1986), ASKEW (1988) and VAN TOL (2002). For each species, information on distribution, flight period and habitat is given.

Distribution: Information on the distribution in Turkey is based on the distribution maps presented in KALKMAN & VAN PELT (2006). For species largely confined to southwest Asia or species that are absent or very rare in Europe additional information is given on their world distribution.

Flight period: Information on the flight period in Turkey is based on the flight histograms presented in KALKMAN & VAN PELT (2006). For species rare or absent in Turkey the information on flight histograms was taken from various sources (see references).

Habitat: Information on habitats is largely based on field experience in Turkey, often combined with field experience in Europe. For species rare or absent in Turkey the information on habitat was taken from various sources (see references).

Covered area

The key includes all species known to occur in Turkey, Greece, Bulgaria, Cyprus, Lebanon, Iraq, Syria, Georgia, Armenia, Azerbaijan and Iran. Iran has been poorly explored and the southeast of the country is likely to yield a dozen or more species not yet known from the country. A checklist of the species occurring in these countries is given in Table 1. The

checklist is based on the following publications:
Armenia: TAILLY *et al.* (2004).
Azerbaijan: At the moment no critical checklist for Azerbaijan is available. The checklist presented here is derived from a draft version of a critical checklist for Georgia, Azerbaijan and Armenia in preparation by Marc Tailly. From species given with a question mark it is unclear whether or not the record was made within the limits of the present days country or the identification is doubtful. The most recent information on Azerbaijan was presented in DUMONT (2004).
Bulgaria: MARINOV (2000), MARINOV (2001c), MARINOV (2004).
Cyprus: LOPAU & ADENA (2002), Nigel Cottle (pers. comm.).
Georgia: At the moment no critical checklist for Georgia is available. The checklist presented here is derived from a draft version of a critical checklist for Georgia, Azerbaijan and Armenia in preparation by Marc Tailly. From species given with a question mark it is unclear whether or not the record was made within the limits of the present days country or the identification is doubtful.
Greece: LOPAU, W. & A. WENDLER (1995), LOPAU (1998a), LOPAU (1998b), LOPAU (2000), GREBE *et al.* (2005), KALKMAN (2005), LAISTER (2005), OLIAS & GÜNTHER (2005).
Iran: HEIDARI & DUMONT (2002).
Iraq: ASAHINA (1973), ASAHINA (1974).
Lebanon: So far no checklist of Lebanese odonates has been published. The list here presented was taken from TSUDA (2000) with some additions from SCHNEIDER & MOUBAYED, 1985 and SCHNEIDER, 2004.
Syria: So far no checklist of Syrian odonates has been published. The list here presented was, with some minor changes, taken from TSUDA (2000) with some additions from DUMONT & BORISOV (1995) and SCHNEIDER (2004).
Turkey: Based on the checklist by KALKMAN *et al.* (2003). Recent new records published by Askew (2004), BOUDOT *et al.* (2004) and HACET & AKTAÇ (2004) have been incorporated.

A small number of species or subspecies are omitted from the key:
- *Calopteryx splendens*: The key to the subspecies facilitates the identification of subspecies occurring or expected to occur within Turkey. Subspecies occurring in countries surrounding Turkey *balcanica*, *cretensis* and *syriaca*) are lacking from the key.
- *Lestes virens*: subspecies *virens* and vestalis have been published for Turkish territory. Both are omitted from the key as the characters distinguishing these taxa are unclear (see note in checklist for more information).
- *Coenagrion*: *C. vanbrinkae* and *C. persicum* are omitted, as the characters separating them from respectively *C. ornatum* and *C. pulchellum* are unclear.
- *Pseudagrion*: *P. decorum*, *P. laidlawi* (both known from one record in eastern Iran) and *P. sublacteum* (known from southern Syria).
  Cordulegaster: *C. vanbrinkae* is known from only one male and the information on this species was not sufficient to include it in the key. Some information on the recognition of this species is given in the text of the genera.
- *Cordulegaster*: subspecies *amasina, charpentieri, insignis, mzymtae, nobilis* of *C. insignis*, subspecies *bucholzi*, *helladica* and *kastalia* of *C. helladica* and subspecies *heros* and *pelionensis* of *C. heros* are not included as the characters defining these subspecies are often highly variable and difficult. Much information on *Cordulegaster* can be found in BOUDOT, 2001.

Table 1.
Checklist of species occurring in Turkey, Greece, Bulgaria, Cyprus, Lebanon, Iraq, Syria, Georgia, Armenia, Azerbaijan and Iran. Subspecies are mentioned only when several subspecies occur in the region or when a subspecies other than the nominate subspecies occurs. Some subspecies mentioned in the articles on which this checklist is based are believed to be synonyms with other subspecies and are not mentioned in this checklist. For Turkey an 'e' indicates that the species is to be expected.

Suborder: ZYGOPTERA **Family: CALOPTERYGIDAE**	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
Genus: *Calopteryx* Leach, 1815												
C. splendens (Harris, 1782)			x									
C. splendens amasina Bartenef, 1912	x											
C. *splendens balcanica* Fudakowski, 1930		x										x
C. splendens cretensis Pongrácz, 1911		x										x
C. *splendens hyalina* Martin, 1909	e									x	x	
C. splendens intermedia Selys, 1890	x				x	x	x	x	x	x		
C. splendens mingrelica Selys, 1868	x	x		x	x				x			
C. splendens orientalis Selys, 1887							x		x			
C. splendens syriaca Rambur, 1842										x	x	x
C. splendens tschaldirica Bartenef, 1909	x				x	x	x					
C. splendens waterstoni Schneider, 1984	x											
C. virgo (Linnaeus, 1758)			x	(1)			x					
C. virgo festiva (Brullé, 1832)	x	x			x							
C. virgo feminalis Bartenef, 1910	x(2)											
Family: EUPHAEIDAE												
Genus: *Epallage* Charpentier, 1840												
Epallage fatime (Charpentier, 1840)	x	x	x	x	x	x	x	x	x	x	x	
Family: LESTIDAE												
Genus: *Lestes* Leach, 1815												
L. barbarus (Fabricius, 1798)	x	x	x	x	x	x	x		x			
L. concinnus Hagen in Selys, 1862									x			
L. dryas Kirby, 1890	x	x	x		x	x	?					
L. macrostigma (Eversmann, 1836)	x	x	x	x	x	x	x					
L. parvidens Artobolevsky, 1929	x	x	x	x	x		x		x	x		
L. sponsa (Hansemann, 1823)	x	x	x		x	x	x		x			
L. virens (Charpentier, 1825) (3)	x	x	x		x	x	x		x			
L. viridis (Vander Linden, 1825)	e	x	x									
Genus: *Sympecma* Burmeister, 1839												
S. fusca (Vander Linden, 1820)	x	x	x	x	x	x	x		x			
S. gobica (Foerster, 1900) (4)												
S. paedisca (Brauer, 1877)	x					x	x	x	x			
Family: COENAGRIONIDAE												
Genus: *Agriocnemis* Selys, 1877												
A. sania Nielsen, 1959	e											
A. pygmaea (Rambur, 1842)									x			

	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
Genus: *Ceriagrion* Selys, 1876												
C. georgifreyi Schmidt, 1953	x	x								x		
C. tenellum (De Villers, 1789)		x										
Genus: *Coenagrion* Kirby, 1890												
C. armatum (Charpentier, 1840)	e(5)				x	x	?					
C. australocaspicum Dumont & Heideri, 1995	e(6)						x		x			
C. hastulatum (Charpentier, 1825)			x									
C. intermedium Lohmann, 1990		x										
C. lunulatum (Charpentier, 1840)	x				x	x	?					
C. mercuriale (Charpentier, 1840)			(7)		(8)							
C. ornatum (Selys, 1850)	x	x	x		x		?					
C. persicum Lohmann, 1993	e								x			x
C. ponticum (Bartenef, 1929)	x				x		x					
C. puella (Linnaeus, 1758)	x	x	x		x	x	x					
C. pulchellum (Vander Linden, 1825)		x	x			x	x			x		
C. pulchellum pulchellum (Vander Linden, 1825)	x				x							
C. pulchellum saisanicum Belyshev, 1964	x											
C. scitulum (Rambur, 1842)	x	x	x		x	x	x		x			
C. syriacum (Morton, 1924)	x									x	x	
C. vanbrinkae Lohmann, 1993	x					x			x	x(9)	x(9)	x
Genus: *Enallagma* Charpentier, 1840												
E. cyathigerum (Charpentier, 1840) (10)	x	x	x		x	x	x		x	x		
Genus: *Erythromma* Charpentier, 1840												
E. lindenii (Selys, 1840)			x	x	x	x	x					
E. lindenii lindenii (Selys, 1840)	x	x								x		
E. lindenii zernyi Schmidt, 1938	x								x	x	x	
E. najas (Hansemann, 1823)	e	x	x						x			
E. viridulum (Charpentier, 1840)	x	x	x		x	x	x		x	x		
Genus: *Ischnura* Charpentier, 1840												
I. aurora (Brauer, 1865)									x			
I. elegans (Vander Linden, 1820)			x			x						
I. elegans ebneri Schmidt, 1938	x	x		x					x	x	x	
I. elegans elegans (Vander Linden, 1820)	(11)											
I. elegans pontica Schmidt, 1938	x				x	x	x		x			
I. evansi Morton, 1919	e							x	x	x		
I. fontaineae Morton, 1905	x				?		x	x	x	x		
I. forcipata Morton, 1907									x			
I. intermedia Dumont, 1974	x								x	x		
I. pumilio (Charpentier, 1825)	x	x	x	x	x	x	x	x	x			
I. senegalensis (Rambur, 1842)	e							x	x			
Genus: *Pseudagrion* Selys, 1876												
P. decorum (Rambur, 1842)									x			x
P. laidlawi Fraser, 1922									x			x
P. syriacum (Selys, 1887)	x									x	x	
P. sublacteum (Karsh, 1893)												
P. sublacteum mortoni Schmidt in Ris, 1936										x		x
Genus: *Pyrrhosoma* Charpentier, 1840												
P. elisabethae Schmidt, 1948		x										
P. nymphula (Sulzer, 1776)	x	x	x		x		?		x			

	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
Family: PLATYCNEMIDIDAE												
Genus: *Platycnemis* Burmeister, 1839												
P. dealbata Selys, 1863	x				x	x	x	x	x	x	x	
P. kervillei (Martin, 1909)	x							x		x	x	
P. pennipes (Pallas, 1771)			x		x	x	x		x	x	x	
P. pennipes pennipes (Pallas, 1771)	x	x										
P. pennipes nitidula (Brullé, 1832)		x										x
suborder: ANISOPTERA												
Family: AESHNIDAE												
Genus: *Aeshna* Fabricius, 1775												
A. affinis Vander Linden, 1820	x	x	x	x	x	x	x		x			
A. cyanea (Müller, 1764)	x	x	x		x	x	x		x			
A. isoceles (Müller, 1767) (12)	x	x	x		x	x	x		x			
A. juncea (Linnaeus, 1758)	x		x		x		x					
A. mixta Latreille, 1805	x	x	x	x	x	x		x	x	x		
A. serrata Hagen, 1856	x				x	x						
A. subarctica Walker, 1908												
A. subarctica elisabethae Djakonov, 1922			x									
Genus: *Anax* Leach, 1815												
A. ephippiger (Burmeister, 1839)	x	x	x	x	x	x	x	x	x	x		
A. immaculifrons Rambur, 1842	x	x		x					x			
A. imperator Leach, 1815	x	x	x	x	x	x	x	x	x	x		
A. parthenope (Selys, 1839)	x	x	x	x	x	x	x	x	x			
Genus: Boyeria McLachlan, 1896												
Boyeria cretensis, Peters, 1991		x										
Genus: *Brachytron* Evans, 1845												
B. pratense (Müller, 1764)	x	x	x		x		?		x			
Genus: *Caliaeschna* Selys, 1883												
C. microstigma (Schneider, 1845)	x	x	x	x	x	x		x	x		x	
Family: GOMPHIDAE												
Genus: *Anormogomphus* Selys, 1854												
A. kiritshenkoi Bartenef, 1913	x							x	x			
Genus: *Gomphus* Leach, 1815												
G. davidi Selys, 1887	x							(13)		x	x	
G. flavipes (Charpentier, 1825)		x	x			x	x					
G. flavipes flavipes (Charpentier, 1825)	e				?							
G. flavipes ubadschii Schmidt, 1953	x				x			x	x	x		
G. kinzelbachi Schneider, 1984	e							x	x			
G. schneiderii Selys, 1850 (14)	x	x			x	x	x		x			
G. vulgatissimus (Linnaeus, 1758)	x(15)	x	x		?							

	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
Genus: *Lindenia* De Haan, 1826												
L. tetraphylla (Vander Linden, 1825)	x	x			x(16)		x	x	x	x		
Genus: *Onychogomphus* Selys, 1854												
O. assimilis (Schneider, 1845)	x				x	x	?		x			
O. flexuosus (Schneider, 1845)	x				x	x	x	x	x	x		
O. forcipatus (Linnaeus, 1758)	x		x									
O. forcipatus forcipatus (Linnaeus, 1758)	x(17)	x			x		x					
O. forcipatus albotibialis Schmidt, 1954	x	x		x	x	x	x		x			
O. lefebvrii (Rambur, 1842)	x							x	x	x	x	
O. macrodon Selys, 1887	x								(18)	x	x	
Genus: *Ophiogomphus* Selys, 1854												
Ophiogomphus cecilia (Fourcroy, 1785)	e	x	x									
Ophiogomphus reductus Calvert, 1898	x											
Genus: *Paragomphus* Cowley, 1934												
P. genei (Selys, 1841)	e											
P. lineatus (Selys, 1850)	x								x	x		
Family: CORDULEGASTRIDAE												
Genus: *Cordulegaster* Leach, 1815												
C. bidentata Selys, 1843		x	x									
C. helladica (Lohmann, 1993)												
C. helladica buchholzi (Lohmann, 1993)		x										x
C. helladica helladica (Lohmann, 1993)		x										x
C. helladica kastalia (Lohmann, 1993)		x										x
C. heros Theischinger, 1979			x									
C. heros heros Theischinger, 1979		x										x
C. heros pelionensis Theischinger, 1979		x										x
C. insignis Schneider, 1845			x				x					
C. insignis amasina (Morton, 1916)	x											x
C. insignis charpentieri (Kolenati, 1846)	x				x	x	?					x
C. insignis coronata Morton, 1916									x			x
C. insignis insignis Schneider, 1845	x	x								x	x	x
C. insignis mzymtae Bartenef, 1929	x				x							x
C. insignis nobilis (Morton, 1916)	x				?		?	x	x			x
C. picta Selys, 1854	x	x	x				?					
C. vanbrinkae Lohmann, 1993									x			x
Family: CORDULIIDAE												
Genus: *Cordulia* Leach, 1815												
C. aenea (Linnaeus, 1758)	x	x	x		x		x					
Genus: *Somatochlora*, Selys 1871												
S. arctica (Zetterstedt, 1840)			x									
S. borisi Marinov, 2001	x(19)	x										
S. flavomaculata (Vander Linden, 1825)	x	x	x		x				x			
S. meridionalis Nielsen, 1935	x	x	x									
S. metallica (Vander Linden, 1825)			x									

Family: LIBELLULIDAE	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
Genus: *Brachythemis* Brauer, 1868												
B. fuscopalliata (Selys, 1887)	x							x	x	x		
B. leucosticta (Burmeister, 1839)	x			x	x							
Genus: *Crocothemis* Brauer, 1868												
C. erythraea (Brullé, 1832)			x	x	x	x	x					
C. erythraea erythraea (Brullé, 1832)	x	x							x			
C. erythraea chaldaeorum Morton, 1924								x	x			
C. servilia (Drury, 1773)	x					x		x	x			
Genus: *Diplacodes* Kirby, 1889												
D. lefebvrii (Rambur, 1842)	x	x		x				x	x	x		
Genus: *Leucorrhinia* Brittinger, 1850												
L. caudalis (Charpentier, 1840)	e											
L. dubia (Vander Linden, 1825)	e(20)		x									
L. pectoralis (Charpentier, 1825)	x		x		x	x						
Genus: *Libellula* Linnaeus, 1758												
L. depressa Linnaeus, 1758	x	x	x		x	x	x	x	x			
L. fulva Müller, 1764	x	x	x		x		?					
L. pontica Selys, 1887	x				x	x		x		x		
L quadrimaculata Linnaeus, 1758	x	x	x		x	x	x		x			
Genus: *Orthetrum* Newman, 1833												
O. albistylum (Selys, 1848)	x	x	x		x	x	x		x			
O. brunneum (Fonscolombe, 1837)	x	x	x	x	x	x	x	x	x	x		
O. cancellatum (Linnaeus, 1758)	x	x	x	x	x	x	x		x			
O. chrysostigma (Burmeister, 1839)	x	x		x					x	x		
O. coerulescens (Fabricius, 1798) (21)	x	x	x	x	x	x	x	x	x	x		x
O. luzonicum (Brauer, 1868)									x			
O. ransonnetii (Brauer, 1865)	x								x			
O. sabina (Drury, 1773)	x	x		x	x	x	x	x	x	x		
O. taeniolatum (Schneider, 1845)	x	x		x				x	x	x		
O. trinacria (Selys, 1841)	x	x						x	x			
Genus: *Pantala* Hagen, 1861												
P. flavescens (Fabricius, 1798)	x			x	x		x	x	x			
Genus: *Selysiothemis* Ris, 1897												
S. nigra (Vander Linden, 1825)	x	x	x	x	?		x	x	x	x		
Genus: *Sympetrum* Newman, 1833												
S. arenicolor Jödicke, 1994	x							x(22)	x	x		
S. danae (Sulzer, 1776)	e				x	x	?					
S. depressiusculum (Selys, 1841)	x	x	x		x	x	x	x				
S. flaveolum (Linnaeus, 1758)	x	x	x		x	x	x					
S. fonscolombii (Selys, 1840)	x	x	x	x	x	x	x	x	x	x		
S. haritonovi Borisov, 1983	x								x			
S. meridionale (Selys, 1841)	x	x	x	x	x	x	x		x			
S. pedemontanum (Müller in Allioni, 1766)	x	x	x		x	x	x		x			
S. sanguineum (Müller, 1764)			x			x	x					

	Turkey	Greece	Bulgaria	Cyprus	Georgia	Armenia	Azerbaijan	Iraq	Iran	Syria	Lebanon	Absent from key
S. sanguineum armeniacum (Selys, 1884)	x											
S. sanguineum sanguineum (Müller, 1764)	x	x			x				x			
S. sanguineum ssp.	x											
S. striolatum (Charpentier, 1840)			x		x	x	x	x				
S. striolatum pallidum Selys, 1887	x											
S. striolatum striolatum (Charpentier, 1840)	x	x		x					x			
S. vulgatum (Linnaeus, 1758)			x									
S. vulgatum decoloratum (Selys, 1884)	x				x	x	x	? (22)	x			
S. vulgatum vulgatum (Linnaeus, 1758)	e	x			x							
Genus: *Tholymis* Hagen, 1867												
Tholymis tillarga (Fabricius, 1798)									x			
Genus: *Tramea* Hagen, 1861												
Tramea basilaris (Palisot de Beauvois, 1817)									x			
Genus: *Trithemis* Brauer, 1868												
T. annulata (Palisot de Beauvois, 1807)	x	x		x				x	x	x		
T. arteriosa (Burmeister, 1839)	x			x					x	x		
T. festiva (Rambur, 1842)	x	x		x				x	x			
T. kirbyi Selys, 1891									x			
T. pallidinervis (Kiby, 1889)												
Genus: *Zygonyx* Selys in Hagen, 1867												
Z. torridus Selys in Hagen, 1867	x(23)								x			

Note 1: A record of *Calopteryx virgo* was published by Navas (1932). Lopau & Adena, 2002 could not find other records of this species for Cyprus and assume that the record of Navas (1932) is based on a misidentification of *C. splendens mingrelica*.

Note 2: Material of *Calopteryx virgo* from northeastern Turkey belongs to subspecies *feminalis* (pers comm.. H. Dumont). This subspecies has not been published for Turkey before.

Note 3: Several subspecies of *virens* or species allied to *virens* have been described based on the coloration on the thorax and abdomen and the extent of the yellow pattern on the thorax. The characters defining these subspecies are not clear, nor is their distribution. Both subspecies *virens* and subspecies *vestalis* have been published for Turkish territory. In a recent article Samraoui *et al.* 2003 made the hypothesis that both of these subspecies might be based on populations of hybrids between the recently described *L. numidicus* Samraoui *et al.*, 2003 from Algeria and an eastern taxon for which the valid name might be *L. marikovskii Belyshev*, 1961. However the information on this subject is rather confusing, thus the subspecies, but not the species, are omitted from the key.

Note 4: The distribution of *Sympecma gobica* is little known but the species seems to be not uncommon in Central Asia and might occur in northeastern Iran and is therefore included in the key.

Note 5: *Coenagrion armatum* has been found in Armenia and Georgia close to the Turkish border (Ketenchiev & Haritonov, 1998) and might occur in the mountains of northeast Turkey. Not mentioned as expected in Kalkman et al. 2003.

Note 6: Recently *Coenagrion australocaspicum* was found further to the west (Azerbaijan) than thus far known (Dumont, 2004). Thus it is not unlikely that this species is present in Turkey.

Note 7: Bulgarian records of *C. mercuriale*, summarised in Marinov (2000) are based on records of larvae. Probably these were not correctly identified and it is likely that all Bulgarian records of *C. mecruriale* pertain to *C. ornatum* (Marinov, 2001b).

Note 8: So far no substantiated records of *C. mercuriale* east of Slovenia are known. It is not unlikely that records of *C. mercuriale* from the

Caucasus pertain to *C. ecornutum* or are simply misidentifications of other species.

Note 9: In SCHNEIDER (2004) *Coenagrion vanbrinkae* is noted from both Syria and Lebanon. I do not know if this is based on actual identification of specimens or on the assumption that *C. ornatum* from these countries is likely to be *C. vanbrinkae*.

Note 10: The subspecies *E. cyathigerum* rotundatum was poorly described by BARTENEV (1929) and was mentioned from Turkey by ST-QUENTIN (1964). Here it is considered to be conspecific with the nominate subspecies.

Note 11: In KALKMAN *et al.* (2003) only subspecies *pontica* and *ebneri* of *Ischnura elegans* are mentioned as occurring in Turkey. However in 1967 SCHMIDT published a distribution map of the subspecies of *Ischnura elegans* in which he also gave two records of *Ischnura elegans elegans* for Turkey (Kütschük and Gediz both in western Turkey). The distinction between the subspecies of *Ischnura elegans* is not clear and a review based on material of a large part of southeastern Europe and Turkey is needed.

Note 12: The subspecies *antehumeralis* of *Aeshna isoceles* described by SCHMIDT (1950) only differs from the nominate by the extent of the yellow coloration on the thorax. This is probably simply the result of the warmer climate in the regions were this subspecies is found and therefore this subspecies is regarded as conspecific with the nominate subspecies.

Note 13: ASAHINA (1973) published a record of one teneral male and one teneral female of *Gomphus davidi* from Korikavana, Iraq. This is well east of the distributional range of *G. davidi* and SCHNEIDER (1984) was probably right in suggesting that these specimens belong to *Gomphus kinzelbachi*.

Note 14: Two subspecies of *Gomphus schneiderii* have been described, both of which are regarded here as conspecific with the nominate. *Gomphus schneiderii amseli* was described from Afghanistan as a full species. SEIDENBUSCH (1997) showed that *amseli* is structurally identical with *schneiderii* and differs mainly in the reduced black pattern. *Gomphus schneiderii transcaspicus* was described by SEIDENBUSCH (1997) from Turkmenistan. This subspecies is also structurally identical with the nominate and also differs mainly in the reduced black pattern, although less so than in *amseli*. As these subspecies are structurally the same and the configuration of the pattern is the same as the nominate (the black pattern only being reduced) I regard them as conspecific with the nominate. It seems that *Gomphus schneiderii* becomes paler towards the east.

Note 15: *Gomphus vulgatissimus* was already mentioned for Turkey by HACET & AKTAÇ (1994). The species was listed only as 'expected' in KALKMAN *et al.* (2003) as it was not clear whether or HACET & AKTAÇ (1994) ruled out *G. schneiderii*. HACET & AKTAÇ (2004) published new records for *Gomphus vulgatissimus* from the European part of Turkey describing the characters they used to distinguish the specimens from *G. schneiderii*.

Note 16: *Lindenia inkiti* is here considered to be a synonym of *L. tetraphylla* (KALKMAN, 2004).

Note 17: The first Turkish records of the nominate subspecies of *Onychogomphus forcipatus* were published by HACET & AKTAÇ (2004). The border between subspecies *forcipatus* and *albotibialis* might be formed by the Bosphorus.

Note 18: HEIDERI & DUMONT (2002) mentioned *O. macrodon* as occurring in Iran based on a record by Blom (1982). These specimens, however, belong to *O. forcipatus* (SCHNEIDER, 1987).

Note 19: The first Turkish record of *Somatochlora borisii* was recently published by BOUDOT *et al.* (2004). The only Turkish specimen has been caught in the Black Sea region of Thrace (one female, Pabuç River near Kıyıköy, 05 July 1992; leg. N. Hacet). It is not clear if a population is present at this locality.

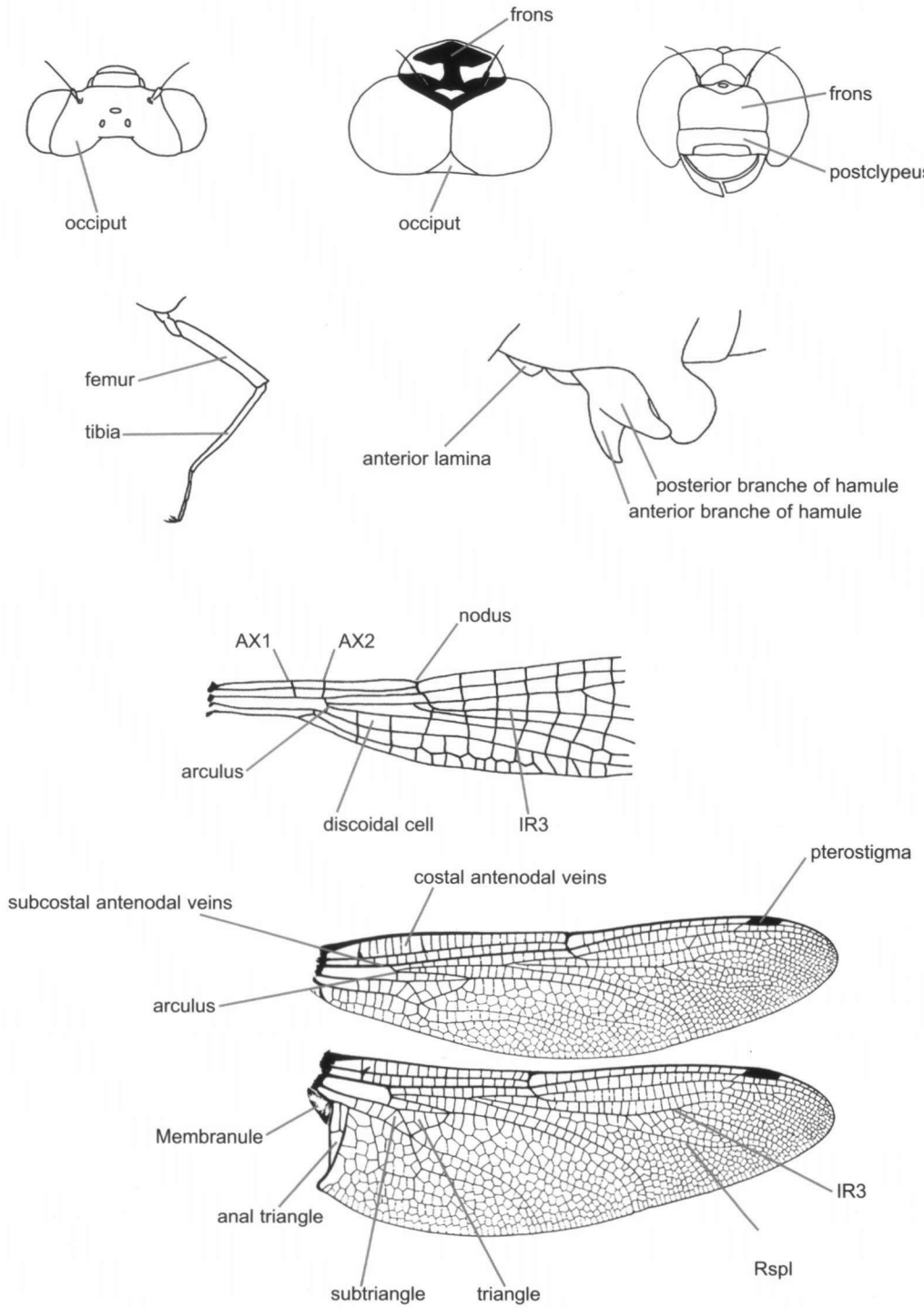
Note 20: In KALKMAN *et al.* (2003) *Leucorrhinia dubia* was not mentioned as expected in Turkey. But the species occurs in the northern parts of the Caucasus and it seems possible that the species is also present in Georgia and northeastern Turkey.

Note 21: Two subspecies of *O. coerulescens* are often recognised. These two differ slightly in the form of the anterior lamina. Here both are considered to be conspecific, as intermediate individuals occur in large areas. Another character often mentioned for subspecies anceps is that the males tend to be covered with a more dense and extensive pruinosity. However species with pruinosity often tend to have more dense and extensive pruinosity in the south of their range and this seems to have not much taxonomic value.

Note 22: Old records of pale *Sympetrum* specimens from Iraq were published as *S. decoloratum*. JÖDICKE *et al.* (2000) made clear that at least some of these records belong to *S. arenicolor*. It remains unclear whether or not some of the old records pertain to *Sympetrum vulgatum decoloratum*.

Note 23: A single male was reported at 16 May 1990 by P.W. Swire (ASKEW, 2004). KUNZ *et al.*, 2006 believed this record to be correct and included it in their review of the distribution of *Zygonyx torridus*.

1. Terminology used in the keys



Morphology

The terminology used in the keys is largely the same as in Askew (1988). The text below gives information on characters used in the key. Others are illustrated in plate 1. Abbreviations used can be found in Table 2. The expressions used to show the position of characters are described in Table 3. More information on the morphology of dragonflies can be found in Askew (1988).

Adult dragonflies can be divided into the head, thorax and abdomen. The thorax is divided into the prothorax and the synthorax. The first pairs of legs is attached to the prothorax, the other pairs of legs and the wings are attached to the synthorax. The pronotum is the dorsal plate of the prothorax. In the key the synthorax is simply called thorax. On the thorax several sutures (fine grooves) are visible. The sutures bordering each side of the front of the thorax are the humeral sutures. A (often dark) stripe running along this suture is called a humeral stripe. As pale stripe on the dorsal side of the thorax (so bordering a humeral stripe) is called an antehumeral stripe. The abdomen is made up of 10 segments (S) with the segment at the tip of the abdomen being segment 10. In males the ventral side of S2-3 holds the secondary genitalia. On the sides of S2 little 'ears' called auricles can be present. In males the tip of the abdomen have claspers which are used to grasp the female.

The pair of claspers on the dorsal side are the superior appendages. The claspers on the ventral side are called inferior appendages, in Anisoptera the inferior appendages are just a single structure. In females the underside of the tip of the abdomen holds a vulvar scale or an ovipositor structures used for ovipositing.

Table 2: Abbreviations

FW	forewing
Pt	pterostigma
S	segment
HW	hind wing

Table 3: Directions or positions

Anterior (anteriorly):	in front
Apical (apically):	towards the end
Basal (basally):	towards the base
Dorsal (dorsally):	the upper side, i.e. the surface you see when the dragonfly is seen from above
Lateral (laterally):	the sides, i.e. the surface you see when the dragonfly is seen from the side
Posterior (posteriorly):	at the back
Ventral (ventrally):	underside, i.e. the surface you see when the dragonfly is seen from beneath

Key to suborders of the Turkish Odonata

1a Base of FW and HW similarly shaped and, except in *Calopteryx* and *Epallage*, petiolate. Eyes always well separated on top of the head (Fig. 2.6) .....Zygoptera

1b Base of FW differently shaped and narrower than base of HW, wings never petiolate. Eyes, except in Gomphidae (Fig. 2.9), touching on top of the head (Fig. 2.7, 2.8).....Anisoptera

Key to families of the Turkish Zygoptera

1a Wings not petiolate and with twelve or more antenodal cross-veins (Fig. 2.4, 2.5). Most (sub)species with (partly) blue or brownish wings. ..... (2)

1b Wings petiolate and with two antenodal cross-veins (2.1-3). Wings always hyaline..... (3)

2a Abdomen metallic blue or metallic green. Wings with eighteen or more antenodal cross-veins (Fig. 2.5) .....Calopterygidae

2b Abdomen never metallic. Wings with twelve to fourteen antenodal cross-veins (Fig. 2.4).....Euphaeidae

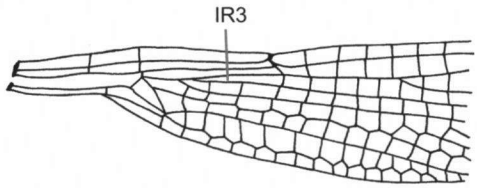
3a Pt at least twice as long as broad and as long or longer than the two underlying cells. R4 and IR3 originate less than halfway from arculus to level of subnodus (Fig. 2.1). Most species with metallic coloration on thorax and abdomen .... Lestidae

3b Pt less than twice as long as broad and shorter than the two underlying cells. R4 and IR3 originate well beyond halfway from arculus to level of subnodus (Fig. 2.2, 2.3). Never with metallic coloration on thorax and abdomen..... (4)

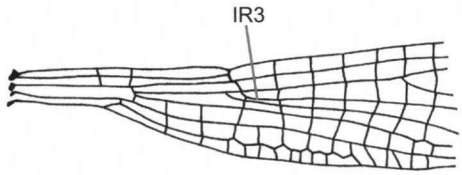
4a Discoidal cells trapezoidal, in FW anterior border of the discoidal cell at most twice as long as distal border (Fig. 2.3). Most often 3 cells between discoidal cells and subnodus (Fig. 2.3). Head not very wide, about 2x as broad as deep .... Coenagrionidae

4b Discoidal cells almost rectangular, in FW anterior border of the discoidal cell about 3x as long as distal border (Fig. 2.2). Usually 2 cells between discoidal cell and subnodus (rarely 3) (Fig. 2.3). Head very wide, about 3x as broad as deep..... ..... Platycnemididae

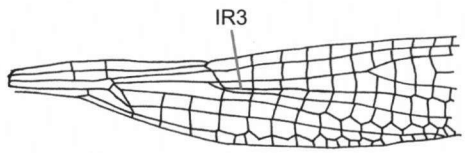
2. Zygoptera, Anisoptera



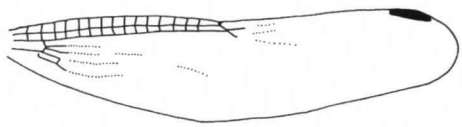
2.1 Wingbase of Lestidae (*Lestes*)



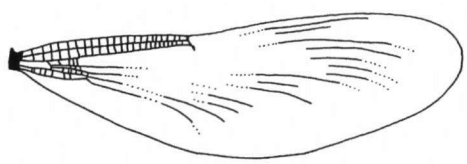
2.2 Wingbase of Platycnemididae (*Platycnemis*)



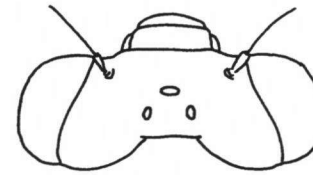
2.3 Wingbase of Coenagrionidae (*Pyrrhosoma*)



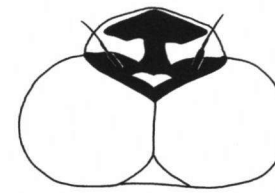
2.4 Wing of Euphaeidae (*Epallage*)



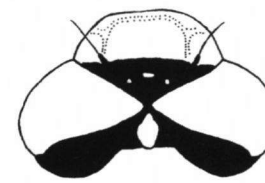
2.5 Wing of Calopterygidae (*Calopteryx*)



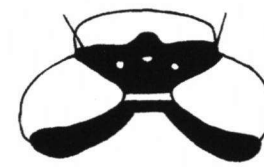
2.6 Head of Zygoptera



2.7 Head of Aeshnidae



2.8 Head of Cordulegastridae



2.9 Head of Gomphidae

Key to genera of Calopterygidae

This subfamily is only represented by the genus *Calopteryx*. Information on the identification of the subspecies of *C. splendens* can be found in DUMONT *et al.* (1987) and DUMONT *et al.* (1997).

Key to species of Calopteryx (males)

The females of *Calopteryx* are often impossible to identify and therefore no key is given.

Subspecies of *Calopteryx splendens*: The numerous subspecies of *Calopteryx splendens* are separated largely on the basis of the size and shape of the blue wing spot in the males and the colours of the underside of the last segments. There is much variation in the wing spots within and between populations and there are large areas where intermediate forms between the subspecies occur. The identification of subspecies of *C. splendens* is therefore difficult and often impossible. Due to the variation within populations it is necessary to look at several specimens from one population when identifying to subspecies-level. It is advisable to state the characters used for identification when publishing records of subspecies of *C. splendens*. The most recent checklist of Turkish dragonflies (KALKMAN *et al.* 2003) mentions four subspecies of *C. splendens* as definitely occurring (*amasina, intermedia, waterstoni, tschaldirica*) and another two are mentioned as expected (*hyalina, mingrelica*). In two of these, *waterstoni* and *hyalina*, the males have hyaline wings and can be easily identified. Throughout most of Turkey specimens are found that belong to either *amasina* or *intermedia*. The name *mingrelica* is sometimes used for what here is called *amasina*. Also included in the key is subspecies *orientalis*, which occurs in a coastal strip along the southern part of the Caspian Sea. Not included in the key are subspecies *balcanica* occurring in Greece and Bulgaria, subspecies *cretensis* occurring on Crete and subspecies *syriaca*. None of these is expected to occur in Turkey.
Warning: the subspecies of *C. splendens* are not well defined and the characters used to define the subspecies vary between authors. The characters given in this key are an interpretation of the literature on this subject. A thorough review of the subspecies including DNA analyses based on a large amount of material from a broad geographical range is necessary to establish the distinguishing characters between the subspecies and their distributional ranges.
Subspecies of *Calopteryx virgo*: Based on the size and shape of the wing spot in the males and the colours of the underside of the last segments of the abdomen, several subspecies of *C. virgo* have been described from Europe. Interpretation of the characters is often difficult and the borders of their areas of distribution are not well known. Specimens from Turkey and the Balkans are usually referred to as subspecies *festiva* although the characters distinguishing *festiva* from the nominate subspecies are ill defined. A second subspecies *C. virgo feminalis* occurs in northeast Turkey along the Black Sea coast.

1a Wings hyaline ..... (2)
1b Wings with at least a small blue spot .. (3)

2a Occurring in northeast Turkey along the Black Sea coast. Male: The lower appendages end with a single tooth. Underside of S8 and S9 ochreous with black markings. Wings less broad with the FW 3.2 to 3.3 times as long as broad ..... *Calopteryx splendens waterstoni*
2b Might be present in southeast Turkey. Male: The lower appendages end with two teeth. Underside of S8 and S9 ochreous without black markings. Wings broader with the FW 3.4 to 3.7 times as long as broad ..... *Calopteryx splendens hyalina*

3a The wing spot in the FW starts less than 10 cells before the nodus or several cells beyond the nodus (Fig. 3.1, 3.2, 3.5). The wing spot often leaves a small part of the wingtip hyaline (except in *C. s. orientalis*) ..... (4)
3b The wing spot in the FW starts more than 10 cells before the nodus (Fig. 3.3 & 3.4, 3.6, 3.7). The wing spot often covers the wing tip ..... (6)

4a The wing spot in the FW does not reach or just barely reaches the hind margin of the wing. Wing tip hyaline for more than 5mm (Fig. 3.5)..... ..... *Calopteryx splendens tschaldirica* ..... and *Calopteryx splendens mingrelica*

4b The wing spot in the FW reaches the hind margin of the wing. Wing tip hyaline for less than 5 mm (Fig. 3.1, 3.2) ..... (5)

5a The wing spots often leaves a small part of the wingtip hyaline. The wing spot in the FW starts between 10 cells before the nodus to two cells beyond the nodus. ..... *Calopteryx splendens amasina*

5b The wing spots always cover the wingtip. The wing spot in the FW starts 6 to 22 cells beyond the nodus..... .....*Calopteryx splendens orientalis*

6a Base of wing never covered by the wing spot. The first fifteen antenodal cells are entirely hyaline (Fig. 3.3 & 3.4). Underside of S9, S10 and underside of inferior appendages yellow, sometimes with a reddish gloss..... ..... *Calopteryx splendens intermedia*

6b Base of wing often covered by the wing spot or the first fifteen antenodal cells largely suffused with yellow-brown (Fig. 3.6, Fig. 3.7). Underside of S9, S10 and underside of lower appendages brick red or underside of S9 black and S10 and underside of inferior appendages whitish ..... (7)

7a Underside of S9, S10 and underside of lower appendages red .... *Calopteryx virgo festiva*

7b Underside of S9 black (sometimes with small dark-reddish spots), S10 and underside of inferior appendages whitish.. ..... *Calopteryx virgo feminalis*

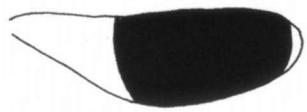
Calopteryx splendens

Distribution: Common across Turkey. Subspecies *amasina* is the most widespread of the Turkish subspecies and it is present in the whole of Turkey, being replaced by the other subspecies in parts of the southeast and northeast only. Subspecies *intermedia* is present along the Mediterranean from Antalya eastwards and in parts of southeast Turkey. Subspecies *waterstoni* is present along the Black Sea coast east of Giresun where it occurs in fast-running rivulets draining the northern slopes of the Pontic Alps. Subspecies *tschaldirica* occurs in the area north of Kars where it inhabits the plateau area of northeast Anatolia at altitudes ranging between 1600 and 1800m and similar areas in Armenia (DUMONT *et al.* 1987). Subspecies *mingrelica* is not found in Turkey but occurs near the border in Georgia. Subspecies *hyalina* occurs in Syria and might occur in southeast Turkey.
Flight period: Beginning of May to beginning of October, with a few records in March and April.
Habitat: All kinds of running waters, highest densities found at brooks and smaller rivers.

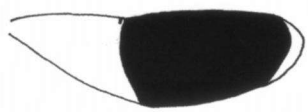
Calopteryx virgo

Distribution: Common in western Turkey and along the Black Sea coast, less common in eastern Turkey. Almost all records in Turkey belong to subspecies *festiva*. Subspecies *C. v. feminalis* is found along the eastern part of the Turkish Black Sea coast. Material present in the RMNH from Rize and Trabzon has the underside of S9 black and S10 and underside of lower appendages whitish and is thought to pertain to subspecies *feminalis*. Information on the distribution of this subspecies is scarce. Material from other parts of Turkey have the underside of S9, S10 and underside of lower appendages red and pertains to *C. v. festiva*.
Flight period: Mid-May to beginning of September.
Habitat: Brooks. Generally preferring colder (shaded) brooks than *C. splendens*.

3. Calopteryx, Epallage

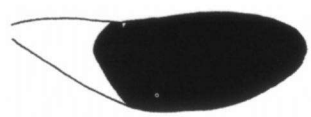


3.1 *C. splendens amasina* (♂), wing

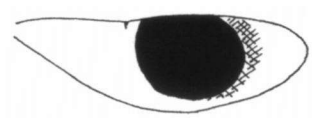


3.2 *C. splendens amasina* (♂), wing

3.3 *C. splendens intermedia* (♂), wing



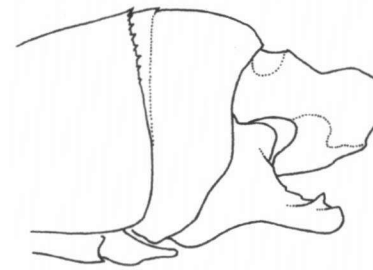
3.4 *C. splendens intermedia* (♂), wing



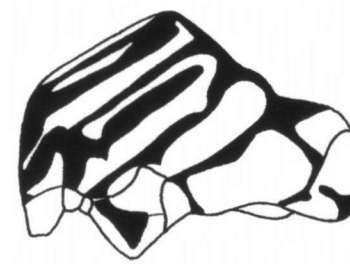
3.5 *C. splendens mingrelica* (♂), wing

3.6 *C. virgo festiva* (♂), wing

3.7 *C. virgo festiva* (♂), wing



3.8 *E. fatime* (♂), appendages



3.9 *E. fatime* (♀), thorax

Key to genera Euphaeidae

This family is represented only by the monotypic genus *Epallage*.

Key to species of Epallage

Only one regional species present. Male appendages: Fig. 3.8; thorax female: Fig. 3.9.

Epallage fatime

Distribution: Common in the south and fairly common in the rest of Turkey but remarkably scarce in Thrace.
Flight period: End of April to mid-August.
Habitat: Stony, running waters. Most common along brooks but also found by rivers.

Key to genera of Lestidae

1a Abdomen and thorax metallic green or bronze, often with blue pruinosity or greenish to brownish without an extensive and clearly-defined dark pattern on thorax and abdomen. The Pt of the FW and HW at almost the same distance from the wing tip. Hind border of the prothorax rounded and not trilobed..... ..... *Lestes*

1b Abdomen and thorax brownish with a distinct dark brown pattern on the abdomen and thorax, never with pruinosity. The Pt in the FW much nearer to the wing tip than in the HW. Hind border of the prothorax trilobed ..... *Sympecma*

Key to species of Lestes

This key is not suited for freshly emerged specimens. Fresh males can be identified by their appendages (Fig. 4.1-7).

1a Thorax and abdomen not metallic green but greenish to brownish. Thorax never with distinct yellow stripes. S10 and most often also 9 pale with a small but distinct mid-dorsal longitudinal stripe. Male: Upper appendages more abruptly bent inwards (Fig. 4.7). Lower appendages shorter than half the length of the upper appendages ..... *Lestes concinnus*

1b Thorax and abdomen metallic green or bronze. Dorsal surface of S10 and S9 largely metallic green to brown. Thorax with or without yellow stripes. Male: Upper appendages smoothly curved inwards. Lower appendages shorter or longer than half the length of the upper appendages ..... (2)

2a Back of head bicoloured: lower part yellow and upper part dark..... (3)

2b Back of head unicoloured: lower and upper part dark..... (4)

3a Pt clearly bicoloured, the apical third whitish and the basal part brown. Male: Lower appendages with diverging apices (Fig. 4.1)..... *Lestes barbarus*

3b Pt unicoloured, only the apical and basal fringe whitish. Male: Lower appendages without diverging apices (Fig. 4.5)..... ..... *Lestes virens*

4a Markings on side of synthorax as in Fig. 4.11, with a dark 'peninsula' extending into the pale area; sides of thorax never with pruinosity. Pt is pale or dark coloured. Male: Never with blue pruinosity on S1 and S2. Lower appendages always less than half the length of the upper appendages (Fig. 4.6) ..... (5)

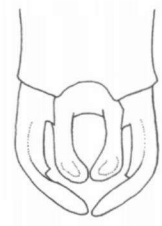
4b Markings on side of synthorax as in Fig. 4.10, with the dark protrusion shorter or absent; markings on side of thorax sometimes obscured by pruinosity. Pt in mature individuals dark coloured. Male: Mature males with blue pruinosity on S1 and S2. Lower appendages longer or shorter than half the length of the upper appendages (Fig. 4.2-4)..... (6)

5a Pt dark or pale-coloured. Male: The inner parts of the upper appendages are hollowed out inwardly, and a small tooth is present on the inner rim of the folding. The apex of the lower appendages (seen from lateral) is narrow and strongly curved (Fig 4.17). Female: Ovipositor with less than 10 spines, normally 6 to 8 (Fig. 4.9)..... *Lestes parvidens*

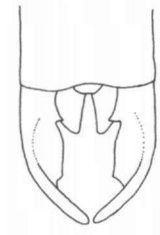
5b Pt pale-coloured. Male: The inner parts of the upper appendages are not hollowed out inwardly. The small tooth present on the inner side of the upper appendages

4. Lestes

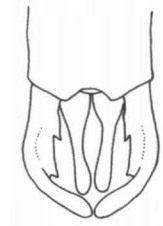
4.1 L. barbarus (♂)



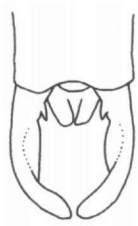
4.2 L. dryas (♂)



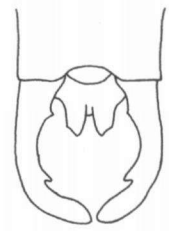
4.3 L. macrostigma (♂)



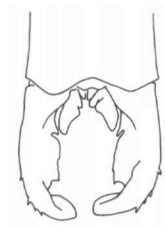
4.4 L. sponsa (♂)



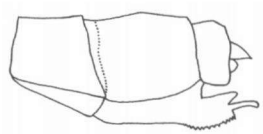
4.5 L. virens (♂)



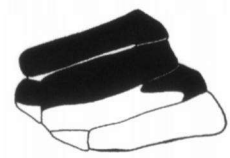
4.6 Lestes viridis (♂)



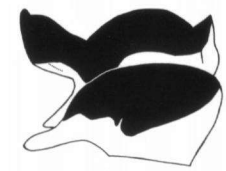
4.7 L. concinnus (♂)



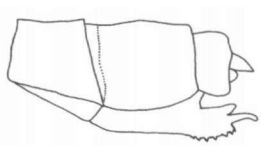
4.8 L. viridis (♀), tip of abdomen



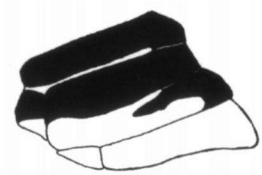
4.10 L. spec, thorax



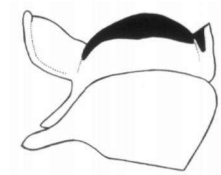
4.12 L. dryas, prothorax



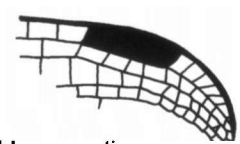
4.9 L. parvidens (♀), tip of abdomen



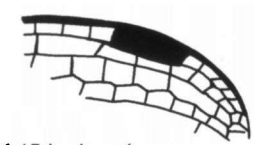
4.11 L. parvidens, thorax



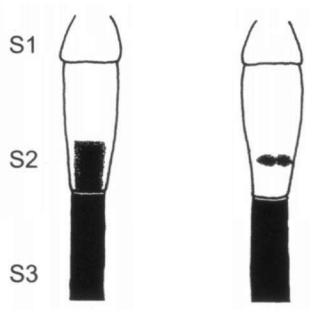
4.13 L. sponsa, prothorax



4.14 L. macrostigma, pterostigma



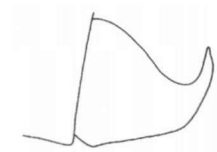
4.15 L. dryas/sponsa, pterostigma



4.18 *L. dryas* (♂), abdomen

4.19 *L. sponsa* (♂), abdomen

4.16 *L. viridis* (♂), inferior appendages lateral view



4.17 *L. parvidens* (♂), inferior appendages lateral view

has a broad base and does not lie on the upper side of the appendages. The apex of the lower appendages (seen from lateral) is blunt and only weakly curved (Fig 4.16). Female: Ovipositor with at least 10 spines (Fig. 4.8) ..... *Lestes viridis*

6a Pt very large and broadened in the middle, extending over three or four cells (Fig. 4.14). Males: Lower appendages less than half as long as upper appendages (Fig. 4.3)..... *Lestes macrostigma*

6b Pt smaller, normally extending over two cells only (Fig. 4.15). Males: Lower appendages longer than half the length of the upper appendages (Fig. 4.2, 4.4) ..... (7)

7a Male: Lower appendages with tips broadened and bent inwards (somewhat 'spoon'-shaped) (Fig. 4.2). The blue pruinosity (present in mature individuals only) on the dorsal side of S2 does not cover the whole segment; at the posterior side a square space is left free (Fig. 4.18). Female and teneral males: The lateral side of the prothorax with a large dark mark (Fig. 4.12)..... *Lestes dryas*

7b Male: Lower appendages almost straight (Fig. 4.4). The blue pruinosity (present in mature individuals only) on the dorsal side of S2 covers the whole segment (Fig. 4.19). Female and teneral males: The lateral side of the prothorax with a large dark mark (Fig. 4.13) ..... *Lestes sponsa*

Lestes barbarus

Distribution: Fairly common across Turkey.
Flight period: Mid-May to end of August.
Habitat: Standing waters, most often those that are well vegetated and shallow.

Lestes concinnus

Distribution: Not expected to occur in Turkey. Widespread species occurring from eastern Iran to Australia. Known from two records from the southeast of Iran (SCHMIDT, 1960).
Flight period: The records from Iran are from March and April. In most of its range on the wing during the larger part of the year.
Habitat: Marshes in open country (LIEFTINCK, 1954).

Lestes dryas

Distribution: Common in the north of Turkey, scarce in the south.
Flight period: End of May to end of August, with one record Mid-April.
Habitat: Standing, often well-vegetated waters.

Lestes macrostigma

Distribution: Known from a small number of localities along Turkish west- and southcoast and from a small number of inland localities.
Flight period: End March to begin July.
Habitat: Standing, shallow and often perennial waters. The species favours slightly brackish habitats and is therefore often found at coastal wetland and large steppe lakes.

Lestes sponsa

Distribution: Fairly common in north Turkey (especially in the northeast), rare in the south.
Flight period: Mid-June to end of August.
Habitat: Standing waters, most often at well-vegetated waters.

Lestes virens

Distribution: Found throughout Turkey but everywhere scares.
Flight period: Mid-April to mid-August with most records in July and August.
Habitat: Standing often well-vegetated waters.

Lestes parvidens

Distribution: Fairly common in Thrace and scarce along the Mediterranean coast, rare in the rest of Turkey.
Flight period: Beginning of May to beginning of October, with two records in November.
Habitat: Standing waters at least partly bordered with trees (oviposition in wood).

Lestes viridis

Distribution: Not yet found in Turkey but might occur in Thrace.
Flight period: Expected during the same period as *L. parvidens*.
Habitat: Standing waters at least partly bordered with trees (oviposition in wood).

Key to species of Sympecma

The pattern on the thorax and abdomen is variable. This is especially true for *S. paedisca* in which the pattern on the thorax and abdomen becomes increasingly reduced towards the south of its range. The key uses characters based on the pattern, as these are easiest and in most cases reliable. However it is advisable always to check the structural characters given for the males. More information on the recognition of the species can be found in DUMONT & BORISOV, 1993 and JÖDICKE, 1997. The first gives structural characters illustrated with SEM-pictures for the identification of females.

1a Thorax in lateral view: the lower border of the upper dark stripe is broadened posteriorly, often forming a small hook (Fig. 5.5). S2-8: at the end of each segment the dark dorsal mark is upturned forming a 'fishhook' on each side of the segment. Male: Hind rim of S10 slightly raised and with a number of spines. Lower appendages do not reach across the tooth on the inner side of the upper appendages... ..... *Sympecma gobica*

1b Thorax in lateral view: the lower border of the upper dark stripe is not posteriorly broadened (Fig. 5.3, 5.4). S2-8: the dark dorsal mark is not upturned at the end of each segment. Male: Hind rim of S10 slightly depressed and without spines. Lower appendages may or may not reach across the tooth on the inner side of the upper appendages..... (2)

2a Thorax in lateral view: the lower border of the upper dark stripe on the thorax is almost straight and has no protrusion in the pale area (Fig. 5.3). Male: Lower appendages reach across the tooth on the inner side of the upper appendages (Fig. 5.1)..... *Sympecma fusca*

2b Thorax in lateral view: the lower border of the upper dark stripe on the thorax has a small protrusion in the pale area (Fig. 5.4). Male: Lower appendages do not reach across the tooth on the inner side of the upper appendages (Fig. 5.2) ..... *Sympecma paedisca*

Sympecma fusca

Distribution: Fairly common across Turkey.
Flight period: End of March to mid-August. Adults hibernate and can probably be found on the wing throughout the year.
Habitat: Standing, well-vegetated waters.

Sympecma gobica

Distribution: Occurs in central Asia and might occur in northeastern Iran but not expected to occur in Turkey. Records published before the re-description by DUMONT & BORISOV, 1993 are unreliable. The species at least occurs in Tajikistan, Turkmenistan, Uzbekistan, Kyrgyzstan, Kazakhstan, China (SCHOORL, 2000; JÖDICKE, 1997; COLL RMNH; COLL. SIBERIAN ZOOLOGICAL MUSEUM).
Flight period: Adults hibernate and can probably be found on the wing throughout the year. Records published by SCHOORL (2000) and present in collection RMNH are from June, July, August and November.
Habitat: Mentioned by SCHOORL (2000) from a marsh in an oasis resting on grasses and in bushes. Frequently co-occurs with *S. fusca* and/or *S. paedisca* (SCHOORL, 2000; coll. RMNH).

Sympecma paedisca

Distribution: In Turkey known from only two records from the 19th century (SELYS, 1887) from the provinces of Hatay and Malatya. These records suggest that it was present in a large part of Turkey. Recently the species was found in Armenia close to the border with Turkey, which makes it highly likely that the species is also present in the adjacent parts of Turkey.
Flight period: No dates known. Adults hibernate and can probably be found on the wing throughout the year.
Habitat: No habitat information for Turkey known, probably to be found in standing, well-vegetated waters.

Key to genera of Platycnemididae

This family is represented only by the genus *Platycnemis*.

Key to species of Platycnemis

1a Tibia not expanded (Fig. 5.12). Mature individuals with blue pruinosity on abdomen. Male: Upper appendages bifid. (Fig. 5.7)..... *Platycnemis kervillei*

1b Tibia expanded (Fig. 5.11, 5.13). Individuals never with blue pruinosity on abdomen. Male: Upper appendages bifid or rounded (Fig. 5.6, 5.8)..... (2)

2a Tibia with black stripe (Fig. 5.13). Male: Upper appendages bifid (Fig. 5.8). Female: Hind ridge of pronotum with a slightly pointed elevation about halfway between the lowest and highest point (Fig. 5.10).....*Platycnemis pennipes*

2b Tibia unmarked or with only a few black spots (Fig. 5.11). Male: Upper appendages with rounded apex (Fig. 5.6). Female: Hind ridge of pronotum without pointed elevation halfway between the lowest and highest point (Fig. 5.9)..... ..... *Platycnemis dealbata*

Platycnemis dealbata

Distribution: Common in southeast Turkey and in the coastal area in the southeast. Occurring from Israel and east Turkey to India and Afghanistan. With the exception of west Georgia it is common in the Transcaucausus but has not yet been found in northeast Turkey.
Flight period: End of April to end of September.
Habitat: All kinds of running waters, most common in brooks.

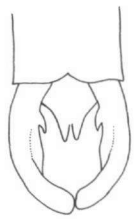
Platycnemis kervillei

Distribution: Common in southeast Turkey and in the Adana Delta. Has a restricted range and is confined to Iraq, Israel, Lebanon, Syria and Turkey.
Flight period: Beginning of April to Mid-August, most records from May.
Habitat: Found in brooks and seems to be absent from larger running waters.

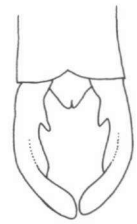
Platycnemis pennipes

Distribution: Common in west Turkey, scarce in the northeast. Seems to be largely absent in the southeast were replaced by *P. dealbata* and *P. kervillei*. The species is widespread in Central- and southwest Asia.
Flight period: Beginning of April to beginning of October.
Habitat: All kinds of running waters and more rarely in lakes, most common in brooks.

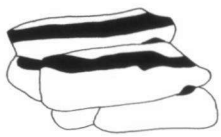
5. Sympecma, Platycnemis



5.1 *S. fusca* (♂)



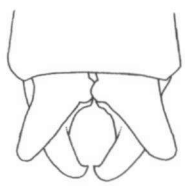
5.2 *S. paedisca* (♂)



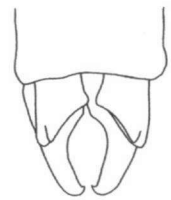
5.3 *S. fusca*, thorax

5.4 *S. paedisca*, thorax

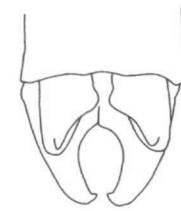
5.5 *S. gobica*, thorax



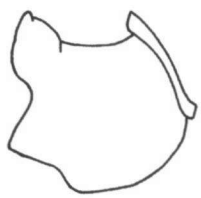
5.6 *P. dealbata* (♂)



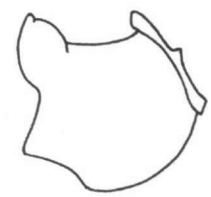
5.7 *P. kervillei* (♂)



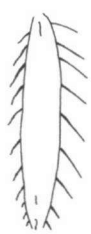
5.8 *P. pennipes* (♂)



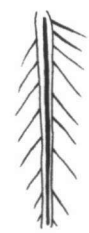
5.9 *P. dealbata* (♀), prothorax lateral view



5.10 *P. pennipes* (♀), prothorax lateral view



5.11 *P. dealbata*, tibia



5.12 *P. kervillei*, tibia

5.13 *P. pennipes*, tibia

Key to genera of Coenagrionidae

1a Arculus is situated about its own length beyond Ax2 (Fig. 7.16). Very small species, total length less than 24mm ..... *Agriocnemis*

1b Arculus roughly situated at level of Ax2 (Fig. 7.17)..... (2)

2a Occiput dorsally entirely bronze-black, lacking pale postocular spots. (exception: some populations of *Coenagrion pulchellum* are very dark. These may lack pale postocular spots) Males: Eyes reddish; abdomen and legs can be red. Female: Vulvar spine absent ..... (3)

2b Occiput dorsally with two postocular spots (sometimes confluent) or occiput dorsally largely pale (Fig. 7.12-14); in the female form typica of *Ischnura pumilio* the postocular spots can be missing. Males: Eyes, abdomen and legs never red. Female: Vulvar spine absent or present (Fig. 9.10)..... (5)

3a Legs reddish, Pt reddish ..... *Ceriagrion*

3b Legs black, Pt black..... (4)

4a Males: Abdomen red with a black pattern. Females: Abdomen red with black pattern. Exception: Some females lack the red and have a very extensive black pattern on the abdomen. These can be distinguished from females of *Erythromma* by the antehumeral stripe which crosses the humeral suture..... *Pyrrhosoma*

4b Males: Abdomen black with a blue pattern. Females: Abdomen black, never with red ..... *Erythromma*

5a Males..... (6)

5b Females ..... (10)

6a Upper appendages about twice as long as lower appendages..... (7)

6b Upper appendages clearly less than twice as long as lower appendages..... (8)

7a Upper appendages bifid (Fig. 10.5). Head and pronotum often with blue or greyish pruinosity.....*Pseudagrion*

7b Upper appendages not bifid (Fig. 7.10). Head and pronotum never with blue or greyish pruinosity ....*Erythromma (Erythromma lindenii)*

8a Dorsal side of S2 black. Pt in FW bicoloured. Posterior border of S10 often raised ..... *Ischnura*

8b Dorsal side of S2 blue with black markings. Pt in FW black, sometimes with small whitish fringes. Posterior border of S10 never clearly raised ..... (9)

9a Sides of the thorax have just one thin black line (Fig. 8.2). Antehumeral stripe wider than the black line below it (Fig. 8.2). Lower appendages always longer than upper appendages (Fig. 8.1) ....*Enallagma*

9b Sides of the thorax have two lines: a short one and a longer one. Antehumeral stripe smaller than the black line below it (Fig. 8.3). Lower appendages longer or shorter than upper appendages (Fig. 6.5-11)..... *Coenagrion*

10a Vulvar spine absent. Pt never clearly bicoloured.....(11)

10b Vulvar spine present (Fig. 9.10). Pt often clearly bicoloured ..... (13)

11a Stylets and lateral epaulettes present (Fig. 10.6). When stylets and lateral epaulettes small then S9 with a pair of black spots, S10 pale and mature individuals with blue pruinosity on the base of the wings.....*Pseudagrion*

11b Stylets and lateral epaulettes absent. S9 and S10 largely black. Mature individuals never with blue pruinosity on the base of the wings..... (12)

12a A bulb-like, spiny swelling is present on the sides of the synthorax. (Fig. 7.11). Postocular spots elongated (Fig. 7.13), or if confluent then the occiput is largely pale (Fig. 7.14)..... .....*Erythromma (Erythromma lindenii)*

12b No bulb-like, spiny swelling is present on the sides of the synthorax. Postocular spots round or triangular (Fig. 7.12)..... ..... *Coenagrion*

13a Pale antehumeral stripe is smaller than the black stripe beneath it, or the side of the thorax is largely orange or blue without well-defined black markings. S8 in most cases at least partially blue. Hind margin of pronotum often with an upward-directed middle lobe. Pt in FW at least partially whitish..... *Ischnura*

13b Pale antehumeral stripe is as broad or broader than the black stripe beneath it. S8 always black. Hind margin of pronotum smoothly rounded without an upward-directed middle lobe. Pt in FW black, sometimes with small whitish fringes .....*Enallagma*

Key to species of Agriocnemis

Agriocnemis sania and *A. pygmaea* are closely related and are distinguished based on details in the pronotum, the lamina mesostigmalis and the male appendages. These differences are difficult to place in a key. A full description of *A. sania* with a comparison with *A. pygmaea* can be found in DUMONT (1974). Appendages of male *A. pygmaea/sania* are shown in Fig 7.15

1a Found in Iran and further east ....*Agriocnemis pygmaea*

1b Found in Libya and from the extreme north of Israel to the Sinai desert..... ..... *Agriocnemis sania*

Agriocnemis sania

Distribution: Found in Libya and from the extreme north of Israel to the Sinai desert. Might be present in Turkish provinces adjacent to Syria.

Flight period: In Israel recorded from March to August (DUMONT, 1991).

Habitat: Richly-vegetated standing waters and marshes, occasionally in slowly-running water (DUMONT, 1974).

Agriocnemis pygmaea

Distribution: Widespread in the Oriental region. Not expected to occur in Turkey. In Iran known from one location where it was found to be common and emerging in huge numbers.

Flight period: The only record from Iran is from 28 April 1995 (DUMONT & HEIDARI, 1996) but it is probably on the wing during most of the year.

Habitat: Shallow, well-vegetated, standing or slowly-flowing waters.

Key to species of Ceriagrion

1a Males: Tubercle on S10 with a crown of black spines (Fig. 6.1). Lower appendages slender (Fig. 6.1). Females: The two upright lobes on the thorax just behind the pronotum are conspicuous and are higher than the hind rim of the pronotum (Fig. 6.3)..... *Ceriagrion georgifreyi*

1b Males: Tubercle on S10 without a crown of black spines (Fig. 6.2). Lower append-

ages less slender (Fig. 6.2). Females: The two upright lobes on the thorax just behind the pronotum are inconspicuous and never higher than the hind rim of the pronotum (Fig. 6.4) ... *Ceriagrion tenellum*

Ceriagrion georgifreyi

Distribution: In Turkey uncommon along the Mediterranean coast, not found west of Lake Köyceğiz. Has a small range, so far recorded from Greece, Turkey, Israel and Syria (KALKMAN, 2005).
Flight period: Mid-May to beginning of October.
Habitat: Seepage areas.

Ceriagrion tenellum

Distribution: Probably does not occur in Turkey; nearest localities on Crete and in Albania (KALKMAN, 2005).
Flight period: In the Balkans and on Crete probably the same as *Ceriagrion georgifreyi*.
Habitat: In the Balkans and on Crete probably found in seepage areas.

Key to species of Coenagrion (males)

The females of the genus *Coenagrion* are often difficult to identify and therefore no key is given. *Coenagrion vanbrinkae* and *C. persicum* were relatively recently described by LOHMANN (1993). Both species are omitted from the key as the characters used for identification are unclear. *Coenagrion vanbrinkae* is close to *C. ornatum* and so far there are published records for Lebanon, Syria, Iran, eastern Turkey and Armenia. *Coenagrion persicum* is close to *C. pulchellum* and was described based on one male from the west of Iran. It might occur in Turkey.

1a Lower appendages massive and two or three times as long as upper appendages (Fig. 6.15). Abdomen largely black, with blue only on S1-3 and S8-9 (Fig. 7.6) ..... *Coenagrion armatum*

1b Lower appendages small and as long, or only slightly longer than, upper appendages (Fig. 6.5-14)..... (2)

2a The black markings on S3 and S4 has black lateral lines running forwards almost as far as the anterior edge of the segment. These lines are always at least twice as long as the median projection (Fig. 7.3-7.4c)..... (3)

2b The black markings on S3 and S4 have no or only short black lateral lines (Fig. 7.1, 7.2, 7.5)..... (8)

3a The black markings on S3 and S4 covers more than 1/3 of each segment (Fig. 7.4a,b) except in the rare form puellaeformis (Fig. 7.4c). Antehumeral stripe often interrupted. Appendages as Fig. 6.7 ..... (4)
(subspecies of *Coenagrion pulchellum*)

3b The black markings on S3 and S4 covers less than 1/3 of each segment (Fig. 7.3) Antehumeral stripe rarely interrupted.....(5)

4a Dorsal surface of occiput entirely black, lacking pale postocular spots..... *Coenagrion pulchellum saisanicum*

4b Two pale (blue) postocular spots between the eyes ..... *Coenagrion pulchellum pulchellum*

5a Seen dorsally, the dorsal branches of upper appendages diverge and are widely separated at the base (Fig. 6.13)..... (6)
5b Seen dorsally, the dorsal branches of upper appendages contact along the median axis (Fig. 6.12, 6.14)..... (7)

6a Seen laterally, the lower appendages are shorter than those of *C. australocaspicum* and shorter than S10 (Fig. 6.10). Upper appendages without a small internal spine..... *Coenagrion puella*
6b Seen laterally, the lower appendages are longer than those of *C. puella* and almost as long as S10 (compare with material of *C. puella*!). Upper appendages with a small internal spine .... *Coenagrion australocaspicum*

7a Seen laterally, the lower appendages are directed upwards at an angle of about 45 degrees to the abdominal axis and are clearly less than twice as long as the upper appendages (Fig. 6.9) .... *Coenagrion ponticum* & *C. intermedium*
7b Seen laterally, the lower appendages are directed almost horizontally and are twice as long as the upper appendages (Fig. 6.11) .....*Coenagrion syriacum*

8a S6 dorsally blue for at least 20% of its length (Fig. 7.2, 7.7). Upper appendages slightly shorter than the lower appendages (Fig. 6.6)..... (9)
8b S6 dorsally black, sometimes with a small apical blue margin (Fig. 7.1, 7.5). Upper appendages slightly longer than the lower appendages (Fig. 6.5, 6.8)..... (10)

9a Pale postocular spots with their posterior edges conspicuously denticulate (sometimes lacking) Black markings on S5 with one long median point (Fig. 7.2). Underside of eyes blue..... .....*Coenagrion ornatum/C. vanbrinkae*
9b Pale postocular spots with their posterior edges regular (sometimes denticulated) Black markings on S5 with three small points (Fig. 7.7). Underside of eyes greenish ..... *Coenagrion hastulatum*

10a Pt about 1½ times as long as broad and often paler (brownish, not black). Black markings on second abdominal segment consists of only one black mark (Fig. 7.5). This mark does reach to the posterior margin of the segment. Underside of eyes often greenish but can be blue. Appendages as Fig. 6.8..... .....*Coenagrion scitulum*
10b Pt as long as broad and always dark brown to black. Black markings on second abdominal segment consists of three isolated marks (Fig. 7.1). These marks do not reach to the posterior margin of the segment. Underside of eyes greenish. Appendages as Fig. 6.5..... ..... *Coenagrion lunulatum*

Coenagrion armatum

Distribution: Has been found in Georgia close to the Turkish border (KETENCHIEV & HARITONOV, 1998) and might occur in the mountains of northeast Turkey.
Flight period: A spring species expected from April to June.
Habitat: To be expected at higher-altitude (>500m a.s.l.) fens with shallow water and dense vegetation of sedges or *Equisetum*.

Coenagrion australocaspicum

Distribution: Described from Anzali wetland (Iran) and was since found 200 km east near Chalus (Iran) and near Sollar (Azerbaijan). Might occur in Turkey.
Flight period: Found on 20 April (Anzali wetland, Iran), 4 June (near Chalus, Iran) and 27 June (near Sollar, Azerbaijan) (DUMONT, 2004; DUMONT & HEIDERI, 1995; COLL RMNH). Presumably a spring and early summer species.
Habitat: Shallow stagnant lakes and wetlands, as well as streamlets with abundant littoral vegetation.

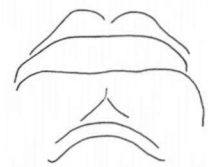
Coenagrion intermedium

Distribution: Endemic to the island of Crete where it is widespread and abundant. Not expected to occur in Turkey.
Flight period: So far recorded from 22 April to 19 August (BATTIN, 1993), probably most common in May and June.
Habitat: Occurs at running waters; so far only once recorded at a pond (BATTIN, 1991; JÖDICKE, 2005).

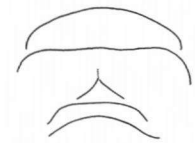
6. Ceriagrion, Coenagrion

6.1 *C. georgiffreyi* (♂)

6.2 *C. tenellum* (♂)

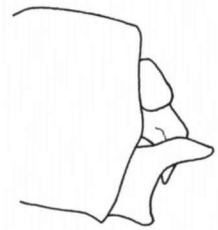


6.3 *C. georgiffreyi* (♀), prothorax seen from dorsal

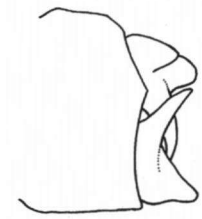


6.4 *C. tenellum* (♀), prothorax seen from dorsal

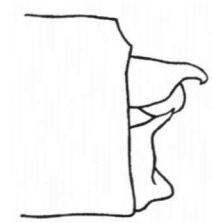
6.5 *C. lunulatum* (♂)



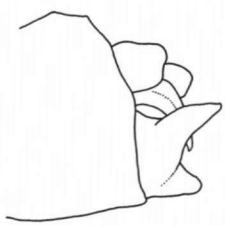
6.6 *C. ornatum* (♂)



6.7 *C. pulchellum* (♂)



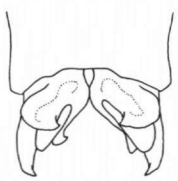
6.8 *C. scitulum* (♂)



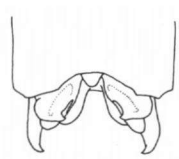
6.9 *C. ponticum, intermedium* (♂)

6.10 *C. puella* (♂)

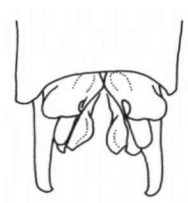
6.11 *C. syriacum* (♂)



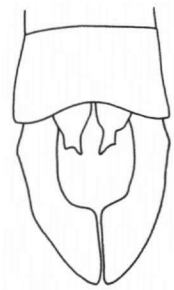
6.12 *C. ponticum* (♂)



6.13 *C. puella* (♂)

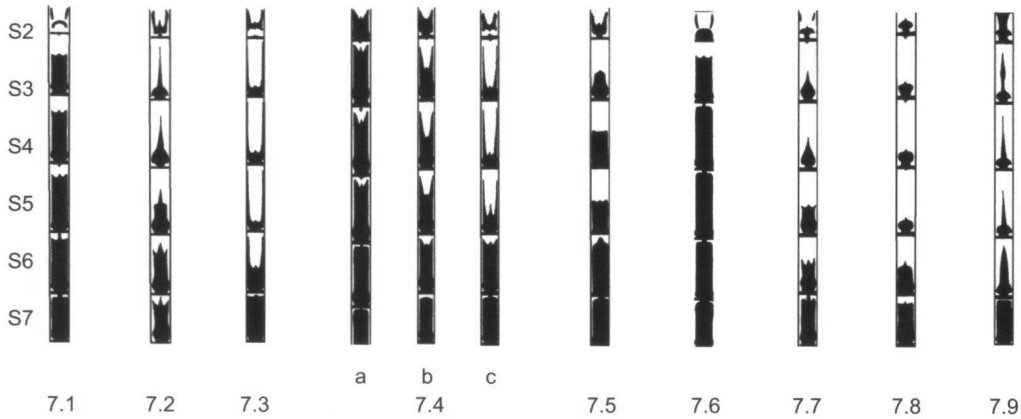


6.14 *C. syriacum* (♂)



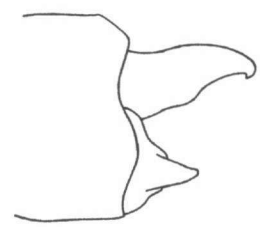
6.15 *C. armatum* (♂)

7. Agriocnemis, Cercion, Coenagrion, Enallagma, Erythromma, Ischnura

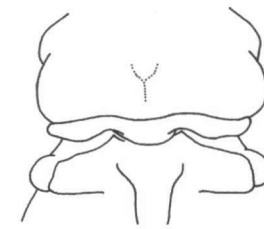


Abdomen of male:

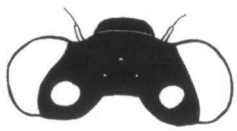
7.1 *C. lunulatum*
7.2 *C. ornatum*
7.3 *C. puella*
7.4a *C. pulchellum*
7.4b *C. pulchellum*
7.4c *C. pulchellum*
7.5 *C. scitulum*
7.6 *C. armatum*
7.7 *C. hastulatum*
7.8 *Enallagma cyathigerum*
7.9 *Erythromma lindenii*



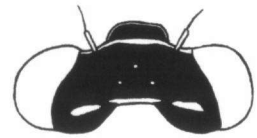
7.10 *Er. lindenii* (♂)



7.11 *Er. lindenii* (♀)



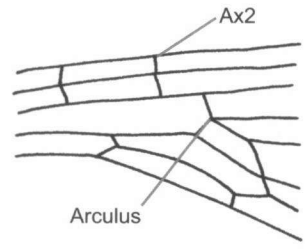
7.12 *C. puella*



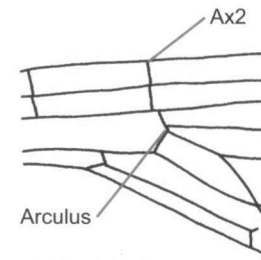
7.13 *Er. lindenii lindenii*

7.14 *Er. lindenii zernyi*

7.15 *A. pygmaea/sania* (♂)



7.16 *A. pygmaea/sania*



7.17 *I. elegans*

Coenagrion lunulatum
Distribution: Known from three localities in the northeastern corner of Turkey and three localities near lake Van.
Flight period: End of May to end of July.
Habitat: Marshes with sedges.

Coenagrion ornatum
Distribution: Fairly common across Turkey. Parts of the records in the east probably pertain to *C. vanbrinkae*.
Flight period: Beginning of May to Mid-August.
Habitat: Small, well-vegetated brooks and seepages.

Coenagrion persicum
Distribution: The species is only known from the type male caught on 4 June 1937 at Khoramabad in the west of Iran. Might occur in Turkey.
Flight period: Presumably a spring and early summer species.
Habitat: The only record was made near a spring and a well-vegetated pond.
Note: Information on identification is present in the original description (LOHMANN, 1993). A re-evaluation of characters used to distinguish this species from *C. pulchellum* is needed.

Coenagrion ponticum
Distribution: In Turkey rather common in the mountains and lowlands along the Black Sea coast east of Giresun.
Flight period: End of June to mid-August.
Habitat: Mountain lakes where especially common in vegetation with *Equisetum*. Also along slowly-flowing water at sea level.

Coenagrion puella
Distribution: Fairly common in Turkey. In parts of Turkey replaced by *Coenagrion ponticum* and *C. syriacum*.
Flight period: Mid-May to mid-August.
Habitat: Found by standing waters, especially those with floating vegetation. Also found, but less common, along slowly-flowing waters.

Coenagrion pulchellum
Distribution: Rare but found throughout Turkey. Turkish specimens of *Coenagrion pulchellum* are darker than specimens from western Europe. The melanic population near Sultansazlik (Kayseri province), which were considered to be *C. p. saisanicum* by Lohmann (1993), might just be the extreme end of this colour variation.
Flight period: Mid-May to mid-August.
Habitat: Marshes and seepage-fed areas.

Coenagrion scitulum
Distribution: Fairly common in west Turkey with two records south of lake Van.
Flight period: Mid-May to end of July.
Habitat: Standing waters such as pools and small lakes.

Coenagrion syriacum
Distribution: Species with a small range largely confined to the coastal areas of Turkey, Syria, Lebanon and Israel. In Turkey common in the Adana Delta. In 1959 and 1972 found in the vicinity of Antalya but since not found again.
Flight period: Mid-April to end of May.
Habitat: Found by standing waters, especially those with floating vegetation.

Coenagrion vanbrinkae
Distribution: Described on basis of specimens from Iran and eastern Turkey, and found in Armenia in 2003. In SCHNEIDER (2004) *Coenagrion vanbrinkae* is noted from both Syria and Lebanon (see note 8 checklist). Differentiation from *C. ornatum* is unclear to the author. Distribution within Turkey is unclear due to confusion with *C. ornatum*. Might be not uncommon in eastern Turkey.
Flight period: Turkish records are from May and August, flight period probably roughly the same as *C. ornatum*.
Habitat: Small well-vegetated brooks and seepages.
Note: Information on identification is present in the original description (LOHMANN, 1993). A re-evaluation of characters used to distinguish this species from *C. ornatum* is needed.

Key to species of Enallagma

Only one regional species present.

Enallagma cyathigerum

Distribution: fairly common in large parts of Turkey but scarce in the lower parts such as Thrace and the Mediterranean region. Very abundant at Lake Van.
Flight period: End of May to beginning of September.
Habitat: Standing waters.

Key to species of Erythromma

1a Occiput dorsally entirely bronze-black, lacking pale postocular spots. Male: eyes red ..... (2)
1b Occiput dorsally with two postocular spots (sometimes confluent) or occiput dorsally largely pale (Fig. 7.13, 7.14). Male: eyes blue ..... (3)

2a Antehumeral stripes absent in males and indicated only anteriorly in females. Male: S10 dorsally blue without black markings (Fig. 8.4). Sides of S8 black (Fig. 8.6). Apex of upper appendages not curved inwards (Fig. 8.4). Female: Posterior edge of pronotum with a prominent median lobe ..... *Erythromma najas*
2b Antehumeral stripes present in both sexes, complete in females but usually interrupted in males. Male: S10 dorsally blue with a black x-shaped mark (Fig. 8.5). Sides of S8 largely blue (Fig. 8.7). Apex of upper appendages curved inwards (Fig. 8.5). Female: Posterior edge of pronotum without a prominent median lobe .....*Erythromma viridulum*

3a Postocular spots not confluent (Fig. 7.13). S8 with black markings..... .....*Erythromma lindenii lindenii*
3b Postocular spots confluent (Fig. 7.14). S8 is (almost completely) devoid of black..... ..... *Erythromma lindenii zernyi*

Erythromma lindenii

Distribution: Common in Thrace, along the Mediterranean and the low Southeast of the country and extremely abundant at lakeshores in southwest Turkey. Almost absent from the northern part of the country. All populations west of the river Ceyhan belong to the nominate subspecies. East of the river Ceyhan hybrid populations are found. In some of these populations the spring specimens resemble *E. l. lindenii* while the summer specimens resemble *E. l. zernyi* (Dumont *et al.* 1995). Outside Turkey subspecies *zernyi* is found in Iran, Syria, Lebanon, Israel and Jordan.
Flight period: Beginning of May to beginning of October. One record from end of March and might be present during most of the win-

ter along the south coast (DIJKSTRA & KALKMAN, 2001).
Habitat: Standing or slowly-flowing, deeper waters, most often with floating vegetation.

Erythromma najas

Distribution: Not found in Turkey but is found in Bulgaria and might occur in Thrace.
Flight period: In Europe a spring and early summer species.
Habitat: Standing or slowly-flowing water with floating vegetation (often *Nymphaea alba*).

Erythromma viridulum

Distribution: Fairly common across Turkey.
Flight period: Beginning of May to beginning of September.
Habitat: Standing waters.

Key to species of Ischnura (males)

The females of *Ischnura* are often difficult to identify and therefore no key is given.

1a Dorsum of S3-6 largely orange or red. Tip of abdomen black with S9 and posterior half of S8 blue..... *Ischnura aurora*
1b Dorsum of S3-6 largely black..... (2)

2a Two spines present on the thorax just behind the pronotum (Fig. 9.7), these spines often conspicuous due to their blue colour. Pt in FW and HW differing in size, that of the fore wing being larger (Fig. 8.14, 8.15) ..... (3)
2b No spines present on the thorax just behind the pronotum. Pt in FW and HW almost the same size ..... (4)

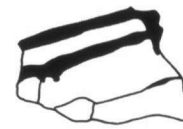
3a Lower appendages longer than upper appendages (Fig. 8.12). In posterior view no small tooth is visible on top of the upper appendages (Fig. 9.5). Pt in fore wing with the apical part whitish and the basal part black (Fig. 8.15) ..... *Ischnura pumilio*
3b Lower appendages (slightly) shorter than upper appendages (Fig. 8.11). In posterior view a small tooth is visible on top of the upper appendages (Fig. 9.4). Pt in fore wing largely black (Fig. 8.14)..... *Ischnura intermedia* & *Ischnura forcipata*

4a Lower appendages about as long as the upper appendages (Fig. 8.9, 8.10) ..... (5)
4b Lower appendages clearly longer than upper appendages (8.8, 8.13) ..... (6)

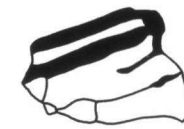
5a Apex of upper appendages pointed (Fig. 9.3). Pt in fore wing black in its basal half, clear in its apical half ..... *Ischnura fontaineae*
5b Apex of upper appendages blunt (Fig. 9.2) Pt in fore wing black in its middle, surrounded by a white fringe ..... *Ischnura evansi*

8. Enallagma, Coenagrion, Erythromma, Ischnura

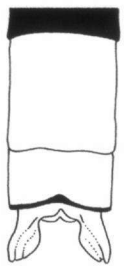
8.1 *En. cyathigerum* (♂)



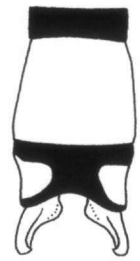
8.2 *En. cyathigerum*



8.3 *C. hastulatum*



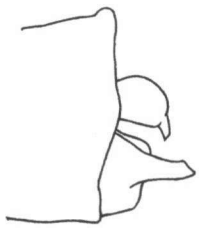
8.4 *Er. najas* (♂)



8.5 *Er. viridulum* (♂)

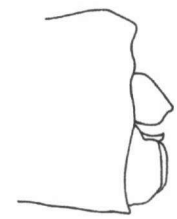
8.6 *Er. najas* (♂),
tip of abdomen from lateral

8.7 *Er. viridulum* (♂),
tip of abdomen from lateral



8.8 *I. elegans* (♂)

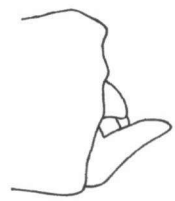
8.9 *I. evansi* (♂)



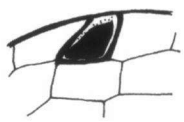
8.10 *I. fountaineae* (♂)

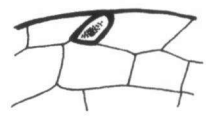
8.11 *I. intermedia* (♂)

8.12 *I. pumilio* (♂)

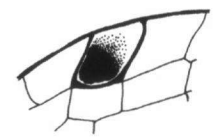


8.13 *I. senegalensis* (♂)





8.14 Pterostigma of *I. intermedia* in forewing (left) and hindwing (right)



8.15 Pterostigma of *I. pumilio* in forewing (left) and hindwing (right)

6a Hind ridge of pronotum with a large and erect middle lobe (Fig. 9.9. Lower appendages seen from behind with two spines directed towards each other (Fig. 9.1) ..... (7) *(spp Ischnura elegans)*

6b Hind ridge of pronotum with inconspicuous middle lobe, which is rounded and not erect (Fig. 9.8) Seen from behind, lower appendages fishhook-shaped (Fig. 9.6) ..... *Ischnura senegalensis*

7a Seen from behind, upper appendages crossed (Fig. 9.1) .... *Ischnura elegans ebneri*

7b Seen from behind, upper appendages not crossed .... *Ischnura elegans elegans/pontica*

Ischnura aurora

Distribution: Widespread and common in the Oriental region. Known from one record in southeast Iran.
Flight period: The only record from Iran is from 28 April 1995 (DUMONT & HEIDARI, 1996) but it is probably on the wing during most of the year.
Habitat: Largely unshaded, standing waters.

Ischnura elegans

Note: The taxonomic status of the subspecies of *I. elegans* is far from clear and a revision of the subspecies is needed. The subspecies are mainly based on differences in the hind ridge of the pronotum and on whether or not the upper appendages are crossed. *Ischnura elegans ebneri* is distinguished from subspecies *elegans* and *pontica* based on its crossed upper appendages. However it is not always easy to see whether or not the appendages are in 'resting' position. Also, intermediates have been mentioned. The subspecies *elegans* and *pontica* are distinguished from each other based on minute differences in the hind ridge of the pronotum, making identification hardly possible. Subspecies *pontica* might prove to be a synonym of subspecies *elegans*.
Distribution: Common across Turkey. Schmidt (1967) gives Turkish records of *pontica* (Thrace), *elegans* (west Turkey) and *ebneri* (south Turkey). More detailed information on the distribution of the subspecies occurring in Turkey is lacking. There is a large amount of recently-collected material available but identification of this material at subspecies level has to wait for a revision of the subspecies.
Flight period: End of March to Mid-November. Probably found throughout the year in the south.
Habitat: A ubiquitous species found at all kinds of standing waters, less often by flowing waters.

Ischnura evansi

Distribution: The species occurs in southwest Asia, the Middle East and northeast Africa. It has been found in Iraq, Iran and Syria and might occur in southeast Turkey.
Flight period: Records from Syria and Iraq range from February to November and it is probably on the wing year round.
Habitat: Largely confined to arid regions, found by standing or slowly-flowing waters.

Ischnura fontaineae

Distribution: Occurs in North Africa, the Middle East, Azerbaijan and Iran. In Turkey only known from Birecik (Sanli Urfa).
Flight period: Turkish records are from May and July. Probably present during most of the summer.
Habitat: In Turkey only known in summer from a small brook (wadi).

Ischnura forcipata

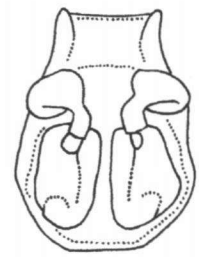
Distribution: Not expected to occur in Turkey. Replaces *I. intermedia* in the east, and is not known to overlap with this species. Found in Nepal, north India, Pakistan, Afghanistan, Tajikistan Uzbekistan, Turkmenistan and Iran (one record in the southeast) (DUMONT & BORISOV, 1995; DUMONT & HEIDARI, 1996; SCHOORL, 2000).
Flight period: No details known; probably occurs throughout the summer.
Habitat: Poorly known, probably by standing and slowly-flowing waters.

Ischnura intermedia

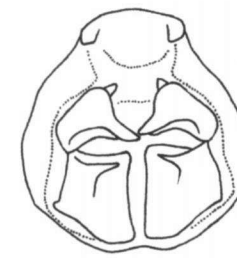
Note: Closely related to *I. forcipata* but not known to overlap. Differences between the two species are described and illustrated in DUMONT (1974) and DUMONT & BORISOV (1995).
Distribution: In Turkey known from three locations in the province of Adiyaman and one in Adana province (not on map). Outside Turkey

9. Ischnura

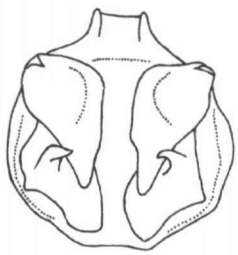
9.1 *I. elegans ebneri* (♂)



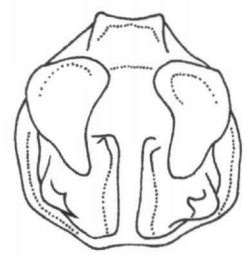
9.2 *I. evansi* (♂)



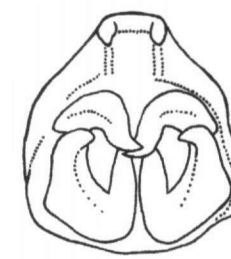
9.3 *I. fontaineae* (♂)



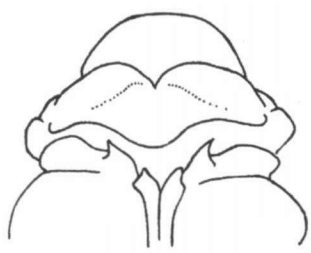
9.4 *I. intermedia* (♂)



9.5 *I. pumilio* (♂)



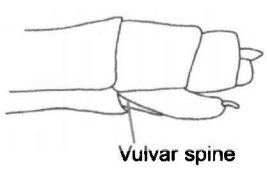
9.6 *I. senegalensis* (♂)



9.7 *I. pumilio* (♂)

9.8 *I. senegalensis* (♂)

9.9 *I. elegans* (♂)



9.10 *I. elegans* (♀)

only known from one locality in north Syria and a few localities in northeast Iran and southwest Turkmenistan (DUMONT & BORISOV, 1995).
Flight period: Turkish records are from May, July and August. Probably present during most of the summer.
Habitat: Poorly known; so far found in standing and slowly-flowing waters.

Ischnura pumilio

Distribution: Fairly common across Turkey.
Flight period: End of March to end of September.
Habitat: Shallow standing waters and seepages.

Ischnura senegalensis

Distribution: Common in large parts of Asia, the Middle East and Africa south of the Sahara. Known from a few records in Iran and Iraq and might occur in eastern Turkey.
Flight period: Occurs thoughout the year in much of its range.
Habitat: Like *I. elegans*, found in all kinds of slowly-flowing waters.

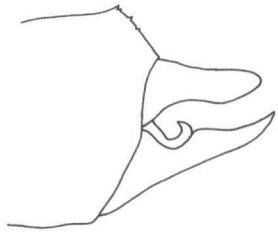
Key to species of Pseudagrion

One species occurs in Turkey. Two others, *Pseudagrion decorum* and *P. laidlawi*, both with their main range in the Indian Peninsula, are known from southeast Iran. The widespread African *Pseudagrion sublacteum* has been found in south Syria.

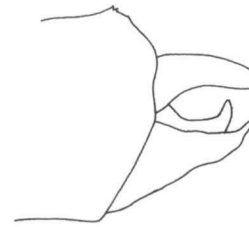
Pseudagrion syriacum

Distribution: Species with a limited range reaching from the Dead Sea in Israel and Jordan to Lebanon and Syria. Common in the Jordan Valley but scarce further north, with two records from Turkey (Hatay province) (SCHNEIDER, 1995; SALUR & KIYAK, 2006 (not on map)).
Flight period: Turkish records are from May and June. In Israel and Syria found from the end of March to mid-August.
Habitat: Mostly slowly-flowing brooks with dense vegetation (often *Mentha* sp.) (DUMONT, 1973).

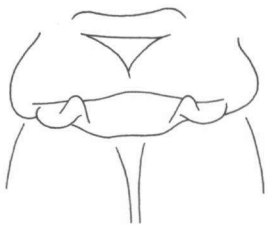
10. Pyrrhosoma, Pseudagrion



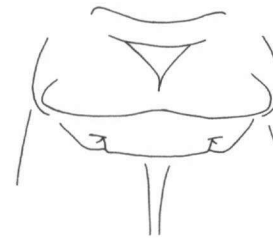
10.1 *Py. elisabethae* (♂)



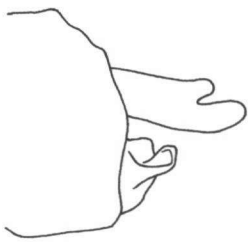
10.2 *Py. nymphula* (♂)



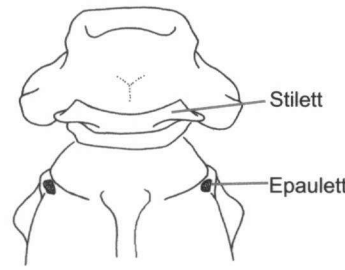
10.3 *Py. elisabethae* (♀)



10.4 *Py. nymphula* (♀)



10.5 *Ps. syriacum* (♂)



10.6 *Ps. syriacum* (♀)

Key to species of Pyrrhosoma

1a Male: The ventral (lower) branch of the upper appendages is about one third as long as the dorsal (upper) branch (Fig. 10.1). The lower appendages clearly reach further than the upper appendages (Fig. 10.1). Female: The hind margin of the pronotum has a deep and raised fold on each side; these folds are prominent when viewed both from the side and above (Fig. 10.3)..... .....*Pyrrhosoma elisabethae*

1b Male: The ventral (lower) branch of the upper appendages is about two thirds as long as the dorsal (upper) branch (Fig. 10.2). The lower appendages are about as long or shorter than the upper appendages (Fig. 10.2). Female: The hind ridge of the pronotum contains only slight kinks in the same position on the hind margin; these are not raised above the margin in side view (Fig. 10.4)..... .....*Pyrrhosoma nymphula*

Pyrrhosoma elisabethae

Distribution: Not expected in Turkey. Has a very small range and is only known from a few localities on Corfu and in the Peloponnisos (southern Greece) and from one locality in south Albania (KALKMAN & LOPAU, 2006).
Flight period: Mid-April to mid-June.
Habitat: Well-vegetated brooks and springs.

Pyrrhosoma nymphula

Distribution: Scarce in northwest Turkey.
Flight period: End of May to end of July.
Habitat: Well-vegetated brooks and springs.

Key to families of the Turkish Anisoptera

1a Eyes completely and widely separated (Fig 2.93)..... Gomphidae
1b Eyes meeting in one point or eyes touching each other over some distance (Fig 2.7, 2.8)..... (2)

2a Eyes meeting in one point (Fig 2.8). Large black and yellow species..... ..... Cordulegastridae
2b Eyes touching each other over some distance (Fig 2.7)..... (3)

3a In the HW, sharpest angle of the triangle points towards the wing tip, but in the FW points towards the appendages. Costal antenodal veins are in alignment with the subcostal antenodal veins..... (4)
3b In both wings, sharpest angle of the triangle points towards the wing tip. Costal antenodal veins are not in alignment with the subcostal antenodal veins. Abdomen and thorax never metallic green ....Aeshnidae

4a S2-4 without a ridge near the base of each segment. Abdomen and thorax metallic green or black. Males: With auricles on S2 and HW basally angulated (with an angle) .....Corduliidae
4b One or more of S2, S3 and S4 have a ridge near the base. Abdomen and thorax in most species non-metallic and never greenish metallic. Males: Without auricles on S2, and HW basally rounded..... .....Libellulidae

Key to genera of Aeshnidae

1a HW with two or more cross-veins between arculus and wingbase (Fig. 13.3)..... (2)
1b HW with no cross-veins between arculus and wingbase (Fig. 13.1, 13.2)..... (3)

2a Pt very short, less than twice as long as broad. IR3 forked about halfway between nodus and Pt..... *Caliaeschna*
2b Pt long, more than twice as long as broad. IR3 not forked .....*Boyeria*

3a One or sometimes two rows of cells present between IR3 and Rspl (Fig. 11.3). Usually only two cross-veins between wing base and the triangle (Fig. 11.3)..... *Brachytron*
3b Several rows of cells present between IR3 and Rspl (Fig. 11.1, 11.2). Usually four to six cross-veins between wing base and the triangle (Fig. 11.1, 11.2) ..... (4)

4a IR3 not forked before the Pt (Fig. 11.2). R3 abruptly arched forward near apical end of the Pt (Fig. 11.2). Male: HW basally rounded and without an anal triangle (Fig. 13.2). No auricles present on S2..... .....*Anax*
4b IR3 with a fork before the Pt (Fig. 11.1). R3 not or only weakly arched forward near apical end Pt (Fig. 11.1). Male: HW basally angulated and with well-defined anal triangle (Fig. 13.1) (less so in *A. isoceles*). Auricles present on S2.....*Aeshna*

Key to species of Aeshna

1a Abdomen uniformly brown with a conspicuous yellow mark on the dorsal side of S2. Never with blue on abdomen. Male: Upper appendages Fig. 12.4 .... *Aeshna isoceles*

1b Abdomen never uniformly brown with a conspicuous yellow mark on the dorsal side of S2. Abdomen often with blue ... (2)

2a S9 and S10 each with a complete pale (green or blue) band. Male: Upper appendages apically with a downwardly-pointed tip (Fig. 12.2)..... *Aeshna cyanea*

2b S9 and S10 each with a pair of spots. Male: Upper appendages apically without a downwardly-pointed tip (Fig. 12.1, 12.3, 12.5, 12.6)..... (3)

3a Smaller species, usually about 60 mm in length. Seven to nine cross-veins between nodus and Pt in FW ..... (4)

3b Larger species, usually exceeding 65 mm in length. Usually eleven or more cross-veins between nodus and Pt in FW..... (5)

4a Sides of thorax brownish with two pale (yellow) bands. Male: S6-8 with 2 pairs of blue spots, of which the anterior ones are less than one third as large as the posterior ones. Appendages as Fig. 12.5. Female: Abdominal appendages longer than the combined length of S9-10..... ..... *Aeshna mixta*

4b Sides of thorax green with thin black lines on the sutures. Male: S6-8 with 2 pairs of blue spots of which the anterior ones are about half as large as the posterior ones. Appendages as Fig. 12.1. Female: Abdominal appendages shorter than the combined length of S9-10.. *Aeshna affinis*

5b Membranula mainly white. Male: Upper appendages have on their dorsal side a series of small teeth (Fig. 12.6, 12.13). Female: The pale spots on the dorsal side of S3-S7 are confluent with the lateral pale spots. Antehumeral stripe always complete..... *Aeshna serrata*

5a Membranula greyish. Male: The dorsal side of the upper appendages is smooth and does not have a series of small teeth (Fig. 12.3). Female: The pale spots on the dorsal side of S3-S7 are not confluent with the lateral pale spots. Antehumeral stripe often incomplete or almost lacking ..... (6)

6a Rear of head black with on each side a yellow spot just behind the eye. The black stripe between the frons and clypeus becomes thinner towards the eyes. S3-4 with two pairs of pale spots, of which the anterior pair is smaller (about half as large) as the posterior pair. Side of thorax: the yellow spots between the two yellow stripes are not confluent [note: in northeast Turkey a few specimens have been found with much more yellow on the side of the thorax then normal]. A small yellow line before the humeral suture is absent in most specimens ..... *Aeshna juncea*

6b Rear of head black without yellow spots. The black stripe between the frons and clypeus does not become thinner towards the eyes. S3-4 with two pairs of pale spots, of which the anterior pair is about as large as the posterior pair. Side of thorax: the yellow spots between the two yellow stripes are larger and often confluent, forming a third stripe (forma interlineata only). A small yellow line before the humeral suture is present in most specimens (forma interlineata only). .... *Aeshna subarctica*

Aeshna affinis

Distribution: In Turkey sparsely distributed but not uncommon.
Flight period: End of May to end of October.
Habitat: Probably well-vegetated standing waters.

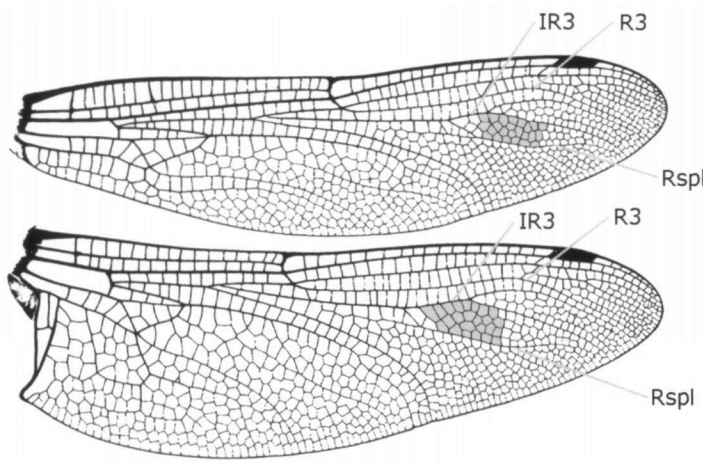
Aeshna cyanea

Distribution: Not uncommon in the mountains of north Turkey.
Flight period: End of June to mid-September.
Habitat: Well-vegetated pools and lakes mostly above 750 m a.s.l.

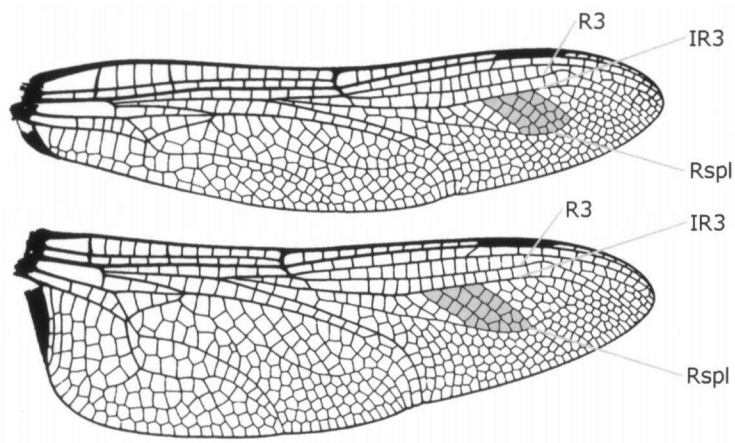
Aeshna isoceles

Distribution: Sparsely distributed across Turkey, very abundant at Lake Köyceğiz (Kalkman et al. 2004).

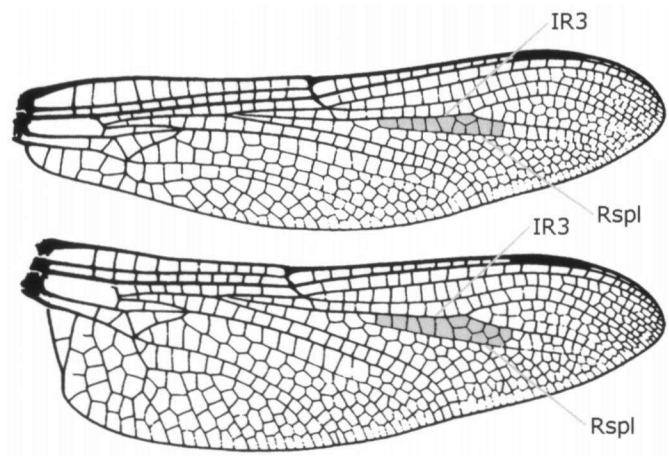
11. Aeshna, Anax, Brachytron



11.1 *Aeshna* (from NVL, 2002)



11.2 *Anax* (from NVL, 2002)



11.3 *Brachytron* (from NVL, 2002)

Flight period: Beginning of May to beginning of August.
Habitat: Well-vegetated channels and lakes, often associated with reedy vegetation.

Aeshna juncea

Distribution: Scarce in northeast Turkey.
Flight period: End of July to end of August
Habitat: found in small lakes and fens from 1300 m to 2300 m a.s.l.

Aeshna mixta

Distribution: In Turkey sparsely distributed but not uncommon.
Flight period: Mid-May to mid-November, most records are from July and August.
Habitat: Standing and slowing flowing waters.

Aeshna serrata

Distribution: In Turkey only known from one record at Lake Van. The main range of this species lies in Russia and the species is very rare in the area covered by this key, with only a few records in Armenia and Georgia.
Flight period: Summer species. Best period probably July.
Habitat: Found at often slightly-brackish standing waters. In Turkey most likely to be found at the reed beds bordering Lake Van.

Aeshna subarctica

Distribution: Not found in Turkey. Nearest record is from western Bulgaria, however this record is unconfirmed.
Flight period: Summer species with roughly the same flight period as *A. juncea*.
Habitat: Fens with floating sphagnum vegetation.

Key to species of Anax

1a Abdomen with the anterior part of the segments yellow and the posterior part of the segments black. Very large species, total length 80mm or more. Male: Appendages as Fig. 12.9 .... *Anax immaculifrons*

1b Abdomen blue, green or brown with a dorsal black stripe. Total length not exceeding 80mm..... (2)

2a Only one ridge on each side of the abdomen, so lacking a second ridge on the sides. Male: The lower appendage is triangular; the upper appendages with sharply-pointed, tapered tips (Fig. 12.12). Female: Never with two tubercles on the hind rim of the occiput.....*Anax ephippiger*

2b Two ridges on each side of the abdomen. Male: The lower appendage is quadrangular; the upper appendages are rounded or have a small sub-basal tooth (Fig. 12.10, 12.11). Female: With or without two tubercles on the hind rim of the occiput..... (3)

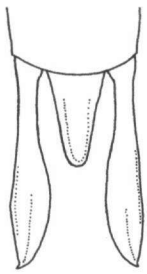
3a Thorax normally green. Male: Lower appendage about one third as long as upper appendages. Upper appendages rounded without a lateral point (Fig. 12.10). Female: Without two tubercles on the hind rim of the occiput .... *Anax imperator*

3b Thorax normally brownish. Male: Lower appendage less than one fifth as long as upper appendages. Upper appendages have a small sub-basal tooth (Fig. 12.11). Female: With two tubercles on the hind rim of the occiput ..... *Anax parthenope*

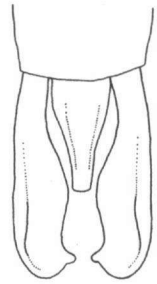
Anax ephippiger

Distribution: Predominantly a migrant from Africa. Abundance in Turkey varies greatly from year to year. Spring migrants probably reproduce successfully in Turkey. Most common along the Mediterranean where larvae might endure the winter.
Flight period: Recorded throughout the year, so far no records from February, October and December
Habitat: Mostly shallow standing waters.

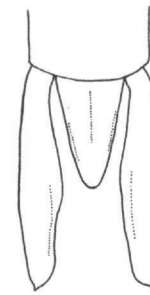
12. Aeshna, Anax, Brachytron, Caliaeschna



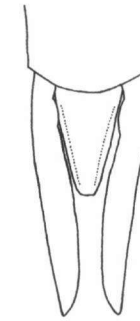
12.1 *A. affinis* (♂)



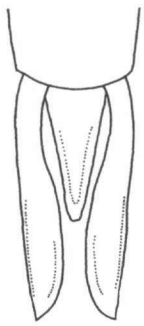
12.2 *A. cyanea* (♂)



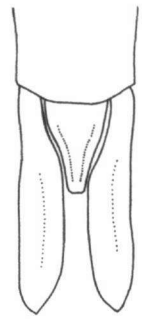
12.3 *A. juncea / subarctica* (♂)



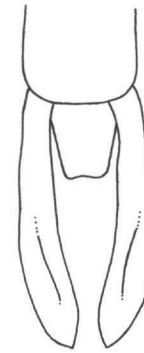
12.4 *A. isoceles* (♂)



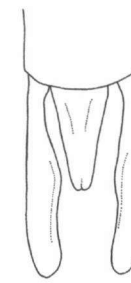
12.5 *A. mixta* (♂)



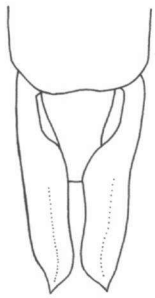
12.6 *A. serrata* (♂)



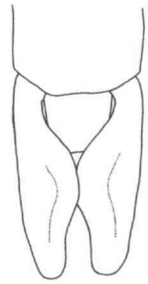
12.7 *B. pratense* (♂)



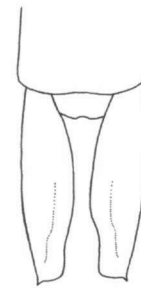
12.8 *C. microstigma* (♂)



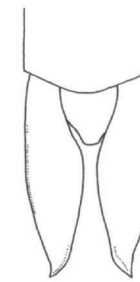
12.9 *Anax immaculifrons* (♂)



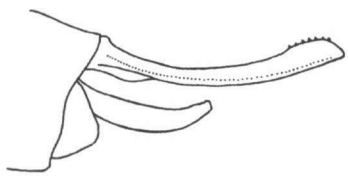
12.10 *A. imperator* (♂)



12.11 *A. parthenope* (♂)



12.12 *A. ephippiger* (♂)



12.13 *A. serrata* (♂)

Anax immaculifrons

Distribution: Uncommon along the Turkish Mediterranean coast with one record further east (Samsat in Adiyaman province). The species is widespread in India and the mainland of southeast Asia.
Flight period: End of May to mid-September, most records in June and July.
Habitat: Larger stony brooks, often at least partly shaded.

Anax imperator

Distribution: Common across Turkey.
Flight period: Beginning of April to beginning of October.
Habitat: Standing waters.

Anax parthenope

Distribution: Common across Turkey, especially in the south.
Flight period: End of March to beginning of December.
Habitat: Standing waters.

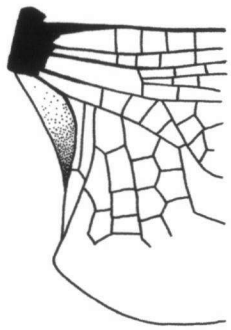
Key to species of Brachytron

Only one regional species present (monotypic genus). Male anal appendages as in Fig. 12.7.

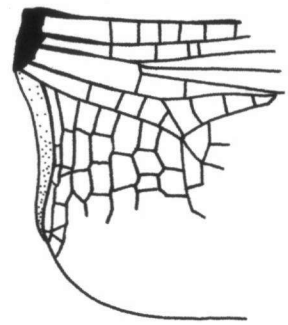
Brachytron pratense

Distribution: Rare in west Turkey, not found in the east.
Flight period: Mid-May to mid-June.
Habitat: Well-vegetated marshes and larger pools.

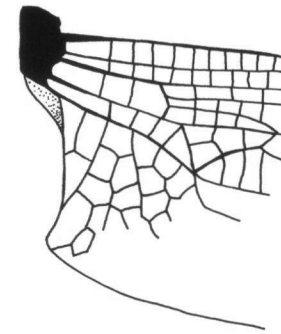
13. Aeshna, Anax, Boyeria



13.1 *Aeshna*



13.2 *Anax*



13.3 *Boyeria*

Key to species of Caliaeschna

Only one regional species present (monotypic genus).

Caliaeschna microstigma

Distribution: Common across Turkey.
Flight period: Mid-May to mid-August.
Habitat: All kinds of running waters but absent from larger rivers; highest densities found at stony brooks and smaller rivers.

Key to species of Boyeria

Only one regional species present.

Boyeria cretensis

Distribution: Endemic to the island of Crete and not expected for Turkey.
Flight period: So far recorded from May to August.
Habitat: Rocky and partly-shaded streams

Key to genera of Gomphidae

1a Triangle divided by cross-veins. Large species, with a total length of 70 mm or more. S7-8 always with large flaps (Fig. 15.3)..... *Lindenia*

1b Triangle undivided. Smaller species, total length never exceeding 70 mm. Abdomen without flaps (foliaceous expansions), or, in *Paragomphus*, with flaps on S8-9.... (2)

2a HW without an anal loop (Fig. 14.2).... (3)

2b HW with an anal loop (Fig. 14.1)..... (5)

3a Anal triangle normally undivided, sometimes with two cells. Thorax without black markings and abdomen only with pairs of small blacks spots on S2-6. Male: HW basally rounded ..... *Anormogomphus*

3b Anal triangle with two or three cells. Thorax and abdomen with black markings. Male: HW basally angulated (with an angle)..... (4)

4a Small, total length less than 5 cm. Five or six cross-veins between the nodus and Pt. Male: Upper appendages more than twice as long as S10 and curved downwards, lower appendage about half as long as upper (Fig. 16.12, 16.13). Broad flaps present on S8, 9..... *Paragomphus*

4b Larger, total length larger than 4 cm. At least seven and usually eight to ten cross-veins between the nodus and the Pt. Male: Upper appendages only about as long as S10 and not curved downwards. Lower appendage about as long or longer than upper. Broad flaps on S8, 9 absent ..... *Gomphus*

5a Thorax grass-green. Male: Upper appendages stout, weakly curved and hardly longer than S10 (Fig. 16.7, 16.8). Female: Tubercles on hind rim of occiput almost lacking, or with a crown of black teeth (16.11)..... *Ophiogomphus*

5b Thorax yellow or brownish never grass-green. Male: Upper appendages slender and strongly curved, much longer than S10 (Fig. 15.5-9). Female: Tubercles on hind rim of occiput lacking or with simple tubercles on back of head but these never with a crown of black teeth ....*Onychogomphus*

Key to species of Anormogomphus

Only one regional species present. Appendages of male are shown in Fig. 15.1, 15.2.

Anormogomphus kiritshenkoi

Distribution: The species is known from India, Pakistan, Afghanistan, Iran, Iraq and several Central Asian states. Only Turkish record is from Ceylanpinar (Sanli Urfa) near the Syrian border. The species is common in the area between the Euphrates and the Tigris (FRASER, 1934).

Flight period: Only Turkish record is from 24 May. In Iraq found from May to end of August (Sage, 1960).

Habitat: In south Iraq found by pools along rivers (FRASER, 1934).

Key to species of Gomphus

The differences between *G. flavipes flavipes* and *G. f. ubadschii* are minor. A redescription of the characters distinguishing these two subspecies is needed. A study of these two taxa is hampered by the small amount of material available from *G. flavipes ubadschii*. The larva of both subspecies can be easily distinguished which makes it more likely that *flavipes* and *ubadschii* are good taxa. *Gomphus vulgatissimus* and *G. schneiderii* are here mentioned as good species although it might be better to regard them as subspecies. From many records taken from literature it is unknown how the identification was done. Due to this the true distribution in the Balkan is still unclear. There might be an intergression zone between these two taxa were *vulgatissimus* slowly merges into *schneiderii*. A careful study based on the characters and the distribution of these two taxa based on a larger amount of material in needed. See also note 13 of the checklist.

1a Antehumeral stripe runs down towards the middle leg without being interrupted by a black line. The yellow antehumeral stripe is as broad or even broader than the dark humeral stripe (Fig. 14.4). Male: Posterior hamule slender 14.9. Female: Vulvar scale only one quarter of the length of S9 (Fig. 14.13) ..... (2)

1b Antehumeral stripe is interrupted by a black line before it reaches the middle leg. The yellow antehumeral stripe is in most cases narrower than the dark humeral stripe (Fig. 14.3, 14.5, 14.6, 14.7). Male: Posterior hamule broadened at the base Fig. 14.8, 14.10, 14.11). Female: Vulvar scale usually longer than one quarter of the length of S9 (Fig. 14.12, 14.14)..... (3)

2a Larger with total length of 50-55 mm. Pattern on S7-10 as in Fig. 14.16; S8-9 black for half or more of their lengths, sides of S7 black. S7 not or only slightly broadened. Male: Upper appendages have relatively slender tapering tips and have a slightly angled outer border ....*Gomphus flavipes flavipes*

2b Small with total length of 44-51 mm. Pattern on S7-10 as in Fig. 14.17: S10 largely yellow with a black mark; S8-9 yellow for half or more of their lengths, sides of S7 yellow. S7 clearly broadened and almost as wide as S9. Male: Upper appendages have a smooth untangled outer border..... .....*Gomphus flavipes ubadschii*

3a The dorsal yellow stripe on the abdomen is interrupted on S8 and S9, with the yellow marks being totally absent or confined to the anterior half of these segments (Fig. 14.18). Tibia almost always black..... (4)

3b The dorsal yellow stripe on the abdomen is not interrupted on S8 and S9, with the yellow marks on these segments running from the anterior border of the segment to the posterior border of the segment (Fig. 14.15). Tibia with a yellow stripe. (The female of *G. kinzelbachi* is not described yet, but probably will key out here)..... (5)

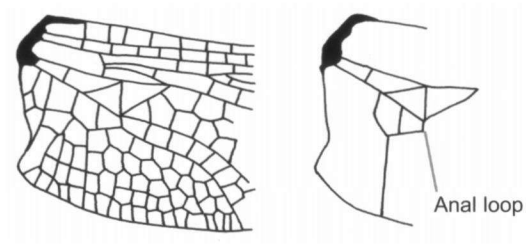
4a Abdomen clearly club-shaped. Femur black without yellow markings. Female: Vulvar scale as broad as the visible part of the ninth sternum (the 'floor' of S9). Distance between the tips of the vulvar scale less broad as the depth of the incision..... *Gomphus vulgatissimus*

4b Abdomen less club-shaped. Femur black, often with yellow markings. Female: Vulvar scale less broad than the visible part of the ninth sternum (the 'floor' of S9). Distance between the tips of the vulvar scale as broad as the depth of the incision (Fig. 14.14).....*Gomphus schneiderii*

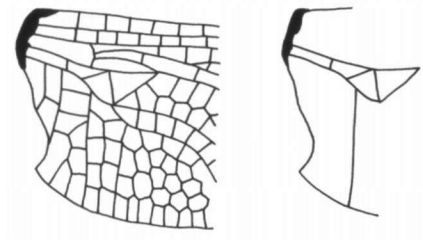
5a Male: In lateral view the narrowest part of hamule is less than half as broad as the broadest part of hamule. Apex of lower appendage in dorsal view visible and not covered by the upper appendages. Upper appendages in lateral view clearly upturned. Anterior branch of hamule in lateral view about one third as long as the posterior branch (Fig. 14.8). Female: The base of the vulvar scales beneath S8 has two conspicuous protuberances (Fig. 14.12).....*Gomphus davidi*

5b Male: In lateral view the narrowest part of hamule is almost as broad as the broadest part of the hamule. Apex of lower appendage in dorsal view not visible and covered

14. Gomphus, Onychogomphus



14.1 *Wingbase of Onychogomphus*

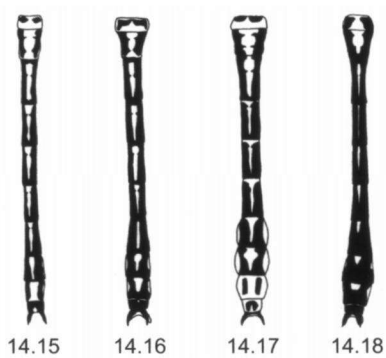


14.2 *Wingbase of Gomphus*

14.3 *G. davidi* 14.4 *G. flavipes* 14.5 *G.kinzelbachi* 14.6 *G. schneiderii* 14.7 *vulgatissimus*

14.8 *G. davidi* (♂) 14.9 *G.flavipes* (♂) 14.10 *G. kinzelbachi*(♂) 14.11 *G. schneiderii*(♂)

14.12 *G. davidi* (♀) 14.13 *G. flavipes* (♀) 14.14 *G. schneiderii* (♀)



14.15 14.16 14.17 14.18

Abdomen of males *Gomphus*
14.15 *G. davidi*
14.16 *G. flavipes flavipes*
14.17 *G. flavipes ubadschii*
14.18 *G. schneiderii*

by the upper appendages. Upper appendages in lateral view not or only slightly upturned. Anterior branch of hamule in lateral view almost half as long as the posterior branch (Fig. 14.10). Female: Not yet described ..... *Gomphus kinzelbachi*

Gomphus davidi

Distribution: Has a limited range, confined to Turkey, Syria, Lebanon, Jordan and Israel. In Turkey common in the Adana Delta and in and around the Hatay province.
Flight period: Mid-May to end of June.
Habitat: Larger standing waters.

Gomphus flavipes flavipes

Distribution: Not yet found in Turkey but is present in Bulgaria and Greece and might be present in Thrace.
Flight period: Summer species. Flight period probably the same as for *G. f. ubadschii*.
Habitat: Larger rivers.

Gomphus flavipes ubadschii

Distribution: Scarce in west and south Turkey, not yet found in east Turkey. *Gomphus f. ubadschii* replaces *G. f. flavipes* east of the Bosporus. It is known from the Greek isle of Limnos, Turkey, Georgia, Iraq, Iran, Syria, Kazakhstan and Tajikistan (coll. Siberian Zoological Museum; DUMONT 1991).
Flight period: Mid-May to beginning of August.
Habitat: Larger rivers.

Gomphus kinzelbachi

Distribution: The species is only known from two records: one from Iraq and one from Iran. It is likely to occur in the southeast of Turkey. Records of *G. davidi* from Korikavana near Dohok (north Iraq) probably pertain to *G. kinzelbachi* (SCHNEIDER, 1984).
Flight period: Only two dates known: 23 May 1937 and 6 June 1958 (SCHNEIDER, 1984; LOHMANN, 1992). The records published by ASAHINA (1973) (see distribution) are from 11 May 1970.
Habitat: Almost no information. In Iraq found at the Alwand River, in Iran found at a broad, fast-flowing river (SCHNEIDER, 1984; LOHMANN, 1992).

Gomphus schneiderii

Note: Differences between *G. schneiderii* and *G. vulgatissimus* are minor, for which reason they were often regarded to be subspecies. Their distribution in the Balkans is not clear as it is often not clear if the published records are correct in their identifications. A review of known records is needed.
Distribution: Fairly common in the south along the Mediterranean and scarce in other parts of west Turkey. In east Turkey only known from a small number of records. Occurs in the Balkans but distribution is not clear due to confusion with the closely-related *Gomphus vulgatissimus*. Further known from Armenia, Azerbaijan, Georgia, Iran, Iraq and Turkey, Turkmenistan and Afghanistan (as *G. amseli* SCHMIDT, 1961; see note 14 of checklist).
Flight period: Mid-April to end of July.
Habitat: All kinds of running waters, but most common at brooks.

Gomphus vulgatissimus

Note: see note *G. schneiderii*.
Distribution: Widespread in Europe and only known from a few records in Thrace although it is relatively common in Bulgaria.
Flight period: Beginning of May to mid-July.
Habitat: All kinds of running waters, but most common at brooks.

Key to species of Lindenia

Only one regional species present.

Lindenia tetraphylla

Distribution: Populations known from Lake Köyceğiz, from the Euphrates-region and the island of Gökçeada (northwest Turkey).
Flight period: End of May to mid-July.
Habitat: Found at large lakes and along rivers, at Lake Köyceğiz associated with extensive reedy vegetation but on the island of Gökçeada found at lakes with hardly any vegetation (KALKMAN *et al.* 2004; SCHORR *et al.* 1999).

Key to species of Onychogomphus

1a Male: Lower appendage shorter than upper appendages. Female: Hind rim of occiput without tubercles..... (2)
1b Male: Lower appendage about as long as upper appendages. Female: Hind rim of occiput with tubercles (in *O. lefebvrii* only faintly visible) Fig. 16.2, 16.6. ..... (4)

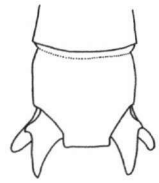
2a Extensive black markings at sides of thorax; the black stripes bordering the yellow humeral stripe are almost confluent, the central yellow stripe being very narrow (Fig. 15.10). Abdomen with extensive black markings (Fig. 15.15). Male: Appendages as in Fig. 15.5..... ..... *Onychogomphus assimilis*
2b Black markings at sides of thorax less extensive; the black stripes bordering the yellow humeral stripe are broadly separated (Fig. 15.11, 15.14). Abdomen largely yellowish (Fig. 15.16, 15.19).... (3)

3a Male: No extensive black markings on S7-9, at most some diffuse brown spots (Fig. 15.16). Lower appendage has no thickening; the underside is not straight but shows a gentle wave (Fig. 15.6). Female: S8 and S9 not broadened and have only poorly-defined brown markings ..... *Onychogomphus flexuosus*
3b Male: Extensive black markings on S7-9 (Fig. 15.19). The lower appendage has a large toothlike, upwardly-pointing basal thickening (Fig. 15.9). Female: S8 and S9 are slightly broadened and have well-defined black markings .... *Onychogomphus macrodon*

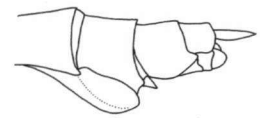
4a Male: Apical part of lower appendage without an apical tubercle (Fig. 15.8). Female: Tubercles on hind rim of occiput small, only faintly visible (Fig. 16.5)..... ..... *Onychogomphus lefebvrii*
4b Male: Apical part of lower appendage with an apical tubercle (Fig. 15.7). Female: Tubercles on hind rim of occiput large and clearly visible (Fig. 16.1)..... (5)

15. Anormogomphus, Lindenia, Onychogomphus

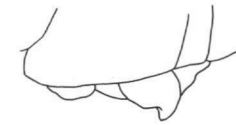
15.1 *A. kiritshenkoi* (♂)



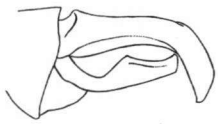
15.2 *A. kiritshenkoi* (♂)



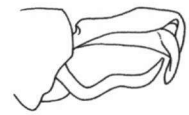
15.3 *L. tetraphylla* (♂)



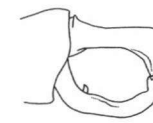
15.4 *L. tetraphylla* (♂)



15.5 *O. assimilis* (♂)

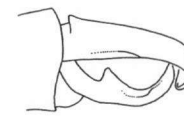


15.6 *O flexuosus* (♂)



15.7 *O. forcipatus/ albotibialis* (♂)

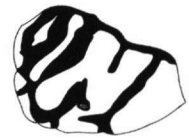
15.8 *O. lefebvrii* (♂)



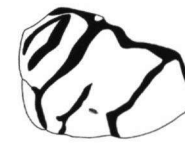
15.9 *O. macrodon* (♂)

15.10 *O. assimilis*

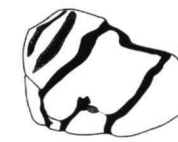
15.11 *O flexuosus*



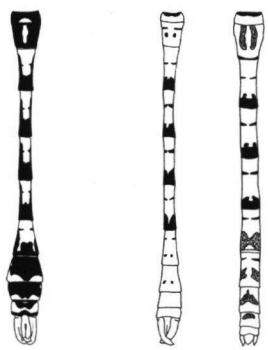
15.12 *O. forcipatus / albotibialis*



15.13 *O. lefebvrii*



15.14 *O. macrodon*



a b

15.15 15.16

a b c

15.17

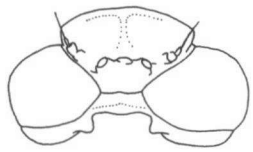
a b

15.18

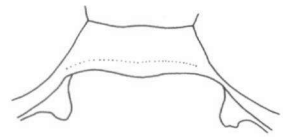
15.19

15.15 *O. assimilis* (♂)
15.16 *O. flexuosus* a: (♂), b: (♀)
15.17 *O. forcipatus albotibialis* a: (♂), b: (♀)
15.18 *O. levebvrii* a: (♂), b: (♀)
15.19 *O. macrodon (♂)*

16. Onychogomphus, Ophiogomphus

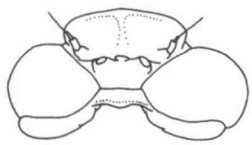


16.1 *O. forcipatus* (♀)

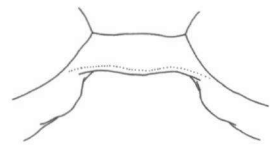


16.2 *O. forcipatus* (♀)

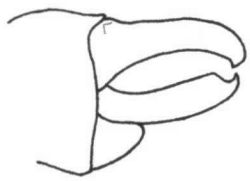
16.3 16.4
Lower appendage of males of *O. forcipatus forcipatus* (16.3) and *O. forcipatus albotibialis* (16.4)



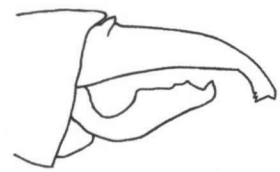
16.5 *O. lefebvrii* (♀)



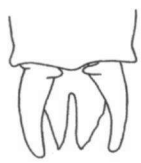
16.6 *O. lefebvrii* (♀)



16.7 *Op. cecilia* (♂)

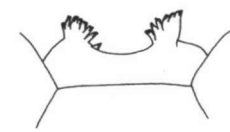


16.8 *Op. reductus* (♂)

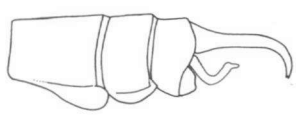


16.9 *Op. cecilia* (♂)

16.10 *Op. reductus* (♂)

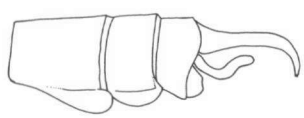


16.11 Occiput of female *Op. cecilia*



16.12 *P. lineatus* (♂)

16.14 *P. lineatus* (♂)



16.13 *P. genei* (♂)

16.15 *P. genei* (♂)

5a Only males can be identified to subspecies. These characters are reliable only when checked on several specimens from one locality. Males: Subterminal dorsal projection of the lower appendage longer than wide, the length to width ratio ranging from 1 to 2.5 within the population (Fig. 16.3) .... *Onychogomphus forcipatus forcipatus*

5b Only males can be identified to subspecies. These characters are reliable only when checked on several specimens from one locality. Males: Subterminal dorsal projection of the lower appendage short and thick, about as wide as long, the length to width ratio ranging from 0.5 to 1 within the population (Fig. 16.4) .... *Onychogomphus forcipatus albotibialis*

Onychogomphus assimilis

Distribution: Fairly common in the coastal areas in the southwest Turkey and along the Coruh Nehri in the northeast. Also known from one record from the extreme southeast (Hakkari province). The species is confined to southwest Asia and is outside Turkey known from Armenia, Georgia, Iran and Turkmenistan.
Flight period: Beginning of May to end of July.
Habitat: Rivers that are at least partly shaded and often cold; in or originating in mountains.

Onychogomphus flexuosus

Distribution: Scarce and known from scattered records in south and central Turkey. The species is confined to southwest and Central-Asia.
Flight period: Mid-May to end of July.
Habitat: Present at large, unshaded rivers. Seems to be associated with broad rivers with gravel banks.

Onychogomphus forcipatus

Distribution: *Onychogomphus f. albotibialis* is common across Turkey but in the southeast is largely replaced by *O. lefebvrii*, and in Thrace by *Onychogomphus f. forcipatus*.
Flight period: mid-May to end of August.
Habitat: Stony brooks and rivers.

Onychogomphus lefebvrii

Distribution: Common in southeast Turkey. The species is confined to southwest and Central-Asia.
Flight period: mid-May to mid-August.
Habitat: Stony brooks and rivers.

Onychogomphus macrodon

Distribution: Species with a limited range and confined to larger rivers in Turkey, Lebanon, Syria, Jordan and northern Israel. Scarce in and around the Adana Delta (Seyhan, Ceyhan and Aksu) and the Hatay province (Orontes).
Flight period: In Turkey only recorded from May, but in other countries recorded in mid-July (SCHNEIDER, 1987).
Habitat: Large rivers.

Key to species of Ophiogomphus

1a Male: Upper appendages clearly longer than the lower appendage (Fig. 16.8). Female: Horns on the occiput poorly developed, present only as rather irregular serrations on the ridge ..... *Ophiogomphus reductus*

1b Male: Upper appendages as long as the lower appendage (Fig. 16.7). Female: Horns on the occiput well developed (Fig. 16.11) ..... *Ophiogomphus cecilia*

Ophiogomphus cecilia

Distribution: Not found in Turkey. The species is locally abundant in eastern Greece and might occur in Turkey.
Flight period: A summer species, expected from May to September.
Habitat: Rivers and large brooks.

Ophiogomphus reductus

Distribution: Only one record from Turkey known, from Malatya in the 19th century. Occurs in Central Asia (ASAHINA, 1979) but has not been found in Iran.
Flight period: The Turkish record is undated. Probably a summer species, expected from May to September.
Habitat: Probably rivers.

Key to species of Paragomphus

1a Face and thorax yellow-greenish with indistinct dark markings. Abdomen with extensive but poorly-defined, mottled dark markings; flaps (very small in females) broadly bordered with black (Fig. 16.5). Slightly smaller than *P. lineatus*; Pt about 3mm. Male: Posterior branch of hamule broad with the apex as broad as the base. Lower appendage as in Fig. 16.13: less strongly curved and as long as S10 ..... *Paragomphus genei*

1b Face and thorax sandy-coloured with well-defined black markings. Abdomen with less extensive but well-defined black markings; flaps (very small in females) largely yellow (Fig. 16.14). Slightly larger than *P. genei*; Pt about 4mm. Male: Posterior branch of hamule slender and gradually tapering towards the apex and ending in a small hook. Lower appendage as in Fig. 16.12: more strongly curved than in *P. genei* and shorter than S10 ..... *Paragomphus lineatus*

Paragomphus genei

Distribution: Not yet found in Turkey. This widely-distributed African species is not uncommon in the Jordan Valley and might occur in the Adana Delta and Hatay province.
Flight period: Expected from May to August.
Habitat: Probably expected at the same habitats as *P. lineatus*.

Paragomphus lineatus

Distribution: Widely distributed in the Indian subcontinent and reaches the western limit of its distribution in Turkey. In Turkey fairly common in the Hatay province in the eastern part of the Adana delta and known from two more eastern records in the province of Şanli Urfa.
Flight period: End of May to end of September.
Habitat: Ditches and other small standing waters, also small flowing waters.

Key to genera of Cordulegastridae

This family is only represented by the genus *Cordulegaster*. It is considered not useful to use the names *Thecagaster* and *Sonjagaster*.

Key to species of Cordulegaster

The identification of *Cordulegaster* species is under review by VAN PELT. The identification of especially the subspecies of *C. insignis* is tricky, and more material is needed in order to evaluate the exact status of some of the taxa described. The key underneath facilitates the identification at the species level. The identification and distribution of the species and subspecies occurring in the Balkans and Turkey has already been reviewed by BOUDOT (2001).
Note: *C. vanbrinkae* was described from north Iran on the basis of a single male. It pertains to the *C. boltonii* species-group, and is probably closely related to *C. picta*. The abdominal markings are very small. Unfortunately, the type specimen is still unavailable for examination, and the taxon is not included in the key underneath.

1a The spot on the lateral side of S1 is situated at the postero-ventral margin and is C-shaped or more or less triangular (Fig. 17.2). The yellow markings between the two large lateral stripes on the thorax extend towards the spiracle with often an additional spot underneath. Foreside of occipital triangle black or black with two small yellow patches, hind part always flat. Male: anal triangle in hind wing normally with 5 cells. Dorsally seen the upper appendages are basally close, diverging towards the apices. The upper appendages have on the underside two teeth (seen form lateral), the basal one is very close to hind margin of S10 and partly covered by the hind margin of S10 (Fig. 17.4). Lower appendage seen from the underside always quadrate.....2
(*C. boltonii* species-group)

1b The spot on the lateral side of S1 is situated just above the middle of the segment and is either small, or extended downwards (Fig. 17.1). The yellow markings between the two large lateral stripes on the thorax are either restricted to the upper part or extend somewhat towards the spiracle. Foreside of occipital triangle black or yellow, hind part flat or strongly swollen. Male: anal triangle in hind wing normally with 3 cells. Dorsally seen the upper appendages are basally separated, more or less parallel. The upper appendages have on the underside two teeth (seen form lateral) the basal one is less close to the hind margin of S10 and clearly visible (Fig. 17.3). Lower appendage seen from the underside either quadrate (17.6) or elongate, tapering towards the apex (Fig 17.5).....3
(*C. bidentata* species-group)

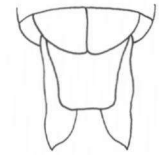
2a Yellow stripes on fore side of thorax with upper lateral corners rounded. Fore side of occipital triangle black with two small yellow patches. Abdominal markings variable, sometimes smaller than ¼, or larger than ⅓ of each segment. Moderately sized *Cordulegaster*. Male: upper appendages slightly longer than S10, basally close (seen dorsally), apically strongly diverging. Female: black marking on frons variable, never fully covering the protruded part. Yellow marking on dorsum of S2 with proximal margin often extended proximally. ..... *Cordulegaster picta*

2b Yellow stripes on fore side of thorax with upper lateral corners angular. Fore side of occipital triangle black. Abdominal markings about ¼ - ⅓ of each segment. Very large species. Male: upper appendages about as long as S10, basally close (seen dorsally), apically moderately diverging. Female: frons always with large black bar, almost fully covering the protruded part. Yellow marking on dorsum of S2 with proximal margin rather straight ..... *Cordulegaster heros*

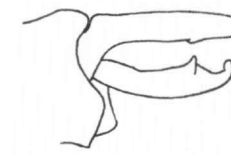
17. Cordulegaster, Cordulia, Somatochlora

17.1 *C. bidentata* species group

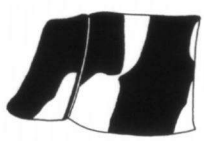
17.3 *C. bidentata* species group (♂)



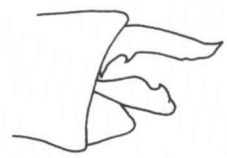
17.5 *C. bidentata* (♂)



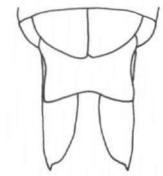
17.7 *Cordulia aenea* (♂)



17.2 *C. boltonii* species group

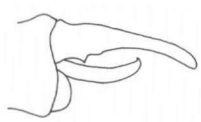


17.4 *C. boltonii* species group (♂)

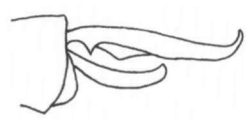


17.6 C. *insignis* (♂)

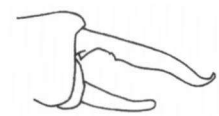
17.8 *Cordulia aenea* (♂)



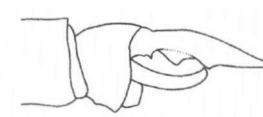
17.9 *S. borisi* (♂)



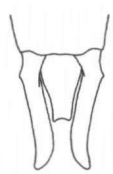
17.11 *S. flavomaculata* (♂)



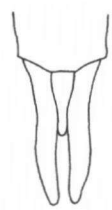
17.13 *S. metallica* (♂)



17.15 *S. arctica* (♂)



17.10 *S. borisi* (♂)



17.12 *S. flavomaculata* (♂)

17.14 *S. metallica* (♂)

17.16 *S. arctica* (♂)

3a Frons with a distinct black marking, extending into the upper lateral corners, resembling 'raised eyebrows.' Fore side of the occipital triangle black, hind part never swollen. Abdominal markings small. Male: upper appendages with basal teeth clear from the hind margin of S10. Lower appendages seen from the underside longer than broad, tapering towards the apex (Fig. 17.5). Female: frons always with large black bar, almost fully covering the protruded part .... *Cordulegaster bidentata*

3b Frons normally only with traces of black. Fore side of the occipital triangle black or yellow, hind part either flat or swollen. Abdominal markings larger (but small in *C. insignis mzymtae*). Male: upper appendages with basal teeth rather near the hind margin of S10 (Fig. 17.4). Lower appendage seen form the underside quadrate or slightly longer than broad (Fig. 17.6). Female: frons normally with only traces of black, never fully covering the protruded part .... *Cordulegaster helladica/insignis*

Cordulegaster bidentata

Distribution: central and East Europe, but not in southern Greece, southeastern Bulgaria and northeastern Greece. Not recorded from Turkey but might occur in Thrace.
Flight period: summer.
Habitat: springs and small brooks.

Cordulegaster insignis

Distribution: southeastern Bulgaria and northeastern Greece, Turkey, Caucasus and Iran. Widely distributed in Turkey, with 5 described subspecies (*insignis, charpentieri, amasina, mzymtae* and *nobilis*). At least 3 undescribed taxa occur in the region as well. More material is needed in order to evaluate the exact status of some of the described subspecies.
Flight period: End of May to mid-August.
Habitat: springs and small brooks, sometimes in larger waters.

Cordulegaster helladica

Distribution: central and southern Greece only. Not expected to occur in Turkey.
Flight period: summer.
Habitat: springs and small brooks, sometimes in larger waters.

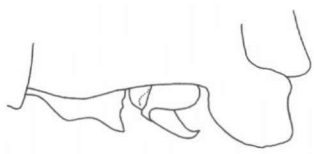
Cordulegaster heros

Distribution: eastern Europe, but not in southeastern Bulgaria and northeastern Greece. Not in Turkey.
Flight period: summer.
Habitat: brooks.

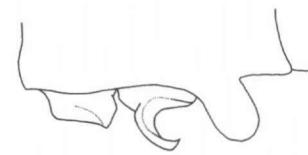
Cordulegaster picta

Distribution: southeastern Bulgaria, northeastern Greece, Turkey, Caucasus. Widely distributed in west and northwest Turkey. In the east only known from one record east of lake Van.
Flight period: End of May to mid-August.
Habitat: springs and small brooks, sometimes in larger waters.

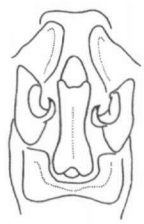
18. Brachythemis, Crocothemis, Diplacodes, Selysiothemis, Tholymis



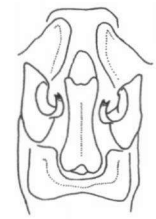
18.1 *B. fuscopalliata* (♂)



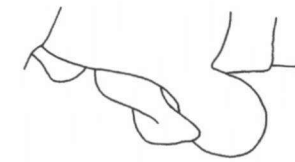
18.2 *B. leucosticta* (♂)



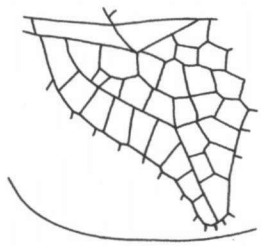
18.3 Secundair genitalia of *C. servilia* from ventral (♂)



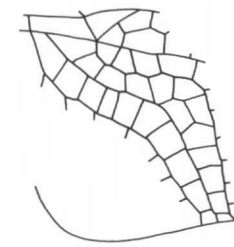
18.4 Secundair genitalia of *C. erythraea* from ventral (♂)



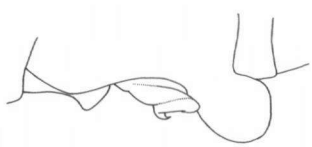
18.5 *C. erythraea* (♂)



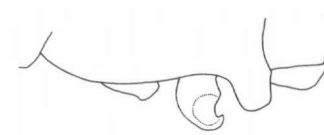
18.6 *Wingbase Crocothemis*



18.7 Wingbase *T. tillarga*



18.8 *D. lefebvrii* (♂)



18.9 *S. nigra* (♂)

Key to genera of Corduliidae

1a HW with a single cross-vein between triangle and wing base. Frons usually without yellow.
Male: Lower appendage deeply divided, each branch carrying a subapical tooth (Fig. 17.7, 17.8)..... *Cordulia*

1b HW with two cross-veins between triangle and wing base. Frons with a yellow bar or with yellow spots. Male: Lower appendage undivided or only slightly divided, no subapical tooth present (Fig. 17.9-16) .....*Somatochlora*

Key to species of Cordulia

Only one regional species present.

Cordulia aenea

Distribution: Scattered records from mountains of northwest and extreme northeast Turkey.
Flight period: Beginning of June to end of July.
Habitat: Larger mountain lakes.

Key to species of Somatochlora

1a S5-8 with lateral yellow spots. Male: Appendages as Fig. 17.11, 17.12..... ..... *Somatochlora flavomaculata*

1b S5-8 without lateral yellow spots ..... (2)

2a Frons with a complete yellow bar along its lower margin connecting two lateral yellow spots; postclypeus without yellow.. ..... (3)

2b Frons with two isolated yellow spots; postclypeus with or without two yellow lateral spots..... (4)

3a A small yellow spot present on the side of the thorax just below the first wing pair. Male: Upper appendages longer and thicker than in *S. metallica*..... ..... *Somatochlora meridionalis*

3b No yellow spot present on the side of the thorax just below the first wing pair. Male: Upper appendages shorter and thinner than in *S. meridionalis* (Fig. 17.13, 17.14) ..... *Somatochlora metallica*

4a Postclypeus with two yellow lateral spots. Male: Abdomen widest at S7-8. Appendages as Fig. 17.9, 17.10 with the lower slightly bilobed and, seen dorsally, the ends of the upper appendages diverging. Female: Vulvar scale less than half as long as S9..... .....*Somatochlora borisi*

4b Postclypeus with no yellow lateral spots. Male: Abdomen widest at S4-6. Appendages as Fig. 17.15, 17.16 with the lower not bilobed and, seen dorsally, the ends of the upper appendages pointing towards each other. Female: Vulvar scale longer than S9..... .....*Somatochlora arctica*

Somatochlora arctica

Distribution: Not expected to occur in Turkey. Nearest record is from the mountains of west Bulgaria (Marinov, 2004).
Flight period: Summer species, expected from May to September.
Habitat: Largely restricted to small water bodies in sphagnum bogs.

Somatochlora borisi

Distribution: This recently-described species is confined to eastern Rhodopes and the northern and southern foothills of the Istranca Mountains. It does not occur outside Bulgaria, Greece and Turkey. So far only one Turkish record has been published (1 female, Pabuç River near Kıyıköy, Black Sea coast in Thrace) (Boudot *et al.* 2004).
Flight period: A spring species, found from May to July (Boudot *et al.* 2004).
Habitat: Found by largely-shaded brooks with muddy bottoms in wooded country (Boudot *et al.* 2004; Marinov, 2001c).

Somatochlora flavomaculata

Distribution: Known from a small number of localities in west Turkey and from one locality at Lake Van.
Flight period: End of May to beginning of September.
Habitat: Often very densely-vegetated standing waters, with only small, scattered areas of open water.

Somatochlora meridionalis

Distribution: Scarce to fairly common in Thrace and adjacent parts of Asian Turkey. One record in the province of Muğla.
Flight period: End of May to end of August.
Habitat: Small streams shaded by trees (Marinov, 2001a).

Somatochlora metallica

Distribution: Not found in Turkey. Nearest locality where *S. metallica* has been found is in the mountains of southwest Bulgaria (Marinov, 2001a).
Flight period: Summer species.
Habitat: In Bulgaria found in mountain lakes with open water (Marinov, 2001a).

Key to genera of Libellulidae

1a Base of HW with a black, not transparent, basal mark ..... (2)
1b Base of HW without a black basal mark; in some cases a transparent dark red or dark brown mark (eg. *Diplacodes lefebvrii* and *Trithemis festiva*)..... (6)

2a Base of HW with two large black marks (sometimes connected) with a yellow area in between. FW hyaline. Appendages as long or longer than the combined length of S9-10. Abdomen often red, never largely black or blue. Secondary genitalia as in Fig. 21.13..... ..... *Tramea basilaris*
2b Base of HW different and with only one black mark. FW hyaline or with black mark. Appendages shorter than the combined length of S9-10. Abdomen often largely black or blue, never red ..... (3)

3a FW with at least 9 antenodal veins; triangle with 1 to 4 cross-veins ..... (4)
3b FW with at most 8 antenodal veins; triangle without or with only 1 cross-vein.... (5)

4a Last antenodal cross-vein in FW complete (check all wings). FW with 12 or more antenodals .....*Libellula*
4b Last antenodal cross-vein in FW incomplete (check all wings). FW with 11 or less antenodals ..... *Trithemis*

5a FW with apical antenodal cross-veins complete (check all wings); triangle with one cross-vein; subtriangle of FW with three cells. Face white .....*Leucorrhinia*
5b FW with apical antenodal cross-veins incomplete (check all wings); triangle without a cross-vein; subtriangle of FW with one or two cells. Face pale brownish or blackish.....*Diplacodes* (males)

6a Subtriangle in FW with 1 or 2 cells. Abdomen black or brownish, never blue or bright red..... (7)
6b Subtriangle in FW with 3 or more cells. Males often with blue or bright red abdomen ..... (9)

7a Venation largely whitish. Pt whitish and bordered posteriorly and anteriorly by thickened veins, that together resemble a "equals" sign. Secondary genitalia as in Fig. 18.9 ..... *Selysiothemis*

7b Venation not whitish; most often dark or reddish. In mature individuals the Pt at least partly dark; posterior and anterior veins bordering the Pt not clearly thickened ..... (8)

8a No ridge present near the base of S4. Discoidal field in FW (field of cells on the longest side of the triangle) starting with two rows of cells. Never with large patches of the wing coloured, although a small brown or yellow basal spot in the HW is often present ..... *Diplacodes*

8b A ridge present near the base of S4. Discoidal field in FW (field of cells on the longest side of the triangle) starting with three rows of cells. Often large patches of the wing coloured blackish or reddish .. .. *Brachythemis*

9a Last antenodal cross-vein in FW complete (check all wings). Adult males: Abdomen often covered with blue pruinosity and never red ..... *Orthetrum*

9b Last antenodal cross-vein in FW incomplete (check all wings). Adult males: Abdomen never covered with blue pruinosity and often red ..... (10)

10a Hind lobe of pronotum large, erect, fringed with long hairs. Fore wing with 7 (sometimes 8) antenodal veins. .... *Sympetrum*

10b Hind lobe of pronotum not large, erect and fringed with long hairs. Fore wing with 9 or more antenodal veins. Exception: *Trithemis pallidinervis* has 7 or 8 antenodal veins ..... (11)

11a Borders of anal loop (HW) meet posterior border before meeting each other, leaving the apex of anal loop open (Fig. 18.7). Male: HW with large dark mark beside the nodus; this mark is bordered on the apical side by a large white mark (can be difficult to see). Female: On the ventral side of S9 a long channelled egg slide extending to the tip of the abdomen is present (Fig.21.12) ..... *Tholymis tillarga*

11b Borders of anal loop (HW) converge and meet before posterior border of HW, leaving apex of loop closed (Fig. 18.6). Male: HW without dark mark beside the nodus but can have large reddish marks at the base of the wing. Female: No channelled egg slide is present ..... (12)

12a HW with two cross-veins between triangle and wing base. Pt in fore wing much larger than that in HW. Secondary genitalia as in Fig. 18.9 ..... *Pantala flavescens*

12b HW with one cross-veins between triangle and wing base. Pt in both wings of similar size ..... (13)

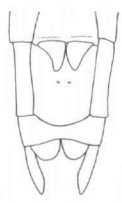
13a Large, body length more than 45 mm. S2-9 black (slightly metallic) with lateral yellow spots and a narrow, mid-dorsal yellow stripe. Thorax black with yellow spots, sometimes covered with pruinosity. Secondary genitalia as in Fig. 22.8 ..... *Zygonyx*

13b Body length less than 45 mm. Pattern on S2-9 different: brown, red or purple with or without an extensive black pattern. Thorax brown, red or purple with or without an extensive black pattern; never with pruinosity ..... (14)

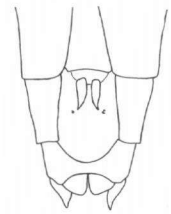
14a Legs always pale coloured (yellow or reddish). No cells between IR_3 and Rspl are doubled. Pterostigma large, about 3.5mm long. Adult male: Abdomen red ..... *Crocothemis*

14b Legs black, or femur black and tibia reddish. Several cells between IR_3 and Rspl are doubled (seldom absent). Pterostigma smaller, about 2.6 mm long. Adult male: Abdomen yellow, red, purple or black ..... *Trithemis*

19. Leucorrhinia, Libellula, Orthetrum

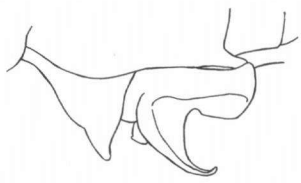


19.1 *L. pectoralis* (♀)

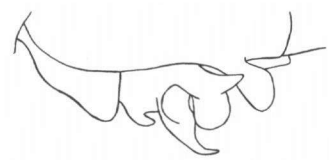


19.2 *L. caudalis* (♀)

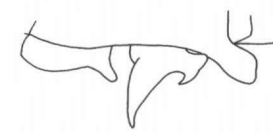
19.3 *L. dubia* (♀)



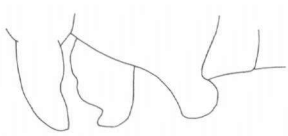
19.4 *L. pectoralis* (♂)



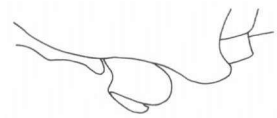
19.5 *L. caudalis* (♂)



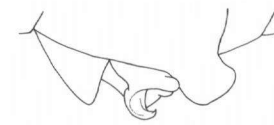
19.6 *L. dubia* (♂)



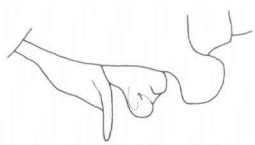
19.7 *L. depressa* (♂)



19.8 *L. fulva* (♂)

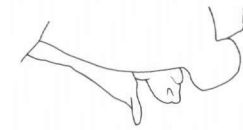


19.9 *L. quadrimaculata* (♂)

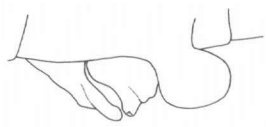


19.10 *O. albistylum* (♂)

19.11 *O. brunneum* (♂)

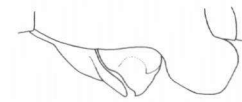


19.12 *O. cancellatum* (♂)

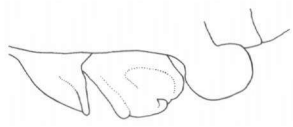


19.13 *O. chrysostigma* (♂)

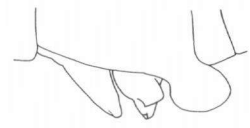
19.14 *O. coerulescens* (♂



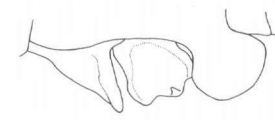
19.15 *O. ransonnetii* (♂)



19.16 *O. sabina* (♂)



19.17 *O. taeniolatum* (♂)



19.18 *O. trinacria* (♂)

Key to species of Brachythemis

1a Pt unicoloured: cream-coloured or sometimes more brownish. Dark abdominal pattern is partly warm brown. Usually no doubled cells between IR_3 and Rspl. Adult males: The wings with the basal halve reddish or brownish roughly between the base and the nodus. Secondary genitalia as in Fig. 18.1 Females: Wing pattern probably always absent in females..... *Brachythemis fuscopalliata*

1b Pt bicoloured, with basal part whitish and apical quarter or third dark. Dark abdominal pattern uniform black. One or more cells between IR_3 and Rspl are doubled. Adult males: Wings with a dark band between the Pt and the nodus. Secondary genitalia as in Fig. 18.2. Females: Half of the females can be recognised as they have the same wing pattern as the males..... *Brachythemis leucosticta*

Brachythemis fuscopalliata

Distribution: In Turkey not uncommon in the Adana Delta with scattered records further east. West of the Adana Delta, populations are present at the Goksu Delta and the Karpuz Cay. The species is known from Iraq, Israel, Jordan, Syria and Turkey.
Flight period: Beginning of May to end-September.
Habitat: Standing waters and slowly-flowing brooks.

Brachythemis leucosticta

Distribution: Only four Turkish records known, three from the Adana Delta and one from Hatay province (not on map). Each record was of a single specimen and so far no populations have been found. The species is widespread in Africa and is common in the Jordan Valley.
Flight period: In Turkey recorded in May and June. Can probably be found from April to October.
Habitat: Standing waters.

Key to species of Crocothemis

1a Fresh specimens: Wing tips smoky; front of wing, roughly between base and Pt, suffused with yellow. Creamy-white stripes on front of thorax conspicuous. Male: Inner branch of hamule with a single apical hook which is not bifid (Fig. 18.4). Female: Each side of vulvar scale with a distinct basal swelling directed towards the head (compare directly with material of *Crocothemis erythraea*) .... *Crocothemis servilia*

1b Fresh specimens: Wing tips and front of wing between base and Pt hyaline. Creamy-white stripes on front of thorax far less conspicuous. Male: Inner branch of hamule with bifid apex (Fig. 18.3). Female: Each side of vulvar scale with a weakly-developed basal swelling directed towards the appendages (compare directly with material of *Crocothemis servilia*)..... *Crocothemis erythraea*

Crocothemis erythraea

Distribution: Common in most of Turkey, especially in the south, scarcer in the north.
Flight period: End of March to beginning of October.
Habitat: All kinds of standing waters.

Crocothemis servilia

Distribution: Widespread oriental species. In Turkey only known from a few records along the eastern Mediterranean coast (Adana, Hatay, Icel) and from one record at Diyarbakir (Diyarbakir).
Flight period: Turkish records are from April, June, July and September but the species is probably on the wing for most of the year.
Habitat: In Turkey so far found at small ditches and pools but probably can be found by all kinds of standing waters.

Key to species of Diplacodes

Only one regional species present. Male: Secondary genitalia as in Fig. 18.8

Diplacodes lefebvrii

Distribution: Not uncommon along the southern Mediterranean coast. There are a few records from more inland locations in the provinces of Adiyaman and Sanli Urfa.
Flight period: Mid-May to mid-November.
Habitat: Small, shallow standing waters.

Key to species of Leucorrhinia

1a Appendages whitish. Fore wing without a black basal mark. Mature male: Pt white from above. At least S3 and S4 blue with pruinosity. Female and immature male: Dorsal side S7 black without a pale spot. Secondary genitalia: Fig. 19.5. Vulvar scale Fig. 19.2..... *Leucorrhinia caudalis*

1b Appendages black. Fore wing with a black basal mark. Mature male: Pt black from above. S3 and S4 never blue and pruinosity. Female and immature male: Dorsal side S7 black with a yellow or red spot ..... (2)

2a Adult male: Dorsal spots on S5-7 uniformly yellow to reddish. Male: S4-5 with small or no reddish markings. Secondary genitalia: Fig. 19.6. Female: Sides of S2-4 with small yellow-brown spots; the anterior half of segment 3 has no yellow-brown band running from one side of the segment to the other. Vulvar scale with two processes that are shorter than ¼ of the sternum (the 'floor' of the segment) (Fig. 19.3)..... *Leucorrhinia dubia*

2b Adult male: Dorsal spot on S7 bright yellow, contrasting with reddish spots on S5-6. Male: S4-5 with reddish markings that cover a large part of the dorsum. Secondary genitalia: Fig. 19.4. Female: Sides of S2-4 without yellow-brown spots; the anterior half of segment 3 has a yellow-brown band running from one side of the segment to the other side. Vulvar scale with two processes that are about as long as ¼ of the sternum (the 'floor' of the segment) (Fig. 19.1)..... ..... *Leucorrhinia pectoralis*

Leucorrhinia caudalis

Distribution: Not found in Turkey. Found in the southwestern Caucasus and might be present in northeast Turkey.
Flight period: Early summer species.
Habitat: Most likely to be found in well-vegetated mountain lakes.

Leucorrhinia dubia

Distribution: Not found in Turkey but occurs in Georgia and might occur in northeast Turkey. Recently found in northwest Bulgaria (Marinov, 2004). Flight period: Spring and early summer species.
Habitat: Expected in mountain bogs.

Leucorrhinia pectoralis

Distribution: Known from three localities in northeast Turkey (Artvin, Kars, Erzurum), four localities in the lake area of the southwest (Afyon, Isparta, Konya) and one in northwest Turkey (Bolu).
Flight period: End of May to beginning of August, probably most common in June.
Habitat: Marshes and larger ditches.

Key to species of Libellula

1a Nodus of wings with a dark mark. Base of FW hyaline. Male: Secondary genitalia as in Fig. 19.9 ..... *Libellula quadrimaculata*

1b Nodus of wings without a dark mark. Base of FW with a dark mark ..... (2)

2a Median space in FW covered by a black basal mark. Abdomen very broad, S4-S6 each about three times as broad as long. Sides of S4-S6 with yellow spots. Mature male: Abdomen largely blue. Male: Secondary genitalia as in Fig. 19.7..... ..... *Libellula depressa*

2b Median space in FW hyaline and not covered by a black basal mark. Abdomen narrower, S4-S6 each only about twice as broad as long. Sides of S4-S6 without yellow spots. Mature male: Abdomen blue or reddish. Male: Secondary genitalia as in Fig. 19.8..... (3)

3a Base of FW with a black mark. Membranula black. Often with dark wing tips. Mature male: Abdomen covered with blue pruinosity (can become very dark); face dark. Male: Secondary genitalia as in Fig. 19.8 ..... *Libellula fulva*

3b Base of FW hyaline or with a fine amber streak. Membranula whitish. Never with dark wing tips. Mature male: Abdomen brick-red with a black central stripe; face red. Male: Secondary genitalia (almost) identical with *L. fulva* (Fig. 19.8)..... ..... *Libellula pontica*

Libellula depressa

Distribution: Common across Turkey.
Flight period: Beginning of May to end of August.
Habitat: All kinds of standing waters.

Libellula fulva

Distribution: Scarce in west Turkey, abundant around Lake Köyceğiz.
Flight period: End of April to mid-July.
Habitat: All kinds of standing or slowly-flowing waters, often associated with reedy vegetation.

Libellula pontica

Distribution: Scarce in southeast Turkey and known from one locality in the northwest (Sakarya). Other countries where the species has been found are Armenia, Iran, Iraq, Kirgizistan, Israel and Syria.
Flight period: Beginning of May to mid-July.
Habitat: Standing or slowly-flowing, well-vegetated waters.

Libellula quadrimaculata

Distribution: Scarce across Turkey; seems to be relatively common in the east.
Flight period: End May to beginning of August.
Habitat: Standing, well-vegetated waters.

Key to species of Orthetrum

Identifying specimens of the genus *Orthetrum* can be difficult. Identification should be checked by comparing the secondary genitalia of the males.

1a Pt black. Male: Abdomen blue with pruinosity but at least S8-10 black. Female and young male: Abdomen with two distinct longitudinal black lines which do not cover the centre of the segments ..... (2)

1b Pt yellow to brown. Male: Abdomen totally blue with pruinosity, with only S10 and seldom also S9 black. Female and young male: most species with only a thin middorsal stripe or an extensive black pattern. Exception is *O. taeniolatum* which has a relatively thick black central line, accentuated by paler areas along it..... (3)

2a Appendages black. Thorax largely brownish without pale bands or stripes. Ground colour of abdomen yellow-brown (becomes obscured with pruinosity in males) and the black lines on each segment less curved. Abdomen broad when compared with albistylum. Female: S10 brownish with black pattern, S8-9 never become totally black. Male: Pruinosity blue. Secondary genitalia as in Fig. 19.12..... *Orthetrum cancellatum*

2b Appendages whitish. Two contrasting milky bands on thorax sides and a pale stripe running dorsally over the thorax between the wings. Ground colour of abdomen paler (becomes obscured with pruinosity in males) and the black lines on each segment slightly more curved. Abdomen slender when compared with albistylum. Female: S10 whitish without black pattern, S8-9 can become totally black. Male: Pruinosity whitish-blue. Secondary genitalia as in Fig. 19.10..... ..... *Orthetrum albistylum*

3a Abdomen without blue pruinosity..... (4)

3b Abdomen with blue pruinosity..... (10)

4a Abdomen largely black with pale streaks or rings. Total length more than 43 mm. Abdomen slender and cylindrical, with S1 and S2 swollen and three times as thick as the other segments ..... (5)

4b Abdomen largely brown with one thin stripe or a relatively thick black central line, accentuated by paler areas along it. Total length less than 50 mm. Abdomen depressed or cylindrical and in most species not swollen at base..... (6)

5a S7-10 expanded and broader than S4-5. Appendages pale and about as long as, or shorter than, S9. Pattern on abdomen: the pale spots on S3 to S6 run down to the sides of the abdomen without being interrupted by a black line; S7-9 black and almost devote of yellow. Total length 43-50mm. Male: Secondary genitalia as in Fig. 19.16, with orange hairs on the anterior lamina (hairs not shown in figure)..... *Orthetrum sabina*

5b S7-10 not expanded, and as slender as S4-6. Appendages black and longer than S9. Pattern on abdomen: the pale spots on S3 to S6 are normally separated from the sides of the segments by a black line; S7-9 black with at least some yellow spots. Total length 51-67mm. Male: Secondary genitalia as in Fig. 19.18 with whitish hairs on the anterior lamina (hairs not shown in figure). ..... *Orthetrum trinacria*

6a Side of thorax with a conspicuous pale stripe immediately behind humeral suture. This pale stripe is accentuated by a black line on the anterior side..... (7)

6b Side of thorax with no conspicuous dark-bordered pale stripe immediately behind the humeral suture..... (8)

7a Membranula whitish to pale brown. Side of thorax with two pale stripes: one behind the first (humeral) suture and one behind the second (metapleural) suture; both stripes accentuated by a black line on the anterior side. Has a relatively thick black central line on the abdomen, accentuated by paler areas along it. Smaller than *O. chrysostigma*; total length 33-38mm. Male: Secondary genitalia: apex of the anterior lamina slightly incised (Fig. 19.17). Upper side of eyes brown, rest of eyes blue..... ..... *Orthetrum taeniolatum*

7b Membranula always dark. Side of thorax with one pale stripe behind the first (humeral) suture and no pale stripe behind the second (metapleural) suture. Black central line on the abdomen thin. Larger than *O. taeniolatum*, total length 39-48mm. Male: Secondary genitalia: apex of the anterior lamina not incised (Fig. 19.13). Eyes blue..... ..... *Orthetrum chrysostigma/luzonicum*

8a R3 almost straight, slightly bisinuous in females only. Usually no (sometimes 1 or 2) cells between IR_3 and Rspl are doubled. Membranulae pale. Females and young males: No black on abdomen, even the small black mid-dorsal stripe is lacking. Male: Secondary genitalia as in Fig. 19.15 ..... *Orthetrum ransonnetii*

8b R3 distinctly bisinuous. Often 2 or more cells between IR_3 and Rspl are doubled. Membranulae pale or dark. Females and young males: Black markings on abdomen present; at least a small black mid-dorsal stripe is present..... (9)

9a Four or more cells between IR_3 and Rspl are doubled (check all wings). Face pale: blue or yellow-whitish. Abdomen with a thin black mid-dorsal line with a pair of black spots on the anterior part of each segment; these spots are seldom confluent with the mid-dorsal line. Pt relatively short: 2.5-3 mm. Male: Secondary genitalia as in Fig. 19.11 ..... *Orthetrum brunneum*

9b Less than four cells between IR_3 and Rspl are doubled (check all wings). Face less pale: yellow-brownish. Abdomen with a thin black mid-dorsal line with a pair of black spots on the anterior part of each segment; these spots are usually confluent with the mid-dorsal line. Pt large: around 4 mm. Male: Secondary genitalia as in Fig. 19.14..... *Orthetrum coerulescens*

10a Long, slender species with abdomen exceeding 50 mm. Appendages longer than S9. Pruinosity dark grey. Male: Secondary genitalia as in Fig. 19.18. Anterior lamina with a tuft of long whitish hairs..... ..... *Orthetrum trinacria*

10b Abdomen less than 50 mm. Appendages shorter than S9. Pruinosity paler blue or greyish. Male: Anterior lamina without a tuft of long whitish hairs .....(see table 4)

Orthetrum albistylum

Distribution: Scarce across Turkey. Records largely concentrated in three areas: Thrace, the lakes in southwest Turkey and along the Black Sea coast near Samsun.
Flight period: Beginning of June to mid-September.
Habitat: Standing waters and pools along stony rivers.

Orthetrum brunneum

Distribution: Found across Turkey and one of the most common Turkish species.
Flight period: beginning of May to beginning of October.
Habitat: Flowing waters, mostly in smaller brooks and seepages.

Orthetrum cancellatum

Distribution: Fairly common across Turkey.
Flight period: Beginning of May to beginning of September.
Habitat: Larger standing waters.

Orthetrum chrysostigma

Distribution: Widespread African species which reaches the south coast of Turkey but is absent from the Balkans. Common along the coastal areas of south Turkey.
Flight period: Mid-May to end of August.
Habitat: Standing waters and slowly-flowing sections of brooks.

Orthetrum coerulescens

Distribution: Common across Turkey.
Flight period: Beginning of May to mid-November.
Habitat: Brooks.

Orthetrum luzonicum

Note: This species is closely related to the largely African *O. chrysostigma* and often regarded as a subspecies. Differences between these two have not been described thoroughly. Differences given by DUMONT & HEIDARI (1996) are: secondary genitalia characterised by an upright, posteriorly curved anterior (upper) branch of hamule; in *O. chysostigma* the anterior (upper) branch of hamule is much shorter and curved outwards instead of backwards. They also state that the front legs of *O. luzonicum* are bright yellow in males and dull yellow in females, whereas those of *O. chrysostigma* are black.

Distribution: Widespread oriental species. The westernmost record is from southeast Iran where it is known from one record.
Flight period: Only record from Iran is from 26 April 1995 (DUMONT & HEIDARI, 1996) but it is probably on the wing during most of the year.
Habitat: Standing waters and slowly-flowing sections of brooks.

Orthetrum ransonnetii

Distribution: Has a wide but discontinuous distribution. Its range stretches from various countries surrounding the Sahara through the Middle East to Central Asia. In the countries covered by this key, only known from Turkey (one record in the 19th century in the province of Malatya) and three records from Iran (one in the north and two in the southeast)
Flight period: Turkish record without date. Iranian records are from April, May and June but it is probably on the wing during most of the year.
Habitat: Occurs in arid climates. Mentioned by WATERSTON & PITTAWAY (1991) from deep rocky pools in boulder-strewn wadis.

Orthetrum sabina

Distribution: Widespread oriental species. In Turkey common along the coastal areas of the south and southwest, with a few inland records.
Flight period: Beginning of April to end of October.
Habitat: All kinds of standing waters.

Orthetrum taeniolatum

Distribution: In Turkey common along the coastal areas of the south and southwest, with a few inland records. The species occurs in the Indian subcontinent, the Middle East and northeast Africa.
Flight period: Begin May to end of September.
Habitat: All kinds of standing waters.

Orthetrum trinacria

Distribution: One Turkish record. This African species is present in the Jordan Valley and might be found in southern Turkey.
Flight period: Only one Turkish record, no date known. Probably a summer species.
Habitat: Standing waters.

Table 4: Characters for recognition adult males of *Orthetrum coerulescens, O. brunneum, O. chrysostigma/luzonicum, O. ransonneti, O. taeniolatum.*
(1) Four or more cells between IR_3 and Rspl are doubled (check all wings).

Diagnostic characters	Total length	Pt	Rspl (1)	Face pale blue	Membranulae
coerulescens	36-45 mm	3.6-4.2 mm	No	Never	intermediate
brunneum	41-49 mm	2.5-3 mm	Yes	Often	pale
chrysostigma/luzonicum (1)	39-48 mm	2.8-3.3 mm	Rarely	Often	dark
ransonneti (2)	47-52 mm		No	Often (?)	pale
taeniolatum (3)	33-38 mm	2-2.5 mm	Rarely	Often	intermediate

ad 1. chrysostigma/luzonicum
Thorax side with one pale, dark-bordered stripe (when fully adult becomes covered with pruinosity). Abdomen waisted, not parallel-sided.
ad 2. ransonneti
R3 straight (bisinuous in other species).
ad 3. taeniolatum
Thorax side with two pale, dark-bordered stripes (when fully adult becomes covered with pruinosity). Upper side of eyes deep brown, not grey.

Key to species of Selysiothemis

Only one regional species present. Secondary genitalia as in Fig. 18.9

Selysiothemis nigra

Distribution: In Turkey scarce along the south coast and in the provinces of Gaziantep and Şanli Urfa. Most records are from the Goksu delta and the Adana delta. The species occurs in Central Asia, the Middle East, parts of North-Africa (oases) and in Europe in scattered populations along the Mediterranean Sea.
Flight period: Beginning of June to beginning of August.
Habitat: Standing, shallow waters.

Key to species of Sympetrum

1a Femur of leg 2 and 3 totally black ..... (2)
1b Femur of leg 2 and 3 black with a yellowish stripe or mainly yellowish ..... (7)

2a Wings without a brown band from the basal part of the Pt to the posterior margin ..... (3)
2b Wings with a brown band from the basal part of the Pt to the posterior margin. Male: Secondary genitalia as in Fig. 20.8. Female: Vulvar scale as in Fig. 21.8 .... *Sympetrum pedemontanum*

3a Thorax laterally without a broad black band. Male: Abdomen never largely black..... (4)
3b Thorax laterally with a broad black band with three isolated yellow spots. Male: Abdomen black with yellow or totally black (adults), never red. Secondary genitalia as in Fig. 20.2. Female: Vulvar scale as in Fig. 21.2..... *Sympetrum danae*

4a Four or five cells between radial supplementary vein and hind margin of the wing (Fig. 20.15). Male: Secondary genitalia as in Fig. 20.9. Female: Vulvar scale as in Fig. 21.9 ..... (5) (subspecies of *S. sanguineum*)
4b Six to eight cells between radial supplementary vein and hind margin of the wing (Fig. 20.14). Male: Secondary genitalia as in Fig. 20.03. Female: Vulvar scale as in Fig. 21.3 .... *Sympetrum depressiusculum*

5a Tibia of leg 2 and 3 without yellow..... (6) (subspecies of *S. sanguineum*)
5b Tibia of leg 2 and 3 with yellow markings. .....*Sympetrum sanguineum armeniacum*

6a Basal yellow coloration on the wings always extends more than halfway from the base of the wing to the triangle. Yellow coloration can spread as far as the nodus and even to Pt. The yellow marking in FW and HW are more or less equal in size. Lower appendage always reaches the middle of the hind margin of the uppers ..... *Sympetrum sanguineum ssp*
6b Basal yellow coloration on the wings reaches less than halfway from the base

of the wing to the triangle. Yellow markings on HW are always more strongly developed. Lower appendages only reach or slightly goes behind the lower-hind angle of the uppers .... *Sympetrum sanguineum sanguineum*

7a Legs black with a yellow line ..... (8)
7b Legs yellow with sometimes a black line ..... (11)

8a Large yellow spot present at base of HW which extends from the base well into the triangle. This spot may be absent in some females (forma hyalina). Male: Underside of abdomen totally black, black extending as far as the sides of the dorsal part of the abdomen. Secondary genitalia as in Fig. 20.4. Female: A complete black line runs on each side of the abdomen. Vulvar scale always incised in middle (Fig. 21.4)..... *Sympetrum flaveolum*
8b Yellow spot at base of HW absent or not extending into the triangle. Male: Underside of abdomen never totally black. Female: Black spots on the side of the abdomen are not confluent and do not form a black line. Vulvar scale incised in middle or rounded without an incision..... (9)

9a Most veins between base of wing and nodus are yellow or in adult males red. HW base with prominent yellow patch Male: Face bright red and contrasting with whitish sides. The anterior branch of hamule is small and clearly shorter than the posterior branch (Fig. 20.5). Female: Vulvar scale barely projecting. The apical edge of the vulvar scale is bilobed (Fig. 21.4)..... *Sympetrum fonscolombii*
9b Veins between base of wing and nodus are black. Base of wing with small or no yellow spot. Male: Face never bright red and contrasting with whitish sides. The anterior branch of hamule slightly shorter or longer than the posterior branch (Fig. 20.10, 20.11). Female: Projection of the vulvar scale is clearly visible, making a hook of at least 30 degrease to the surface of the abdomen. The apical edge of the vulvar scale is not bilobed ..... (10)

10a Black at base of frons does not extends downwards along the eye-margins but terminates at the inner margin of the eye (Fig. 20.13). Male: Secondary genitalia with anterior branch of hamule longer than posterior branch, curved but not apically hooked (Fig. 20.10). Female: Vulvar scale projecting obliquely (Fig. 21.10)..... ..... *Sympetrum striolatum striolatum*
10b Face with black transverse frontal stripe continuing for some distance down inner margin of eye (Fig. 20.12). Male: Secondary genitalia of male with the anterior branch of hamule slightly shorter than posterior branch and with a small terminal hook (Fig. 20.11). Female: Vulvar scale of female projecting almost at right angles from the abdomen (Fig. 21.11)..... ..... *Sympetrum vulgatum vulgatum*

11a Abdomen less than 20 mm. Head, thorax and abdomen without black markings. Side of the thorax and underside eyes slightly greenish coloured. Male: Secondary genitalia as in Fig. 20.6, the posterior branch is less than halve the length of the anterior branch. Female: Vulvar scale as in Fig. 21.6, only slightly projecting seen from lateral .... *Sympetrum haritonovi*
11b Abdomen longer than 20 mm. Head, thorax and abdomen with or without black markings Male: The posterior branch of the secondary genitalia is more than halve the length (often as long or even longer) of the anterior branch. Female: Vulvar scale slightly (*arenicolor, meridionale*) to prominently projecting (*vulgatum, striolatum*) seen from lateral ..... (12)

12a Black along thorax sutures thin but widening near the wing bases and there resulting in two characteristic black drops. Rear of head with brown to blackish stripes. Males: Both the posterior and the anterior branch of the hamule are large, the posterior with a small hook (Fig. 20.7). Females: Paired processes on underside of S9 are absent and are replaced by shallow depressions. Vulvar is almost not projecting and hardly visible in lateral view (Fig. 21.7)..... .....*Sympetrum meridionale*
12b Black along thorax different often totally absent. Rear of the head with no or barely visible brown to blackish stripes. Males: The posterior and anterior branch

of hamule less large, the posterior with or without a small hook (Fig. 20.1, 20.10, 20.11). Females: Paired processes on underside of S9 present. Vulvar scale protruding and well visible in lateral view (Fig. 21.1, 21.10, 21.11)..... (13)

13a Males..... (14)
13b Females ..... (16)

14a Posterior branch of hamule small, normally concealed by the anterior branch when viewed from the side (Fig. 20.1). Lower appendages long its tip reaching halfway the ventral angle of the upper appendages. Each side of S2-3 has a faint short black stripe (often absent). No amber colour present at base of wing .... *Sympetrum arenicolor*
14b Posterior branch of hamule larger, normally well visible and not concealed by anterior branch when viewed from the side (Fig. 20.10, 20.11). Lower appendages less long, its tip usually not reaching halfway the ventral angle of the upper appendages. S2-3 never with a black stripe on the side. Often a trace of amber colour present at base of wing..... (15)

15a Posterior branch of hamule bent and shorter than the anterior branch (Fig. 20.11). Posterior branch of hamule with a small hook. Back of head without black markings..... .....*Sympetrum vulgatum decoloratum*
15b Posterior branch of hamule rather straight and roughly of the same length as the anterior branch. Posterior branch of hamule without a hook (Fig. 20.10). Back of head with or without black markings..... ..... *Sympetrum striolatum pallidum*

16a Vulvar scale barely projecting or projecting at an angle of more than 150 degrees from the abdomen (Fig. 21.1, 21.10) ..... (17)
16b Vulvar scale projecting at an angle of about 135 degrees from the abdomen (Fig. 21.11)..... .....*Sympetrum vulgatum decoloratum*

17a Vulvar scale projecting at an angle of more than 150 degrees from the abdomen (Fig. 21.10). Often a trace of amber colour present at base of wing..... ..... *Sympetrum striolatum pallidum*
17b Vulvar scale barely projecting (Fig. 21.1). No amber colour present at base of wing. ..... *Sympetrum arenicolor*

Sympetrum arenicolor

Distribution: Known from only two Turkish records (Provinces of Malatya and Elazig). The species is widely distributed in Central-Asia (Kyrgyzstan, Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan) and is known from scattered records in southwest Asia (Iran, Iraq, Syria and Turkey).
Flight period: Only one Turkish record with date: 27 July. Probably a late summer species.
Habitat: No details known. Found by Schoorl (2000) on mountain slopes and on a grass field with small trees near a marsh.

Sympetrum danae

Distribution: Not found in Turkey. Occurs in the southwestern Caucasus and might also occur in northeast Turkey.
Flight period: Summer species.
Habitat. Probably to be found in mountain lakes.

Sympetrum depressiusculum

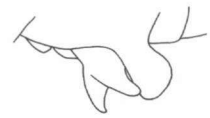
Distribution: Scarce in Thrace and the area along the western Black Sea coast. In the rest of Turkey only found at a number of localities in Karamanmaras and one locality in Konya.
Flight period: Mid-June to mid-September.
Habitat: standing waters, often in rice fields.

Sympetrum flaveolum

Distribution: Fairly common across Turkey, largely absent from the southeast and not yet recorded in Thrace.
Flight period: End of June to end of August.
Habitat: Standing waters often vegetated with rushes and sedges.

20. Sympetrum

20.1 *S. arenicolor* (♂)

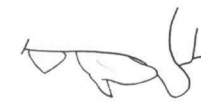


20.2 *S. danae* (♂)

20.3 *S. depressiusculum* (♂)

20.4 *S. flaveolum* (♂)

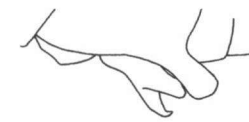
20.5 *S. fonscolombii* (♂)



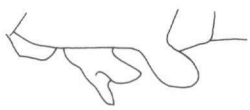
20.6 *S. haritonovi* (♂)

20.7 *S. meridionale* (♂)

20.8 *S. pedemontanum* (♂)

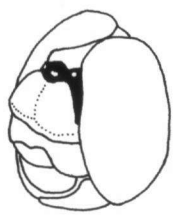


20.9 *S. sanguineum* (♂)



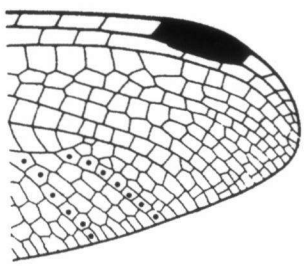
20.10 *S. striolatum* (♂)

20.11 *S. vulgatum* (♂)

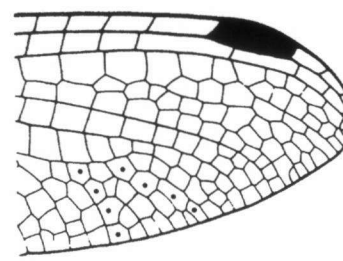


20.12 *S. vulgatum vulgatum*

20.13 *S. striolatum striolatum*



20.14 *S. depressiusculum*



20.15 *S. sanguineum*

Sympetrum fonscolombii
Distribution: Common across Turkey, especially in the south.
Flight period: Found throughout the year, so far not found recorded in February. Most records from April to October.
Habitat: Standing water, most often shallow.

Sympetrum haritonovi
Distribution: In Turkey known from one locality in the province of Antalya and two localities in the province of Erzurum. The species is largely confined to Central-Asia (Tajikistan, Uzbekistan, Kyrgyzstan and Afghanistan) and has not yet been found in Iran.
Flight period: Turkish records are from August. Records from Central-Asia range from 14 June to 21 August (DUMONT *et al.* 1995).
Habitat: small brooks at altitudes of 1800 m or higher.

Sympetrum meridionale
Distribution: Fairly common in west Turkey, seems to be far less common in the east.
Flight period: End of May to end of November.
Habitat: Standing waters, most often shallow.

Sympetrum pedemontanum
Distribution: Scarce in the northeast corner of Turkey. Also known from single records in provinces of Bursa, Kırklareli and Malatya.
Flight period: End June to end of August.
Habitat: Well-vegetated seepages or seepage-fed waters.

Sympetrum sanguineum
Distribution: Common across Turkey. Subspecies *armeniacum* is found in the mountains of eastern Turkey. In southeast specimens, possibly belonging to a separate subspecies, are found with more yellow in the wing. The taxonomic status and distribution of the various subspecies are still largely unclear.
Flight period: End of May to beginning of October, with one record in mid-April.
Habitat: All kinds of standing waters.

Sympetrum striolatum
Distribution: *Sympetrum s. striolatum* is common across Turkey. Subspecies *pallidum* occurs in central Asia and is in Turkey so far only recorded from Van Gölu (SCHMIDT, 1961).
Flight period: Beginning of April to end of November.
Habitat: All kinds of standing waters.

Sympetrum vulgatum
Distribution: *Sympetrum v. decoloratum* occurs in central and southwest Asia. This subspecies is fairly common in southwest and northeast Turkey. Subspecies *Sympetrum v. vulgatum* is present in southwest Caucasus and might be present in northeast Turkey.
Flight period: End of June to end of August.
Habitat: No details known. Probably seepages fed standing waters.

Key to species of Tholymis

Only one regional species present. Vulvar scale as in Fig. 21.12.

Tholymis tillarga
Distribution: Widely distributed in tropical Asia and Africa. Not expected to occur in Turkey. Known from two records in the Fars province of southern Iran.
Flight period: The two Iranian records were made on 27 July 1956 and 24 September 1956 (ASAHINA, 1963). In most of its range found throughout the year, but in Iran probably found only in the summer months.
Habitat: Standing waters.

Key to species of Tramea

Only one regional species present. Secondary genitalia as in Fig. 21.13.

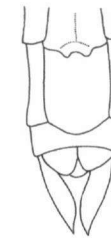
Tramea basilaris
Distribution: Widely distributed from Africa through the Arabian Peninsula to India. Not expected to occur in Turkey. In Iran known from only one record in the southeast.
Flight period: The only record from Iran is from 26 April 1995 (DUMONT & HEIDARI, 1996) but it is probably on the wing during most of the year.
Habitat: Standing waters.

21. Sympetrum, Tholymis, Tramea

21.1 *S. arenicolor* (♀)

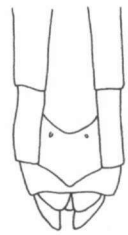
21.2 *S. danae* (♀)

21.3 *S. depressiusculum* (♀)



21.4 *S. flaveolum* (♀)

21.5 *S. fonscolombii* (♀)

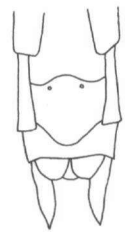


21.6 *S. haritonovi* (♀)

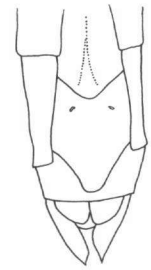
21.7 *S. meridionale* (♀)

21.8 *S. pedemontanum* (♀)

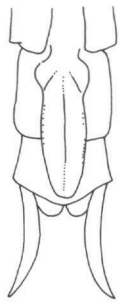
21.9 *S. sanguineum* (♀)



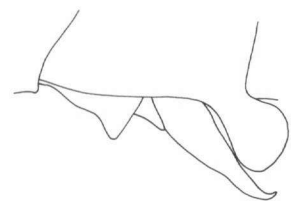
21.10 *S. striolatum* (♀)



21.11 *S. vulgatum* (♀)



21.12 *Tholymis tillarga* (♀)



21.13 *Tramea basilaris* (♂)

Key to species of Trithemis

1a Tibiae yellow or red, contrasting with the black femur ..... (2)
1b Tibiae black..... (3)

2a Vertex raised but without two pointed elevations. Male: Secondary genitalia as in Fig. 22.5. Mature male: Abdomen reddish with a purple sheen. Frons and vertex dark metallic purple. Female and immature males: Abdomen with three black lines, a black mid-dorsal line and two black lines on each side of the abdomen ..... *Trithemis aurora*
2b Vertex raised with two pointed elevations. Male: Secondary genitalia as in Fig. 22.4 with hamule more drawn-out and sickle-shaped than in *T. aurora*. Mature male: Abdomen reddish without a purple sheen. Frons and vertex yellow or bright red. Female and immature males: Abdomen without clear black lines.... *Trithemis kirbyi*

3a Adult male: Abdomen largely black or dark blue. Venation black or yellow. Female and young male: Abdomen with extensive black pattern in which the mid-dorsal carina is black ..... (4)
3b Adult male: Abdomen red or purple. Venation reddish. Female and young male: Abdomen largely yellow or brown, mid-dorsal carina not black..... (5)

4a FW with 10½ antenodal veins. Venation black. Appendages black. Base of hind wing with small dark brown mark. Male: Thorax and abdomen in mature males black with a blue gloss, younger males still have a yellow pattern on the abdomen. Frons and vertex metallic purple. Secundary genitalia as in Fig. 22.3 .... *Trithemis festiva*
4b FW with 8½ antenodal veins. Venation yellow to brown. Base of appendages pale with the apex black. Base of hind wing with large yellow mark. Male: Thorax yellow with black stripes; abdomen largely black with pairs of yellow spots on at least S4-7. Frons and vertex metallic greenish-bronze. Secundary genitalia as in Fig. 22.6..... *Trithemis pallidinervis*

5a Abdomen depressed, S4 and S5 about twice as long as wide. Mature males: Abdomen reddish with a purple sheen. Females and immature males: Sides of S3-S10 with extensive black markings. Male: The genital lobe is distinctly more broadened at its tip (Fig. 22.1)..... ..... *Trithemis annulata*
5b Abdomen slender and cylindrical, S4 and S5 about three times as long as wide. Mature males: Abdomen reddish without a purple sheen. Females and immature males: Sides of S3-S10 with only small black markings. Male: Male genitalia like *T. annulata* but genital lobe with narrower tip (Fig. 22.2)..... *Trithemis arteriosa*

Trithemis annulata

Distribution: Common along the coastal areas of south Turkey with a few records along the coastal area of the southwest. The species is widespread in Africa and reaches Turkey though the Levant. Not yet record from the Balkans.
Flight period: Beginning of April to end of October.
Habitat: Standing waters. Less often at slow flowing, small brooks.

Trithemis arteriosa

Distribution: Scarce along the coastal areas of south Turkey. Found west as far as Demirtas, about 20 km east of Alanya. The species is widespread in Africa and reaches Turkey through the Levant.
Flight period: Mid-May to beginning of July.
Habitat: Standing waters.

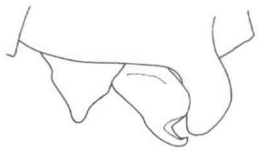
Trithemis aurora

Distribution: Widespread in the Oriental region, reaching as far as southeast Iran where it is known from one record.
Flight period: The only record from Iran is from 28 April 1995 (Dumont & Heidari, 1996) but it is probably on the wing during most of the year.
Habitat: Standing waters.

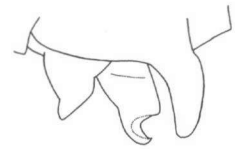
Trithemis festiva

Distribution: Common along the coastal areas of the south but is almost absent in the Adana Delta and the province of Hatay. One of the

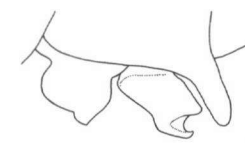
22. Trithemis, Pantala, Zygonyx



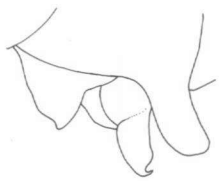
22.1 *T. annulata* (♂)



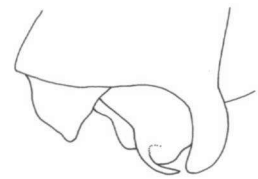
22.2 *T. arteriosa* (♂)



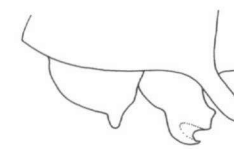
22.3 *T. festiva* (♂)



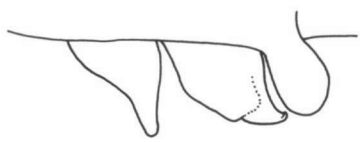
22.4 *T. kirbyi* (♂)



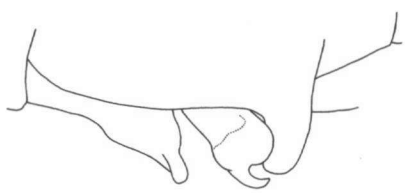
22.5 *T. aurora* (♂



22.6 *T. pallidinervis* (♂)



22.7 *P. flavescens* (♂)



22.8 *Z. torridus* (♂)

most widespread oriental species, reaching as far west as Turkey and the Levant.
Flight period: End of April to end of September.
Habitat: Brooks and small rivers.

Trithemis kirbyi

Distribution: Not expected to occur in Turkey. Widely distributed from Africa through the Arabian Peninsula to India. There are six records from southeast Iran where it is apparently not uncommon (SCHMIDT, 1954; DUMONT & HEIDARI, 1996).
Flight period: Iranian records range from 16 March to 16 May but it is probably on the wing during most of the year.
Habitat: Standing or slowly-flowing waters.

Trithemis palidinervis

Distribution: Not expected to occur in Turkey. Widely distributed in the Oriental region. This widespread oriental species occurs in Oman and is therefore likely to be present in southeast Iran (WATERSTON & PITTAWAY, 1991).
Flight period: Probably to be expected during most of the year.
Habitat: Standing waters.

Key to species of Pantala

Only one regional species present.
Secundary genitalia as in Fig. 22.7

Pantala flavescens

Distribution: on a global scale one of the most widespread species but rare in Turkey and with only a few European records. Rare in Thrace and scarce along the coastal areas of the south with only a few inland records. Turkish records might pertain largely to wanderers but has been found reproducing in the Göksu delta (ARLT, 1999)
Flight period: End of June to end of September.
Habitat: Standing waters.

Key to species of Zygonyx

Only one regional species present.
Secundary genitalia as in Fig. 22.8

Zygonyx torridus

Distribution: Known from one Turkish record: Ruins of Kaunus, NW of Fethiye on 16 May 1990 (KUNZ *et al.*, 2006). Has a wide distribution in the tropical parts of both Africa and Asia. Present in Israel and known from one record in south Iran.
Flight period: In Israel from March to October.
Habitat: Running waters, often near torrents

Acknowledgements

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Summary

Kalkman, V.J., 2006. Key to the dragonflies of Turkey, including species known from Greece, Bulgaria, Lebanon, Syria, the Trans-Caucasus and Iran. Brachytron 10(1): 3-82.

A key and checklist is provided to the species occurring Turkey, Greece, Bulgaria, Lebanon, Syria, Armenia, Georgia, Azerbaijan and Iran. Except for a few poorly known subspecies and species all taxa occurring in this region are keyed and illustrated. Notes on taxonomic problems and information on distribution, flight period and habitat of each species is given.

Keywords

Odonata, Turkey, identification, key to species, species list, checklist, Greece, Bulgaria, Lebanon, Syria, Trans-Caucasus, Iran, distribution, phenology
Libellen, Turkije, identificatie, determinatiesleutel, soortenlijst, Griekenland, Bulgarije, Libanon, Syrie, trans-Kaukasus, Iran, verspreiding, fenologie