

PATTERNS IN THE DISTRIBUTION OF AFROTROPICAL CHRYSOPIDAE

HÖLZEL, H.* and P. OHM†

*Eppersdorf 1, A-9371 Brückl, Austria; E-mail: herbert.hoelzel@aon.at
Westring 337, D-24118 Kiel, Germany

Africa south of the Sahara has a comparatively rich fauna of Chrysopidae. Approximately 180 species in 26 genera have so far been recorded from the Afrotropical Region. The distribution of animals and plants on the continent is defined by the extensive area of lowland rainforest that covers West and Central Africa along the equator. This practically forms a barrier that divides the continent into two different savannah areas. Other important biomes are the isolated montane forests of East and Southeast Africa and three large arid areas: The Sudanese, the Somali and the Southwest arid zones include several important centres for insect distribution. About 100 species of the family occur in South and East Africa of which more than 40 have only been found in South Africa; 37 species and subspecies are probably endemic to the Madagascan subregion. The chrysopid fauna of the arid and semiarid parts of West Africa is rather poor, while the probably rich fauna of the West African rainforest and the West African savannahs is scarcely known.

Key words: Chrysopidae, Afrotropical Region, distribution, biogeography

INTRODUCTION

The Afrotropical region (sub-Saharan Africa, southwestern Arabia, Madagascar, Comoro, Mascarene Islands and Seychelles) has a comparatively rich fauna of Chrysopidae. Approximately 180 species in 26 genera have been recorded from the region. This number includes some synonyms but present research indicates that they will be offset by discovery of new species. The actual figure is probably about 250 species in 30 genera. This compares very well with the faunas of other regions, *e.g.* the Australian Region with 60 recorded species in 16 genera (NEW 1996), America North of Mexico with 80 species in 15 genera (PENNY *et al.* 1997) or the West Palaearctic fauna where recent research enumerated 140 species and subspecies in 16 genera (ASPÖCK *et al.* 2001).

The distribution of animals and plants on the African continent is influenced by the extensive area of lowland rainforest that covers West and Central Africa along the equator. This is essentially a barrier that divides the continent into two different savannah areas (ILLIES 1971). The only effective way for dispersal is through a small corridor in East Africa, between the large lakes and the high East African mountains and which eventually terminates in the Ethiopian highlands. It is therefore not surprising that the largest number of recorded Chrysopidae is in the

eastern half of the continent. The best investigated part of the continent is doubtless southern Africa in the region south of the Cunene and Zambezi rivers. In his revision of the Chrysopidae of this region BO TJEDER (1966) described and redescribed 77 species. This number has subsequently increased to about 90.

MATERIAL

The basic information for the compilation of species in Table 1 originates from the following papers: VAN DER WEELE (1909*a, b*), ESBEN-PETERSEN (1927), KIMMINS (1939, 1959), FRASER (1951, 1952, 1955, 1957), TJEDER (1966, 1976), BARNARD and BROOKS (1984), BROOKS (1984), SÉMÉRIA and QUILICI (1986), HÖLZEL (1987, 1989, 1990*a, b*, 1991, 1992, 1993, 1998), HÖLZEL and DUELLI (1990, 1994), HÖLZEL & OHM (1982, 1990, 1991*a, b*, 1992, 1995), OHM and HÖLZEL (1982, 1992, 1995, 1997, 1998), HÖLZEL *et al.* (1991), HÖLZEL and MONSERRAT (1992), HÖLZEL *et al.* (1994, 1997), HÖLZEL *et al.* (1999), MANSELL (2000). Besides the published records, material collected by the authors in the last 15 years in Africa has been included in this study. Moreover most important data from the collection of African Chrysopidae in the National Collection of Insects, Pretoria, have been used. For these we wish to express our thanks to Dr. M. W. MANSELL, Pretoria.

CHRYSOPIDAE OF THE AFROTROPICAL REGION

Hundred eighty species and 6 subspecies are listed as occurring in the Afrotropical Region. They can be arranged into 10 groups on the basis of their current distribution in Africa. Owing to the scarcity of some species their assignment to one of the groups is presently tentative (Table 1).

West African lowland rainforest

The lowland rainforest has not been extensively explored. Up to now, 18 species have been recorded only from this region. A few have been collected once and never again in almost 100 years. On the other hand the rainforest has been colonised by several widespread species such as *Ceratochrysa antica*, *Chrysoperla congrua*, *Dichochrysa sjoestedti*, *Mallada desjardinsi*. The recorded distribution of *Glenochrysa conradina* is illustrated in Figure 1.

Table 1. Chrysopidae of the Afrotropical Region*

Fam. Chrysopidae	1	2	3	4	5	6	7	8	9	10
Subfam. Nothochrysinæ										
<i>Kimochrysa africana</i> (KIMMINS, 1937)							o			
<i>K. impar</i> TJEDER, 1966							o			
<i>K. raphidioides</i> TJEDER, 1966							o			
<i>Pamochrysa stellata</i> TJEDER, 1966							o			
Subfam. Apochrysinæ										
<i>Apochrysa leptalea</i> (RAMBUR, 1842)							o			
<i>A. wagneri</i> HÖLZEL, 1996		o								
<i>Anapochrysa voeltzkowi</i> (WEELE, 1909)									o	
Subfam. Chrysopinæ										
Tribe Ankylopterygini										
<i>Ankylopteryx alluaudi</i> NAVÁS, 1910								o		
<i>A. buettikoferi</i> VAN DER WEELE, 1905	o									
<i>A. collarti</i> NAVÁS, 1925	o									
<i>A. fastuosa</i> NAVÁS, 1929	o									
<i>A. modesta</i> HÖLZEL et OHM, 1991				o						
<i>A. nepheloptera</i> NAVÁS, 1912	o									
<i>A. overlaeti</i> NAVÁS, 1936	o									
<i>A. pallidula</i> TJEDER, 1966							o			
<i>A. pusilla</i> TJEDER, 1966							o			
<i>A. splendidissima</i> GERSTÄCKER, 1884	o									
<i>A. tanana</i> FRASER, 1952								o		
<i>A. venusta</i> (HAGEN, 1853)							o			
Genus <i>Parankylopteryx</i> TJEDER, 1966										
<i>P. maculata</i> (KIMMINS, 1939)		o								
<i>P. multipunctata</i> (FRASER, 1951)								o		
<i>P. polysticta</i> (NAVÁS, 1910)							o			
<i>P. speciosa</i> (NAVÁS, 1924)		o								
<i>P. tenuis</i> HÖLZEL, STELZL et OHM, 1991	o									
<i>P. waterloti</i> (NAVÁS, 1911)	o									
Tribe Belonopterygini										
Genus <i>Chrysacanthia</i> LACROIX, 1923										
<i>C. varicella</i> (FRASER, 1951)								o		
Genus <i>Chrysaloyisia</i> NAVÁS, 1927										
<i>C. somalica</i> NAVÁS, 1927				o						
Genus <i>Dysochrysa</i> TJEDER, 1966										
<i>D. furcata</i> TJEDER, 1966									o	
Genus <i>Italochrysa</i> PRINCIPI, 1946										
<i>I. amplipennis</i> TJEDER, 1966							o			
<i>I. asirensis</i> HÖLZEL, 1980				o						
<i>I. bimaculata</i> HÖLZEL, 1980					o					
<i>I. boueti</i> (NAVÁS, 1927)								o		
<i>I. burgeoni</i> (NAVÁS, 1924)										o
<i>I. exilis</i> TJEDER, 1966							o			
<i>I. falcata</i> TJEDER, 1966							o			

Table 1 (continued)

Fam. Chrysopidae	1	2	3	4	5	6	7	8	9	10
<i>I. fulvicornis</i> KIMMINS, 1955							o			
<i>I. gigantea</i> (MCLACHLAN, 1867)							o			
<i>I. guerini</i> (NAVÁS, 1911)										o
<i>I. impar</i> (NAVÁS, 1912)							o			
<i>I. limbata</i> (NAVÁS, 1924)								o		
<i>I. lobini</i> HÖLZEL et OHM, 1982					o					
<i>I. lyrata</i> TJEDER, 1966							o			
<i>I. madagassa</i> HÖLZEL et OHM, 1995								o		
<i>I. mozambica</i> (WALKER, 1860)							o			
<i>I. neurodes</i> (RAMBUR, 1842)						o				
<i>I. nossibensis</i> (NAVÁS, 1928)								o		
<i>I. okavangoensis</i> TJEDER, 1966						o				
<i>I. peringueyi</i> (ESBEN-PETERSEN, 1920)							o			
<i>I. pittawayi</i> HÖLZEL, 1988					o					
<i>I. rufostigma</i> (MCLACHLAN, 1867)							o			
<i>I. sectoria</i> (NAVÁS, 1925)	o									
<i>I. serrata</i> TJEDER, 1966						o				
<i>I. similis</i> TJEDER, 1966									o	
<i>I. stigmalis</i> (NAVÁS, 1928)										o
<i>I. temerata</i> (NAVÁS, 1914)	o									
<i>I. turneri</i> (KIMMINS, 1948)						o				
<i>I. variegata</i> (BURMEISTER, 1839)							o			
<i>I. zulu</i> TJEDER, 1966							o			
Genus <i>Nesochrysa</i> NAVÁS, 1910										
<i>N. grandidieri</i> NAVÁS, 1910								o		
<i>N. illota</i> (TJEDER, 1966)							o			
<i>N. macrostigma</i> (GERSTÄCKER, 1894)	o									
<i>N. marginata</i> (NAVÁS, 1912)								o		
<i>N. marginicollis</i> (KIMMINS, 1957)							o			
<i>N. rubeola</i> (TJEDER, 1966)							o			
<i>N. ruficeps</i> (TJEDER, 1966)							o			
<i>N. virgata</i> (TJEDER, 1966)							o			
Genus <i>Oyochrysa</i> BROOKS, 1985										
<i>O. ancora</i> BROOKS, 1985			o							
<i>O. sanguinea</i> BROOKS, 1985			o							
<i>O. spadix</i> BROOKS, 1985			o							
Genus <i>Turnerochrysa</i> KIMMINS, 1935										
<i>T. mirifica</i> KIMMINS, 1935						o				
Tribe Chrysopini										
Genus <i>Apertochrysa</i> TJEDER, 1966										
<i>A. eurydera</i> (NAVÁS, 1910)									o	
<i>A. umbrosa</i> (NAVÁS, 1914)									o	
Genus <i>Borniochrysa</i> BROOKS et BARNARD, 1990										
<i>B. squamosa</i> (TJEDER, 1966)									o	

Table 1 (continued)

Fam. Chrysopidae	1	2	3	4	5	6	7	8	9	10
Genus <i>Brinckochrysa</i> TJEDER, 1966										
<i>B. alfierii</i> (NAVÁS, 1926)					o					
<i>B. antennalis</i> (NAVÁS, 1914)										o
<i>B. beninensis</i> HÖLZEL et DUELLI, 1994	o									
<i>B. chlorosoma</i> (NAVÁS, 1915)									o	
<i>B. lauta</i> (ESBEN-PETERSEN, 1927)							o			
<i>B. notabilis</i> (HÖLZEL et OHM, 1991)				o						
<i>B. plagata</i> (NAVÁS, 1929)					o					
<i>B. pulchella</i> HÖLZEL, 1989							o			
<i>B. stenoptera</i> (NAVÁS, 1910)									o	
<i>B. tjederi</i> HÖLZEL, 1989							o			
<i>B. turkanensis</i> (NAVÁS, 1936)									o	
Genus <i>Ceratochrysa</i> TJEDER, 1966										
<i>C. antica</i> (WALKER, 1853)									o	
<i>C. ceratina</i> (NAVÁS, 1910)							o			
<i>C. disparilis</i> (NAVÁS, 1934)								o		
Genus <i>Chrysemosa</i> BROOKS et BARNARD, 1990										
<i>C. commixta</i> (TJEDER, 1966)							o			
<i>C. jeanneli</i> (NAVÁS, 1915)									o	
<i>C. mosconica</i> (NAVÁS, 1931)				o						
<i>C. parva</i> (TJEDER, 1966)						o				
<i>C. piresi</i> (HÖLZEL et OHM, 1982)					o					
<i>C. senegalensis</i> HÖLZEL, OHM et STELZL, 1994				o						
<i>C. stigmata</i> (NAVÁS, 1936)										o
<i>C. umbralis</i> (NAVÁS, 1933)								o		
Genus <i>Chrysocerca</i> VAN DER WEELE, 1909										
<i>C. nigrivultuosa</i> (KIMMINS, 1955)									o	
Genus <i>Chrysoperla</i> STEINMANN, 1964										
<i>C. brevicollis</i> (RAMBUR, 1842)								o		
<i>C. carnea</i> (STEPHENS, 1836) s. l.					o					
<i>C. comans</i> (TJEDER, 1966)							o			
<i>C. congrua</i> (WALKER, 1853)									o	
<i>C. decaryana</i> (NAVÁS, 1934)								o		
<i>C. exul</i> (MCLACHLAN, 1869)										o
<i>C. insulata</i> (FRASER, 1957)								o		
<i>C. nyerina</i> (NAVÁS, 1933)							o			
<i>C. plicata</i> (TJEDER, 1966)									o	
<i>C. pudica</i> (NAVÁS, 1913)									o	
<i>C. volcanicola</i> HÖLZEL, OHM et DUELLI, 1999							o			
<i>C. zastrowi</i> (ESBEN-PETERSEN, 1928)						o				
Genus <i>Crassochrysa</i> HÖLZEL, 1990										
<i>C. aculeata</i> (TJEDER, 1966)							o			
<i>C. proxima</i> HÖLZEL, 1990							o			
<i>C. somalica</i> HÖLZEL et OHM, 1991				o						

Table 1 (continued)

Fam. Chrysopidae	1	2	3	4	5	6	7	8	9	10
Genus <i>Cunctochrysa</i> HÖLZEL, 1970										
<i>C. kannemeyeri</i> (ESBEN-PETERSEN, 1920)							o			
Genus <i>Dichochrysa</i> YANG, 1991										
<i>D. alliumolens</i> HÖLZEL, OHM et STELZL, 1997						o				
<i>D. amseli</i> (HÖLZEL, 1980)					o					
<i>D. arabica</i> HÖLZEL, 1995					o					
<i>D. atroparsa</i> (TJEDER, 1966)							o			
<i>D. basuto</i> (TJEDER, 1966)							o			
<i>D. bibens</i> HÖLZEL, OHM et STELZL, 1997						o				
<i>D. birungana</i> (NAVÁS, 1924)										o
<i>D. caffer</i> (TJEDER, 1966)							o			
<i>D. chlorella</i> (NAVÁS, 1915)										o
<i>D. chloris</i> (SCHNEIDER, 1851)							o			
<i>D. collartina</i> (NAVÁS, 1932)	o									
<i>D. congolana</i> (NAVÁS, 1911)	o									
<i>D. decaryna</i> (NAVÁS, 1924)								o		
<i>D. decolor</i> (NAVÁS, 1913)	o									
<i>D. duplicata duplicata</i> (NAVÁS, 1934)								o		
<i>D. d. mascarenica</i> HÖLZEL et OHM, 2000								o		
<i>D. d. polyneura</i> (NAVÁS, 1940)								o		
<i>D. gunvorae</i> (TJEDER, 1966)							o			
<i>D. hamata</i> (TJEDER, 1966)							o			
<i>D. handschini</i> (NAVÁS, 1929)							o			
<i>D. incongrua</i> (FRASER, 1951)								o		
<i>D. incrassata</i> (TJEDER, 1966)							o			
<i>D. ingae</i> (TJEDER, 1966)							o			
<i>D. iniqua</i> (NAVÁS, 1931)										o
<i>D. inopinata</i> HÖLZEL et OHM, 1995								o		
<i>D. karoensis</i> (HÖLZEL 1993)						o				
<i>D. kibonotoensis</i> (VAN DER WEELE, 1910)							o			
<i>D. luaboensis</i> (TJEDER, 1966)									o	
<i>D. marchionissa</i> (NAVÁS, 1915)										o
<i>D. mauriciana</i> (HÖLZEL et OHM, 1991)								o		
<i>D. militaris</i> HÖLZEL et OHM, 2000								o		
<i>D. namibensis</i> (HÖLZEL, 1993)						o				
<i>D. nicolaina</i> (NAVÁS, 1929)									o	
<i>D. nigra</i> (MCLACHLAN, 1869)					o					
<i>D. nyassalandica</i> (NAVÁS, 1914)							o			
<i>D. oralis</i> (NAVÁS, 1914)										o
<i>D. perpallida</i> (TJEDER, 1966)							o			
<i>D. pervenosa</i> (TJEDER, 1966)							o			
<i>D. pulchrina</i> (TJEDER, 1966)							o			
<i>D. raedarii</i> HÖLZEL et OHM, 2000								o		
<i>D. rothschildi</i> (NAVÁS, 1915)										o
<i>D. rubicunda</i> (HÖLZEL, 1993)						o				

Table 1 (continued)

Fam. Chrysopidae	1	2	3	4	5	6	7	8	9	10
<i>D. rubra</i> (HÖLZEL, OHM et STELZL, 1994)	o									
<i>D. sansibarica</i> (KOLBE, 1897)							o			
<i>D. setosa</i> HÖLZEL et OHM, 1995								o		
<i>D. sjoestedti</i> (VAN DER WEELE, 1910)									o	
<i>D. spadix</i> (HÖLZEL, 1988)					o					
<i>D. spissinervis</i> (TJEDER, 1966)							o			
<i>D. tacta</i> (NAVÁS, 1921)						o				
<i>D. teiresias</i> (HÖLZEL & OHM, 1982)					o					
<i>D. varians</i> (KIMMINS, 1959)		o								
<i>D. venosella</i> (ESBEN-PETERSEN, 1920)							o			
<i>D. zulu</i> (TJEDER, 1966)							o			
Genus <i>Glenochrysa</i> ESBEN-PETERSEN 1920										
<i>G. conradina</i> (NAVÁS, 1910)	o									
<i>G. insularis insularis</i> HÖLZEL, 1991								o		
<i>G. i. grancomorensis</i> HÖLZEL et OHM, 2000								o		
<i>G. i. mayottensis</i> HÖLZEL et OHM, 2000								o		
<i>G. principissa</i> (NAVÁS, 1915)							o			
Genus <i>Mallada</i> NAVÁS, 1925										
<i>M. desjardinsi</i> (NAVÁS, 1911)									o	
<i>M. meloui</i> (NAVÁS, 1924)	o									
Genus <i>Plesiochrysa</i> ADAMS, 1982										
<i>P. litorosa</i> (NAVÁS, 1911)								o		
<i>P. scotti</i> (ESBEN-PETERSEN, 1927)								o		

* 1 = West African rainforest; 2 = East African montane forests; 3 = West African savannah; 4 = Somali arid; 5 = Sudanese arid; 6 = Southwestern-arid; 7 = East and Southeast Africa; 8 = Madagascan subregion; 9 = Pan African species; 10 = distribution unknown.

East African montane forests

The insect fauna of the montane evergreen forests of East and Southeast Africa is poorly known. In addition to the four listed species of Chrysopidae, descriptions of three further species are in press.

West African savannah

The fauna of the West African savannah is virtually unknown. The four listed species have only been recorded once in Nigeria and in Senegal.

Somali arid zone

There is a poorly known arid-adapted fauna in the horn of Africa. So far, 18 species are known, six of which seem to be endemics; one of them, *Chrysaloyisia somalica*, belongs to an endemic genus. The recorded distribution of *Chrysemosa mosconica* is shown in Fig. 2, as an example.

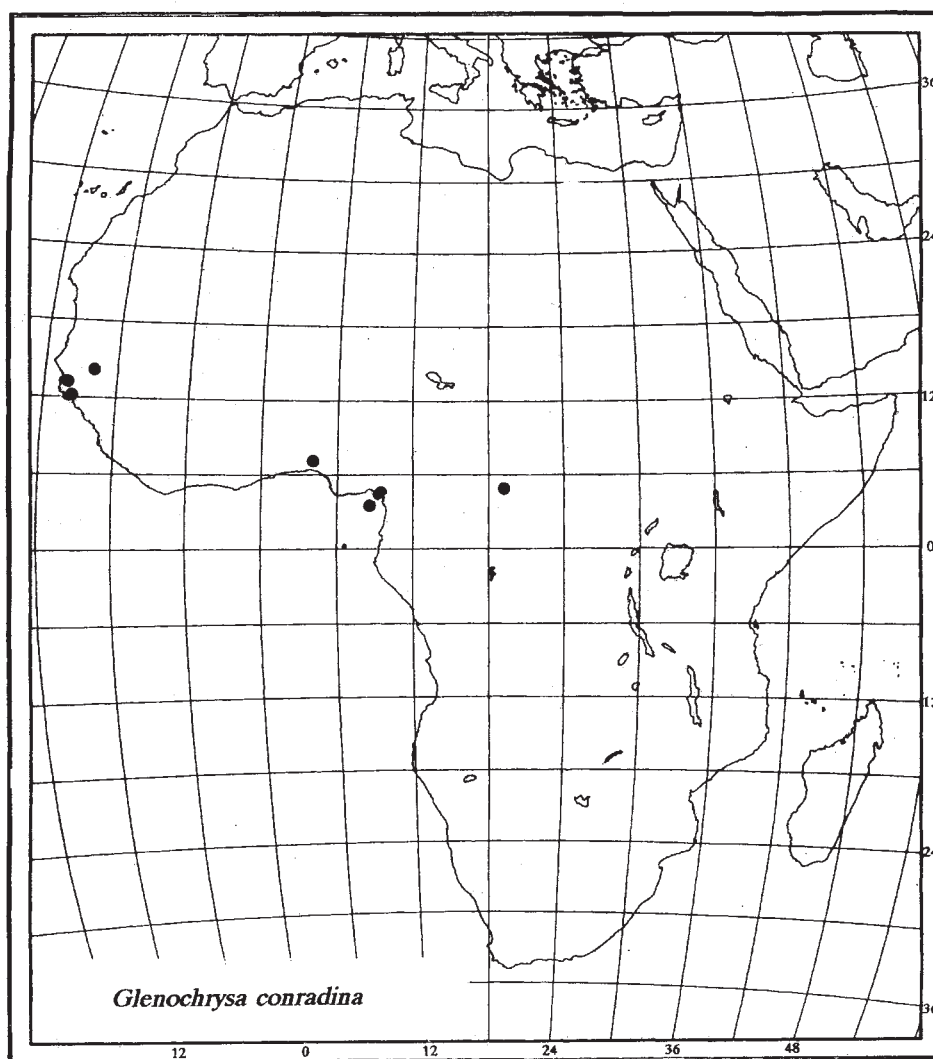


Fig. 1. Recorded distribution of *Glenochrysa conradina*

Sudanese arid zone

The 12 species known from this region manifest three distributional trends. A western faunal component with three species, *Dichochrysa nigra*, *D. teiresias*, endemic to the Cape Verde Islands and *Chrysemosa piresi* occurring on the Cape Verdes and in northwestern Senegal. An eastern faunal component with five spe-

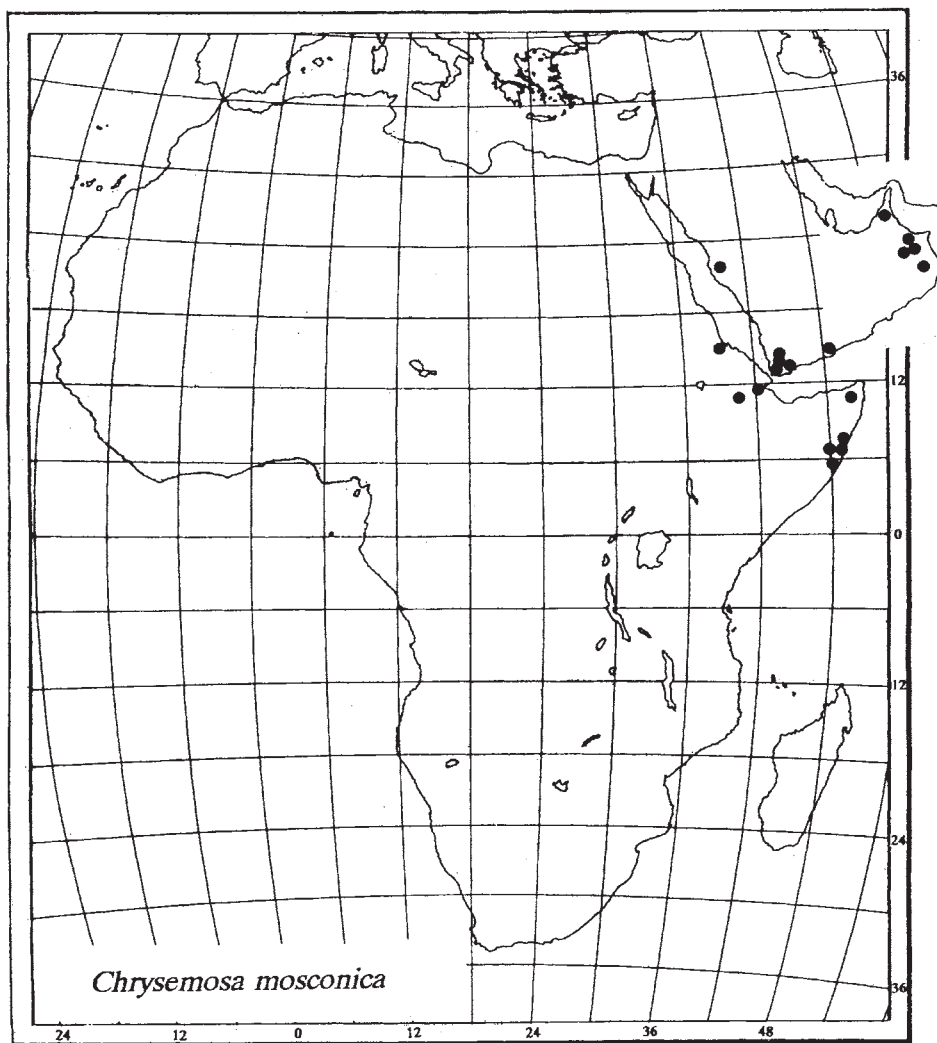


Fig. 2. Recorded distribution of *Chrysemosa mosconica*

cies: *Italochrysa pittawayi* and *Dichochrysa arabica* endemic to the SW Arabian peninsula, *D. amseli*, *D. spadix* and *Brinckochrysa alferii* in SW Arabia and Sudan. More widespread faunal elements represent the other four species: *Italochrysa bimaculata* from NW Senegal, Tunisia and Yemen, *Brinckochrysa plagata* (Fig. 3) from the Cape Verde Islands, Sudan and the southern Arabian peninsula, *Italochrysa lobini* from the Cape Verde Islands, Nigeria and the Hoggar mountains in Algeria and *Chrysoperla carnea* s. l. (a taxon of this group, which can be well

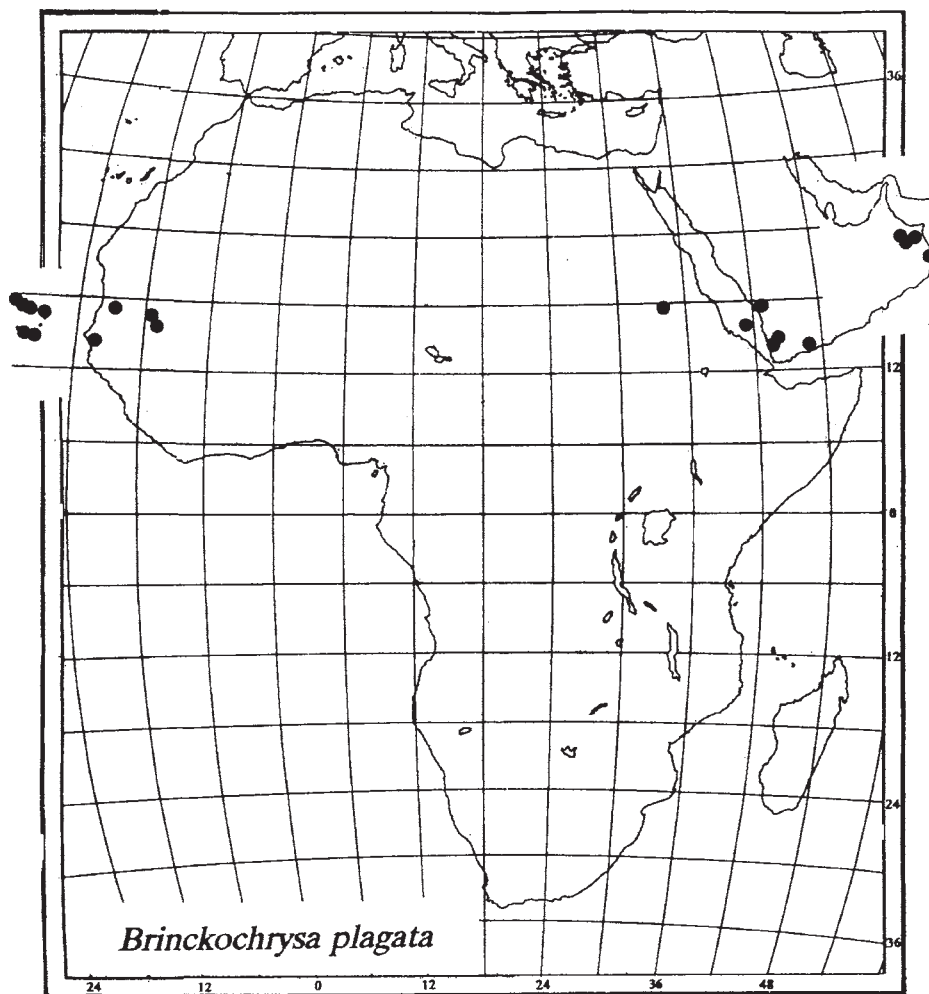


Fig. 3. Recorded distribution of *Brinckochrysa plagata*

differentiated morphologically) from the Cape Verde Islands, Senegal, Ethiopia, Sudan and the southern Arabian peninsula.

Southwestern African arid zone

This area includes the best investigated parts of the continent. Of 29 species found in this region no less than 16 are probably endemics. Five species occur also in southeast Africa and the other eight are wide spread over the continent.

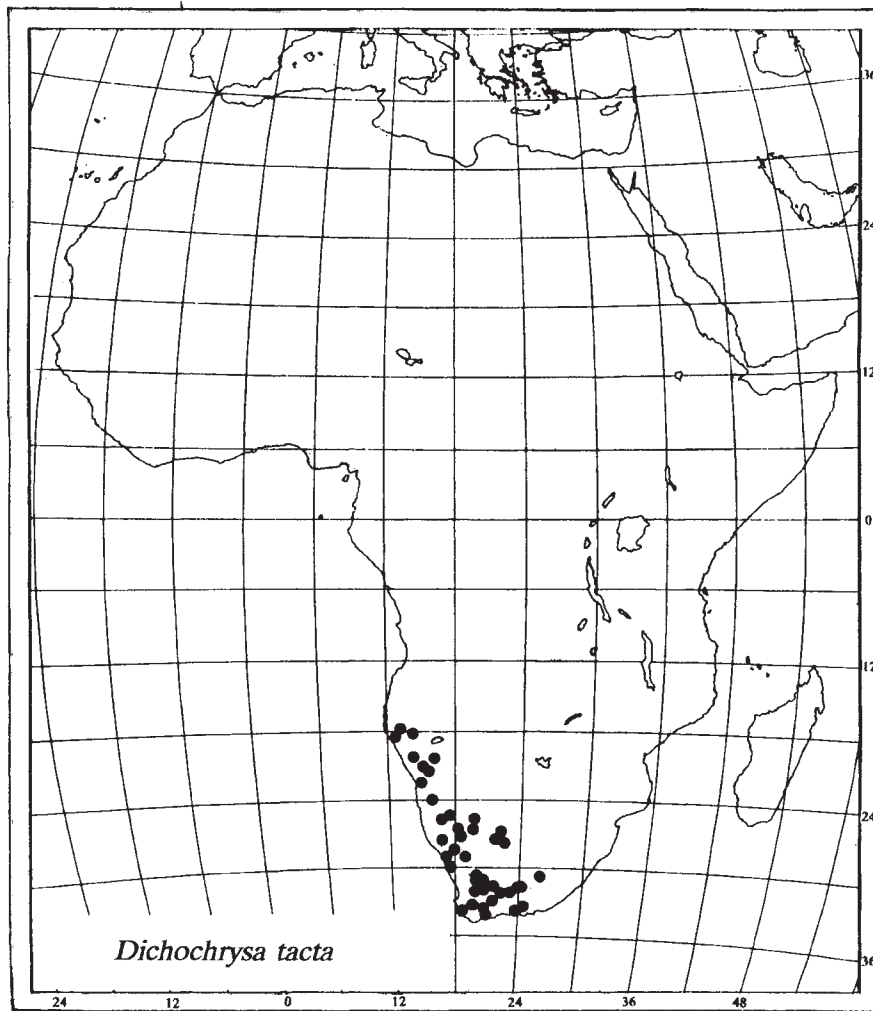


Fig. 4. Recorded distribution of *Dichochrysa tacta*

The 16 apparently endemic species manifest several distributional trends. The distribution of *Italochrysa neurodes*, *Dichochrysa karoensis*, *D. rubicunda* and two undescribed species is limited to the Karoo in the Cape Province. *Chryse-mosa parva* has, so far, only been found in a small area in the Kalahari, *Dichochrysa namibensis* in the Namib desert at Gobabeb and *Dichochrysa* sp. on the Brandberg massif. *Dichochrysa alliumolens*, *D. bibens*, *Italochrysa serrata*, *I. okavangoensis* and *Turnerochrysa mirifica* are known from single records in Na-

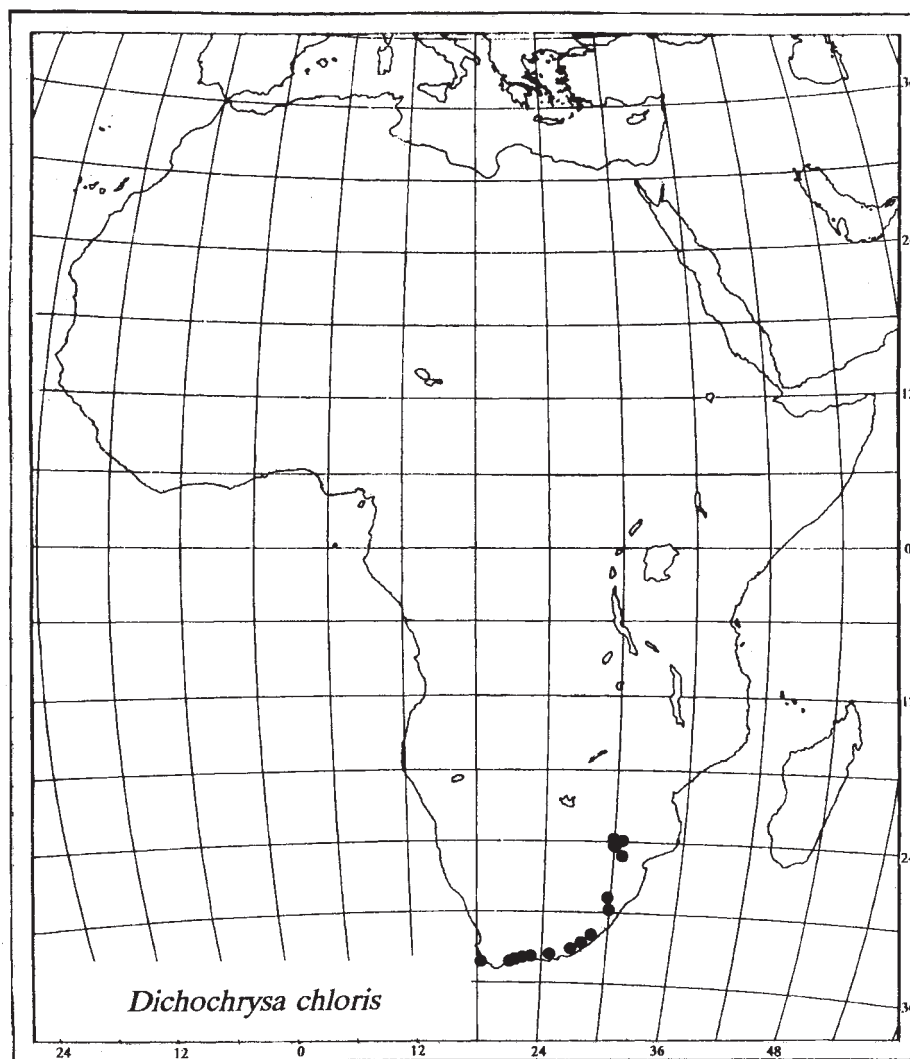


Fig. 5. Recorded distribution of *Dichochrysa chloris*

mibia, only *Dichochrysa tacta* (Fig. 4), *Chrysoperla zastrowi* and *Italochrysa turneri* represent more widespread faunal elements.

East and southeast Africa

The 56 species recorded from this region manifest at least three distributional patterns. Northern faunal component: a few East African species have not been

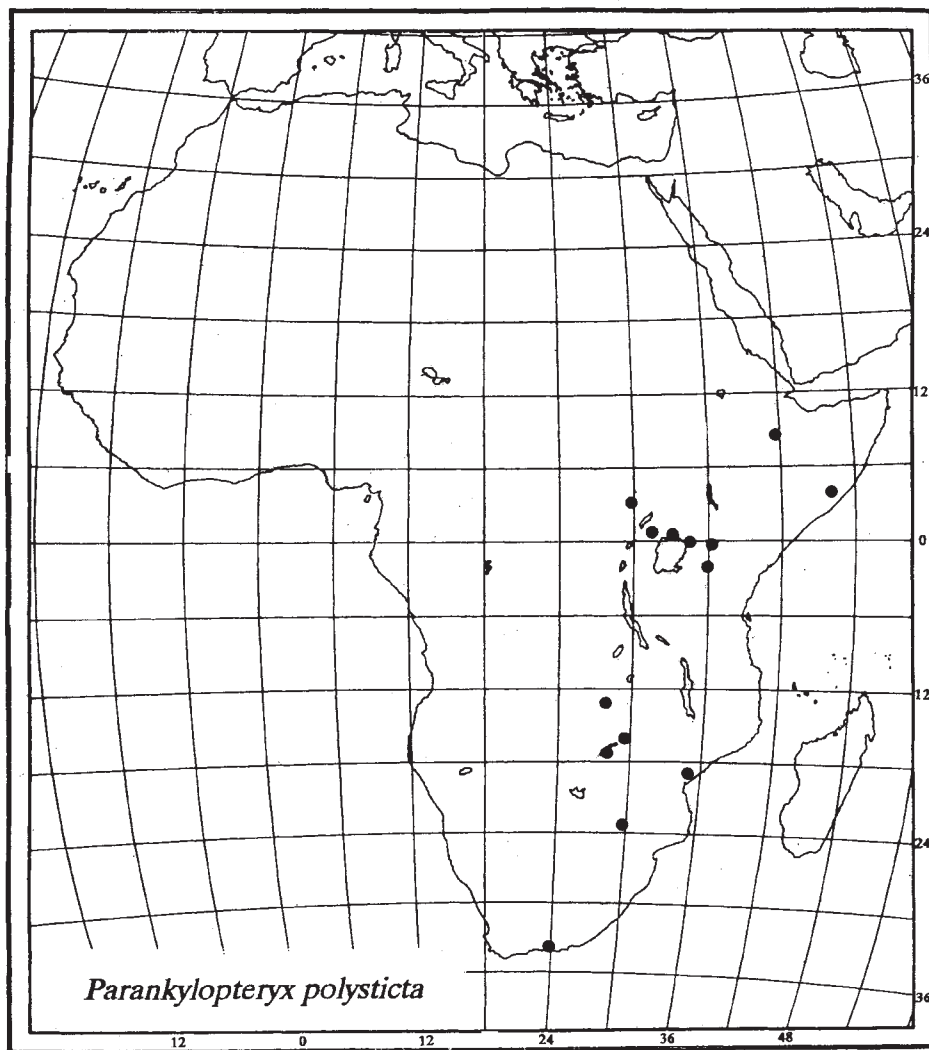


Fig. 6. Recorded distribution of *Parankylopteryx polysticta*

found south of the Zambezi river. *Nesochrysa marginicollis* occurs in Tanzania, while *Chrysoperla nyerina* occurs only in Kenya, *Dichochrysa sansibarica* is only known from the island of Zanzibar and *Chrysoperla volcanicola*, described from Ethiopia, extends to the Comoro islands (Grande Comoro).

Eastern faunal component: 47 species occur in the eastern parts of southern Africa and do not extend into the Southwestern African arid zone: *Kimochrysa*

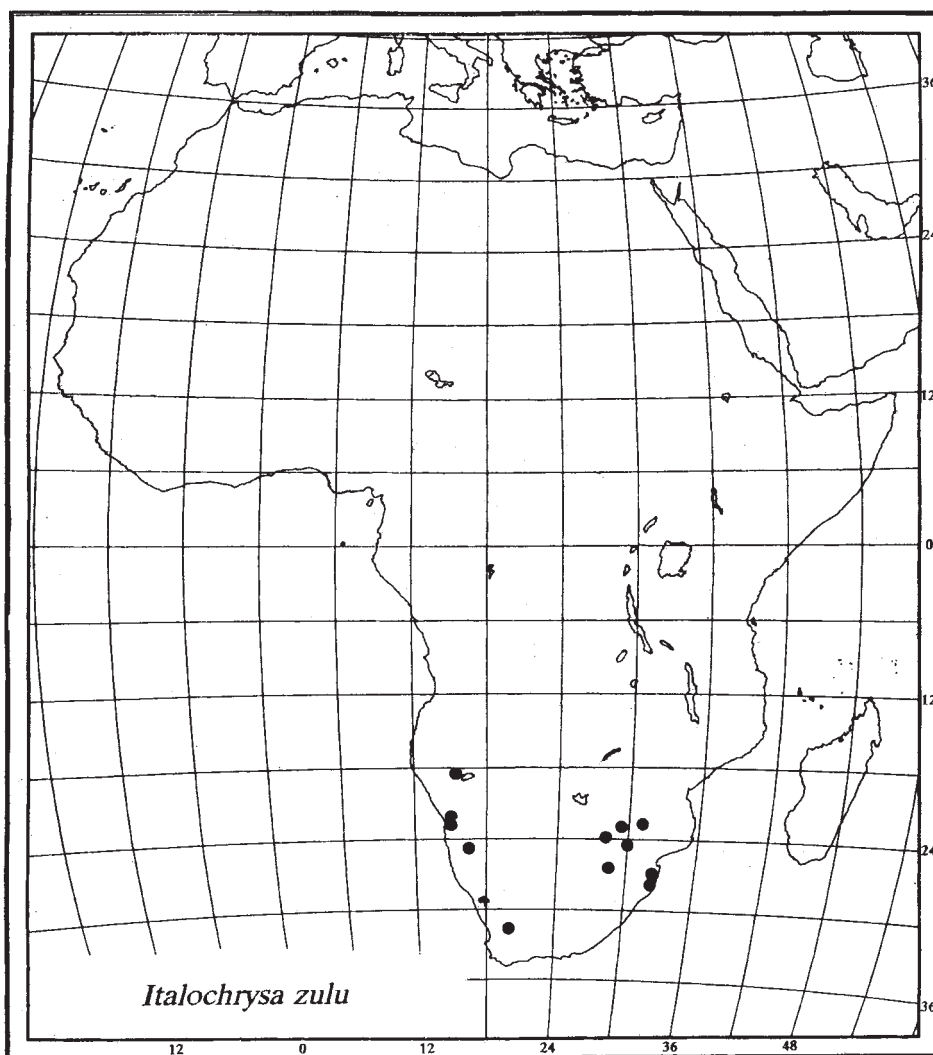


Fig. 7. Recorded distribution of *Italo-chrysa zulu*

africana, *K. impar*, *K. raphidioides*, *Pamochrysa stellata*, *Apochrysa leptalea*, *Ankylopteryx pusilla*, *Italochrysa amplipennis*, *I. exilis*, *I. falcata*, *I. fulvicornis*, *I. gigantea*, *I. lyrata*, *I. mozambica*, *I. rufostigma*, *Nesochrysa illota*, *N. rubeola*, *N. ruficeps*, *N. virgata*, *Ceratochrysa ceratina*, *Crassochrysa aculeata*, *C. proxima*, *Cunctochrysa kannemeyeri*, *Dichochrysa atroparsa*, *D. basuto*, *D. caffer*, *D. chloris* (Fig. 5), *D. gunvorae*, *D. incrassata*, *D. ingae*, *D. perpallida*, *D. pervenosa*,

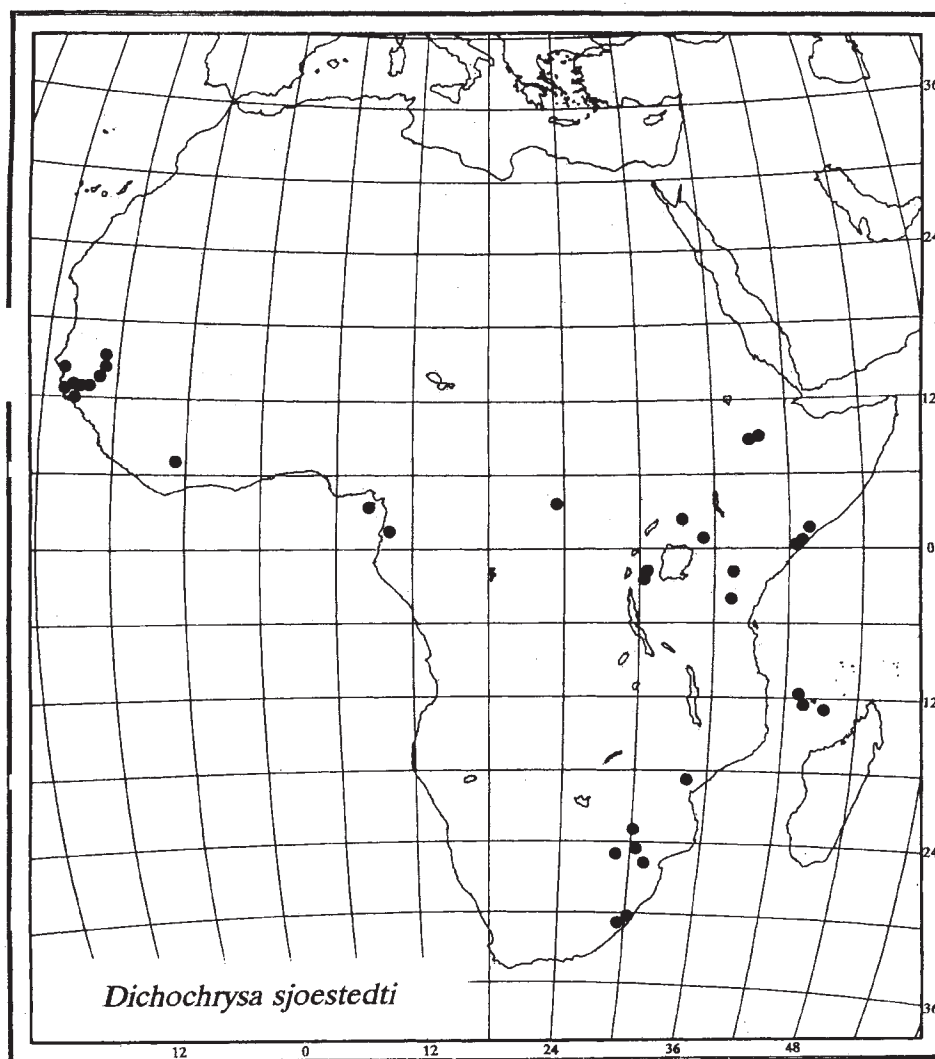


Fig. 8. Recorded distribution of *Dichochrysa sjoestedti*

D. pulchrina, *D. spissinervis*, *D. venosella* and *D. zulu*. Some extend to the islands of the Madagascan subregion or to the north, in some cases up to Ethiopia. These include *Ankylopteryx pallidula*, *A. venusta*, *Parankylopteryx polysticta* (Fig. 6), *Italochrysa peringueyi*, *I. variegata*, *Brinckochrysa lauta*, *Chrysoperla comans*, *D. kibonotoensis*, *D. hamata*, *D. handschini*, *D. nyassalandica* and *Glenochrysa principissa*.

General faunal component: only a few species are widespread in southern Africa some occurring from Kwa-Zulu/Natal in the east to Namibia in the west. These include *Italochrysa impar*, *I. zulu* (Fig. 7), *Brinckochrysa pulchella* (also extends to Madagascar), *B. tjederi*, and *Chryseмоса commixta*.

Eighteen additional wide spread species were also recorded in the region.

Madagascan subregion

Thirty-one described species and subspecies are listed here. They are discussed by OHM and HÖLZEL (2002).

Wide spread in Africa and beyond

The enumerated 19 species do not fit well into the foregoing distribution patterns. They are wide spread over the whole region or at least over large parts of it. Some of them extend even further to other biogeographical regions. *Brinckochrysa chlorosoma* extends to the west up to the Cape Verde Islands, to the north over the whole Arabian peninsula into the Mediterranean to southern Europe. *Mallada desjardinsi* has also extended into the Cape Verdes, occurs in almost all countries of South and Central Africa and extends over all islands of the Madagascan subregion as far as the Bonin Islands in Micronesia. *Chrysoperla congrua* extends to St. Helen in the west, to Oman and Yemen in the north and over some islands of the Madagascan subregion to the Australian region in the east. The distribution of the other species is more or less limited to sub Saharan Africa and the Madagascan subregion.

This pattern of distribution is mainly found in families of the suborder Heme-robiiiformia with larvae living on the vegetation (partly Chrysopidae, Hemerobiidae, Coniopterygidae). They usually do not colonise the lowland rainforest, but some have been recorded from there, e.g. *Ceratochrysa antica*, *Chrysoperla congrua*, *Dichochrysa sjoestedti* (Fig. 8), *Mallada desjardinsi*.

Poorly known Afrotropical Chrysopidae

Many of the 12 species listed here were described almost 100 years ago and have not been recorded since then. In a few cases when type specimens are not available they will have to be removed from the list of Afrotropical Chrysopidae and be considered as nomina dubia

CONCLUSION

In this study a first attempt is made to arrange the known Afrotropical species of the family Chrysopidae into groups on the basis of their current distribution. The main constraint is that large parts of the continent have not been adequately investigated with respect to Chrysopidae. This concerns mainly West Africa where the fauna of the broad savannah belts north and south of the equatorial rainforest is virtually unknown. In 1966, BO TJEDER wrote in his monography of the South African fauna: "We know for the present not a single chrysopid from Angola". This has not changed. Likewise the fauna of the lowland rainforest as well as the fauna of the East African montane forests is scarcely known.

The degree of exploration is satisfactory only in southern Africa, where in the last decades many African and European entomologists have collected extensive material, which could be evaluated. Recent collections have also been made in West Africa on the Cape Verde Islands, in Senegal and in Equatorial Guinea, in East Africa in the Republic of Sudan and in Somalia. Our present knowledge about the Afrotropical elements in the fauna of the southern Arabian Peninsula is also very satisfactory (HÖLZEL 1998).

The attempt to arrange the Afrotropical species with respect to the patterns in their distribution is based on very differing numbers of records and some of the statements may prove to be only tentative.

*

Acknowledgements – We wish to thank the reviewers for their valuable comments on the manuscript and particularly for the linguistic improvement.

REFERENCES

- ASPÖCK, H., HÖLZEL, H. & ASPÖCK, U. (2001) Kommentierter Katalog der Neuropterida (Insecta: Raphidioptera, Megaloptera, Neuroptera) der Westpaläarktis. *Denisia* 2: 1–606.

- BARNARD, P. C. & BROOKS, S. J. (1984) The African lacewing genus *Ceratochrysa* (Neuroptera: Chrysopidae): a predator of the cassava mealy bug, *Phenacoccus manuhoti* (Hemiptera: Pseudococcidae). *Syst. Entomol.* **9**: 359–371.
- BROOKS, S. J. (1984) A redefinition of the *Italo-chrysinini* (Chrysopidae), with a description of a new genus from Nigeria. *Neuroptera International* **3**(2): 79–88.
- BROOKS, S. J. (1994) A taxonomic review of the common green lacewing genus *Chrysoperla* (Neuroptera: Chrysopidae). *Bull. Nat. Hist. Mus. (Entomol.)* **63**(2): 137–210.
- CHAPIN, J. P. (1923): Ecological aspects of bird distribution in tropical Africa. *Amer. Nat.* **57**: 106–125.
- ESBEN-PETERSEN, P. (1927) Neuroptera: Chrysopides of the Seychelles and adjacent islands. – *Ann. Mag. Nat. Hist.* **19**(9): 445–455.
- FRASER, F. C. (1951) A revision of the Madagascar Neuroptera with a key to their identifications and descriptions of new species. *Le Naturaliste Malgache* **3**: 15–31.
- FRASER, F. C. (1952) New additions to the fauna of Madagascar: Odonata and Neuroptera. *Mém. Inst. Sci. Madagascar, Ser. E* **1**(1): 135–143.
- FRASER, F. C. (1955) Nouvelles notes sur les Néuroptères de Madagascar. *Le Naturaliste Malgache* **7**: 127–137.
- FRASER, F. C. (1957) Odonata and Neuroptera of Réunion. *Mém. Inst. Sci. Madagascar, Ser. E*, **8**: 15–28.
- HÖLZEL, H. (1987) Descriptions of two new *Brinckochrysa* species from South Africa, with taxonomic notes on other African species of the genus (Neuropteroidea: Planipennia: Chrysopidae). *J. Ent. Soc. sth. Africa* **50**(2): 261–268.
- HÖLZEL, H. (1989) Chrysopidae (Neuroptera) der Afrotropischen Region: Genus *Chrysoperla* Steinmann. *Neuroptera International* **5**(3): 165–180.
- HÖLZEL, H. (1990a) The Chrysopidae of the Afrotropical region. Pp. 17–26. In MANSELL, M. W. & H. ASPÖCK (eds) *Advances in Neuropterology*. Proc. 3rd Int. Symp. Neuropterol. Kruger National Park, South Africa, 1989, Pretoria.
- HÖLZEL, H. (1990b) *Crassochrysa*, a new genus of Chrysopinae from South Africa (Neuroptera: Chrysopidae). *Phytophylactica* **22**: 285–288.
- HÖLZEL, H. (1991) Chrysopidae (Neuroptera) der Afrotropischen Region: Genus *Glenochrysa* Esben-Petersen. *Z. Arbgem. Öst. Ent.* **43**(3–4): 77–81.
- HÖLZEL, H. (1992) The African species of the *Ankylopterygini* (Insecta: Neuroptera: Chrysopidae). Pp. 159–165. In CANARD, M., ASPÖCK, H. & MANSELL M. W. (eds) *Current Research on Neuropterology*. Proc. Fourth Int. Symp. Neuropterol. Bagnères-de-Luchon, France, 1991. Toulouse 1992.
- HÖLZEL, H. (1993) Neue *Mallada*-Spezies aus dem südlichen Afrika (Neuroptera: Chrysopidae). *Z. ArbGem. Öst. Ent.* **45**: 69–74.
- HÖLZEL, H. (1998) Zoogeographical features of Neuroptera of the Arabian peninsula. *Acta Zool. Fennica* **209**: 129–140.
- HÖLZEL, H. & DUELLI, P. (1990) Remarks on the Chrysopidae of Madagascar (Insecta: Neuroptera). Pp. 271–275. In MANSELL, M. W. & ASPÖCK, H. (eds) *Advances in Neuropterology*. Proc. Third Int. Symp. Neuropterol. Berg en Dal, R.S.A., 1988.
- HÖLZEL, H. & DUELLI, P. (1994) *Brinckochrysa beninensis* n. sp. – eine neue Chrysopiden-Spezies aus Westafrika (Neuroptera: Chrysopidae). *Entomol. Zeitschr. (Frankfurt a. M.)* **134**(3): 54–58.
- HÖLZEL, H. & OHM, P. (1982) Drei neue Chrysopidae-Spezies von den Kapverdischen Inseln (Planipennia, Chrysopidae). *Entomofauna* **3**: 81–95.
- HÖLZEL, H. & OHM, P. (1990) Verbreitung und Phänologie kapverdischer Neuropteren (Insecta: Planipennia). *Cour. Forsch.-Inst. Senckenberg* **129**: 139–145.

- HÖLZEL, H. & OHM, P. (1991a) Beitrag zur Kenntnis der Chrysopidae von Somalia (Neuroptera: Chrysopidae). *Entomofauna* **12**(4): 49–70.
- HÖLZEL, H. & OHM, P. (1991b) Chrysopidae der Mascarene-Inseln (Neuropteroidea: Planipennia). *Entomol. Zeitschr. (Frankfurt a.M.)* **101**(18): 343–347.
- HÖLZEL, H. & OHM, P. (1992) Zoogeographical features of Madagascan Chrysopidae. Pp. 167–181. In CANARD, M., ASPÖCK, H. & MANSELL, M. W. (eds) *Current Research in Neuropterology*. Proc. Fourth Int. Symp. Neuropterol. Bagnères-de-Luchon, France, 1991. Toulouse 1992.
- HÖLZEL, H. & OHM, P. (1995) Vier neue Chrysopidae- Spezies aus der Madagassis (Neuroptera). *Z. ArbGem. öst. Ent.* **47**(3/4): 112–118.
- HÖLZEL, H., OHM, P. & DUELLI, P. (1999) Contribution to the knowledge of the Neuroptera of Ethiopia. *Entomofauna* **20**(21): 345–372.
- HÖLZEL, H., OHM, P. & STELZL, M. (1994) Chrysopidae aus Senegal und Gambia. II Belonopterygini und Chrysopini (Neuroptera). *Entomofauna* **15**(33): 377–396.
- HÖLZEL, H., OHM, P. & STELZL, M. (1997) Chrysopidae von Namibia (Neuroptera: Chrysopinae). *Mitt. Münchener Entomol. Ges.* **87**: 47–71.
- HÖLZEL, H., STELZL, M. & OHM, P. (1991) Chrysopidae (Neuroptera) aus Senegal und Gambia. I: Ankylopterygini. *Neuroptera International* **6**(2): 63–73.
- ILLIES, J. (1971) *Einführung in die Tiergeographie*. G. Fischer Verlag, Stuttgart, 91 pp.
- KIMMINS, D. E. (1939) Ephemeroptera and Neuroptera. *Ruwenzori Expedition 1934–1935* **3**: 105–115.
- KIMMINS, D. E. (1959) Ephemeroptera, Plecoptera and Neuroptera. *Ruwenzori Expedition 1952*. **2** (10): 63–67.
- OHM, P. & HÖLZEL, H. (1982) Tiergeographische und ökologische Aspekte der Neuropterenfauna der Kapverden. *Cour. Forsch.-Inst. Senckenberg* **52**: 159–165.
- OHM, P. & HÖLZEL, H. (1992) Aspects of biogeography and phenology of Chrysopidae from the Republic of Sudan (Insecta: Neuroptera). Pp. 291–301. In CANARD, M., ASPÖCK, H. & MANSELL, M. W. (eds) *Current Research on Neuropterology*. Proc. Fourth Int. Symp. Neuropterol. Bagnères-de-Luchon, France, 1991. Toulouse 1992.
- OHM, P. & HÖLZEL, H. (1995) Die Neuropteren der Seychellen. *Entomol. Nachrichtenblatt (Wien)*, *NF* **2**(2–3): 3–12.
- OHM, P. & HÖLZEL, H. (1997) Beitrag zur Kenntnis der Neuropterenfauna der Maskarenen (Neuroptera: Coniopterygidae, Hemerobiidae, Chrysopidae, Myrmeleontidae). *Entomofauna* **18**(17): 221–236.
- OHM, P. & HÖLZEL, H. (1998) A contribution to the knowledge of the neuropterous fauna of the Comoros: The Neuroptera of Mayotte. *Acta Zool. Fennica* **209**: 183–194.
- OHM, P. & HÖLZEL, H. (2002) Zoogeographical patterns in Chrysopidae of the Madagascan subregion (Insecta: Neuroptera). *Acta zool. hung.* **48**(Suppl. 2): 229–252.
- MANSELL, M. W. (2000) Neuroptera (Insecta). Pp. 163–176. In KIRK-SPRIGGS, A. H. & MARAIS, M. (eds) *Dâures–biodiversity of the Brandberg Massif, Namibia*. Cimbebasia Memoir 9, National Museum of Namibia, Windhoek.
- NEW, T. R. (1996) Neuroptera. In WELLS, A. (ed.) *Zoological Catalogue of Australia*, **28**, Neuroptera, Strepsiptera, Mecoptera, Siphonaptera. Melbourne, CSIRO Publishing, Australia.
- PENNY, N. D., ADAMS, P. H. A. & STANGE, L. A. (1997) Species catalog of the Neuroptera, Megaloptera and Raphidioptera of America north of Mexico. *Proc. Calif. Acad. Sci.* **50**: 39–114.
- SÉMÉRIA, Y. & QUILICI, S. (1986) Première contribution à l'étude des Chrysopidae (Neuroptera: Planipennia) de L'Ile de la Réunion (Ocean Indien). *Neuroptera International* **4**(2): 107–115.
- TJEDER, B. (1966) Neuroptera-Planipennia. The Lace-wings of Southern Africa. 5. Family Chrysopidae. In HANSTRÖM, B., BRINCK, P. & RUDEBEK, G. (eds) *South African Animal Life*. **12**: 228–534.

- TJEDER, B. (1976) 11. Neuroptera. *In: La Faune Terrestre de L'Ile de Sainte-Hélène. Musée Royal de l'Afrique Centrale, Annales. Serie IN-8, Sciences Zoologiques* **251**: 2–17.
- VAN DER WEELE, H. J. (1909a) 13. Neuroptera, 2. Planipennia et Panorpata. *In: Wissenschaftliche Ergebnisse der Schwedischen Zoologischen Expedition nach dem Kilimandjaro, dem Meru und den umgebenden Massai-Steppen Deutsch-Ostafrikas.* **2**: 11–22.
- VAN DER WEELE, H. J. (1909b) Les Planipennia recueillis par le Prof. Voeltzkow a Madagascar et dans les Iles environnantes. *Bull. Scient. France Belgique* **42**: 61–68.

Revised version received 3rd February, 2001, accepted 7th July, 2001, published 30th July, 2002