

ZOOGEOGRAPHICAL PATTERNS  
IN CHRYSOPIDAE OF THE MADAGASCAN SUBREGION  
(INSECTA: NEUROPTERA)

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Fifty four species and subspecies of Chrysopidae have been recorded from the Madagascan subregion. Thirty seven are probably endemic to the subregion, seventeen are more widely distributed: nine occur throughout sub-Saharan Africa, six have only been found in Eastern Africa, while two species occur throughout the continent and extend eastwards as far as the Pacific region. Two of the endemic species, *Dichochrysa duplicata* and *Glenochrysa insularis* are represented in the subregion by three subspecies each.

The origin of most of the endemic species seems to be Africa south of the Sahara. Only two *Plesiochrysa* species from the Seychelles belong to the “oceanica-group” of *Plesiochrysa*, that is not known from Africa but from the Oriental region.

In addition to the distance from the continent of Africa, Madagascar, and the varying sizes and altitudes of the islands, the varying number of known species from different islands is due to the disparate amounts of work done on them. The Seychelles, Mauritius, La Réunion, Mayotte, and Grande Comore were visited several times, Moheli and Rodriguez for a few days only, while we only know of older reports from Madagascar and Anjouan.

Key words: Chrysopidae, Madagascan region, distribution, biogeography

INTRODUCTION

The islands of the Madagascan subregion have different origins (Fig. 1). Madagascar and the rocky islands of the Seychelles are fragments of the former continent of Gondwanaland. The archipelagos of the Mascarenes as well as the Comoros are of volcanic origin, the easternmost island in each archipelago being the oldest and lowest, the westernmost the youngest and highest with active volcanoes. Furthermore, there are numerous coral reefs, partly covered with sand cays that do not rise more than a few metres above sea level. Most of them are situated north of Madagascar, with the volcanic archipelagos being part of the Republic of the Seychelles. All islands are situated within the tropics, between 3° and 26°S.

The first report on a Chrysopid from the Madagascan subregion was by BURMEISTER (1839), who described *Chrysopa variegata* from the Comoros. In 1842, RAMBUR described *Chrysopa brevicollis* from Mauritius. (*Chrysopa mauricianus* RAMBUR from Mauritius is a synonym of the Palearctic *C. pallens*, the citing being incorrect). VAN DER WEELE (1909b) described *Leucochrysa voeltzkowi* from

Mayotte and named *C. congrua* from Moheli. Between 1908 and 1940, NAVÁS described 34 species from the subregion: 19 were later synonymised. In addition, he recorded several new localities.

The first survey of the islands (ESBEN-PETERSEN 1927) listed 13 chrysopids from the Seychelles. He described *C. scotti*, *C. lauta* and four species that were later identified as synonyms. TJEDER (1966) recognised several synonyms. FRASER (1951) described four new species from Madagascar and named only seven Chrysopidae in an overview of all Neuroptera known from Madagascar at that time. In 1952 he described *Ankylopteryx tanana* from the same island, and 1957 he added

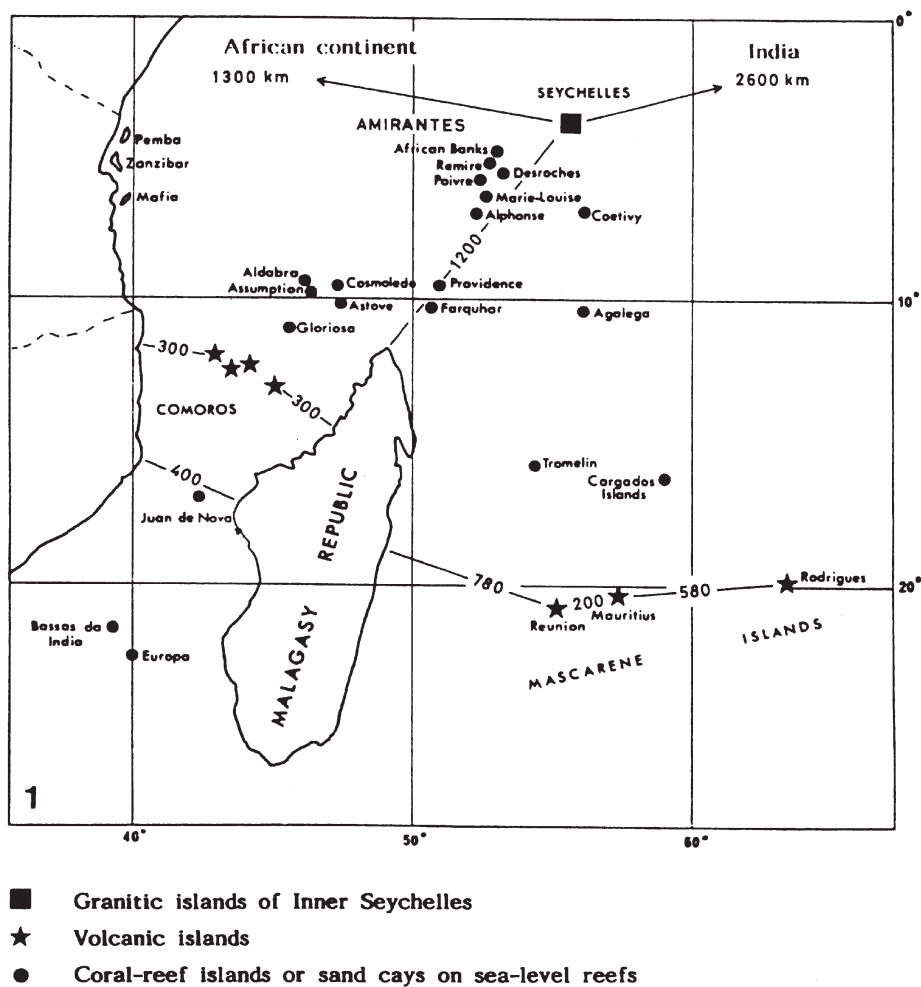


Fig. 1. The archipelagos of the Madagascan subregion (after WHITE 1983, modified and completed)

*Chrysopa insulata* from La Réunion. SÉMÉRIA and QUILICI (1986) reported collection dates of six species from the same island. HÖLZEL and DUELLI (1990) provided a general review of all 31 described nominal species from Madagascar and recorded collecting dates of nine species from the island.

In 1992, HÖLZEL and OHM published an overview of 39 chrysopid species from the whole Madagascan subregion and recognised numerous synonyms. Since then, the Seychelles, Mascarene islands La Réunion, Mauritius and Rodriguez, as well as the Comoro islands Grande Comore, Moheli and Mayotte have been visited several times by one or both authors. New species have been described and new synonyms recognised (HÖLZEL 1991, 1992, HÖLZEL & OHM 1991, 1995, 2000, OHM & HÖLZEL 1995, 1997, 1998). Only Madagascar and the Comoro island of Anjouan, where not visited, and Moheli was only investigated for a few days. These visits greatly increased our knowledge of the composition and distribution patterns of the Madagascan chrysopid fauna.

The material used in this study (partly unpublished) is deposited in the collections of H. HÖLZEL, P. OHM and CIRAD St. Pierre/La Réunion (S. QUILICI & J. F. VAYSSIERES). On a few occasions, on the islands of La Réunion, Moheli and Grande Comore, we found single females and one immature male, apparently belonging to undescribed species.

All literature pertaining to the family Chrysopidae in the Madagascan subregion is cited here. Records of localities from the African continent can be found in recent compilations that are also cited.

## CATALOGUE OF CHRYSOPIDAE OF THE MADAGASCAN SUBREGION

### Subfamily APOCHRYSINAE

*Anapochrysa voeltzkowi* (VAN DER WEELE, 1909)

*Leucochrysa voeltzkowi* VAN DER WEELE, 1909a: 67 (odescr); FRASER 1951 (distr).

*Oligochrysa voeltzkowi* (VAN DER WEELE): ESBEN-PETERSEN 1927 (comb, list).

*Anapochrysa africana* KIMMINS, 1952: 933 (odescr); TJEDER 1966 (redescr); HÖLZEL & OHM 1992 (syn).

*Anapochrysa voeltzkowi* (VAN DER WEELE): HÖLZEL & DUELLI 1990 (comb); HÖLZEL & OHM 1992 (syn, distr); OHM & HÖLZEL 1998 (distr).

Madagascar and the Comoro islands Mayotte, Moheli and Grande Comore; on the continent from the Western Cape Province northward to Kenya and Sao Thomé (TJEDER 1966, OHM & HÖLZEL 1998).

Subfamily CHRYSOPINAE  
Tribe Ankylopterygini

*Ankylopteryx alluaudi* NAVÁS, 1910

*Ankylopteryx alluaudi* NAVÁS, 1910: 50 (odescr); ESBEN-PETERSEN 1927 (list, distr).  
*Ankylopteryx alluaudi* NAVÁS: HÖLZEL & OHM 1992 (distr, list); OHM & HÖLZEL 1995 (distr).  
*Ankylopteryx delicata* NAVÁS, 1935: 62 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL 1992 (syn).  
*Leucochrysa octopunctata* FRASER, 1951: 26 (odescr); HÖLZEL & DUELLI 1990 (comb, distr);  
HÖLZEL 1992 (syn)

Found on the central Seychelles islands Mahé, Silhouette, La Digne and on Madagascar.

*Ankylopteryx pallidula* TJEDER, 1966

*Ankylopteryx pallidula* TJEDER, 1966: 501 (odescr); HÖLZEL 1992 (syn); OHM & HÖLZEL 1998 (distr).  
*Ankylopteryx pellucida* TJEDER, 1966: 502 (odescr); HÖLZEL 1992 (syn).  
*Ankylopteryx grata* TJEDER, 1966: 504 (odescr); HÖLZEL 1992 (syn).

Comoro islands Mayotte, Moheli and Grande Comore; in Eastern Africa known from Kwa Zulu Natal, Mpumulanda, Mozambique (TJEDER 1966) Tanzania and Ethiopia (HÖLZEL *et al.* 1999) (see Fig. 2).

*Ankylopteryx tanana* FRASER, 1952

*Ankylopteryx tanana* FRASER, 1952: 142 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL 1992 (list);  
HÖLZEL & OHM 1992 (distr, list).

Only known from Madagascar.

*Parankylopteryx multipunctata* (FRASER, 1951)

*Leucochrysa multipunctata* FRASER, 1951: 29 (odescr); HÖLZEL & DUELLI 1990 (list).  
*Parankylopteryx multipunctata* (FRASER): BROOKS & BARNARD 1990 (comb); HÖLZEL 1992 (list);  
HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

Tribe Belonopterygini

*Chrysacanthia varicella* (FRASER, 1951)

*Nesochrysa varicella* FRASER, 1951: 29 (odescr); HÖLZEL & DUELLI 1990 (list)  
*Glenochrysa varicella* (FRASER): FRASER 1950 (comb).  
*Chrysacanthia varicella* (FRASER): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

*Italochrysa boueti* (NAVÁS, 1927)

*Nothochrysa boueti* NAVÁS, 1927: 24 (odescr); HÖLZEL & DUELLI 1990 (list).

*Nothochrysa cruciata* NAVÁS, 1935: 63 (odescr); HÖLZEL & OHM 1992 (syn).

*Italochrysa boueti* (NAVÁS): HÖLZEL & DUELLI 1990 (comb); HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

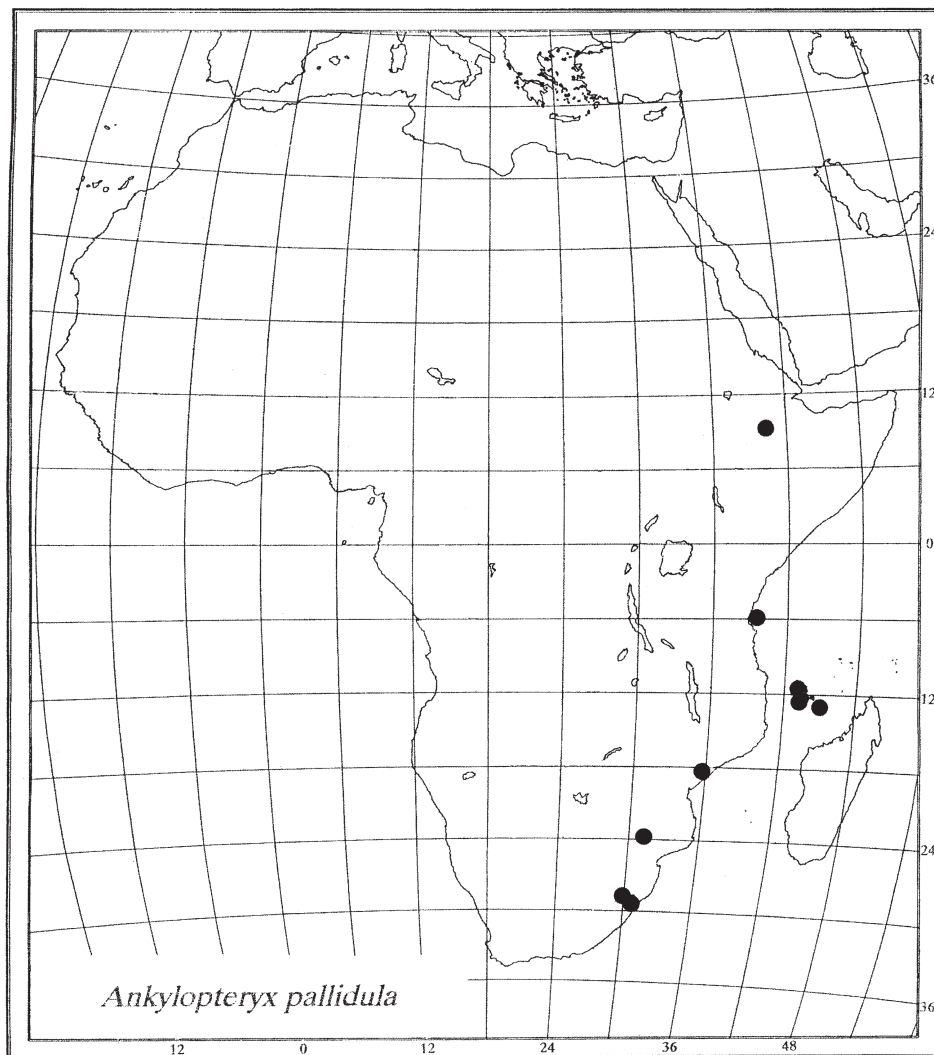


Fig. 2. Recorded distribution of *Ankylopteryx pallidula* TJEDER

*Italochrysa limbata* (NAVÁS, 1924)

*Nothochrysa limbata* NAVÁS, 1924: 113 (odescr).

*Nothochrysa cornuta* NAVÁS, 1935: 64 (odescr); HÖLZEL & DUELLI 1990 (comb); HÖLZEL & OHM 1992 (syn).

*Italochrysa limbata* (NAVÁS): HÖLZEL & DUELLI 1990 (comb); HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

*Italochrysa madagassa* HÖLZEL et OHM, 1995

*Italochrysa* sp. HÖLZEL & OHM 1992 (list).

*Italochrysa madagassa* HÖLZEL & OHM, 1995: (odescr).

Only known from Madagascar.

*Italochrysa nossibensis* (NAVÁS, 1928)

*Nothochrysa nossibensis* NAVÁS, 1928: 113 (odescr).

*Italochrysa nossibensis* (NAVÁS): HÖLZEL & DUELLI 1990 (comb); HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

*Italochrysa variegata* (BURMEISTER, 1839)

*Chrysopa variegata* BURMEISTER, 1839: 981 (odescr).

*Nothochrysa variegata* (BURMEISTER): ESBEN-PETERSEN 1927 (comb, list).

*Nothochrysa sordidata* NAVÁS, 1908: 404 (odescr); ESBEN-PETERSEN 1927 (syn); HÖLZEL & DUELLI 1990 (list).

*Italochrysa sordidata* (NAVÁS): BROOKS & BARNARD 1990 (comb).

*Italochrysa variegata* (BURMEISTER): TJEDER 1996 (redescr, comb, distr); HÖLZEL & OHM 1992 (list); OHM & HÖLZEL 1998 (distr).

Madagascar and the Comoro island Anjouan; in Eastern Africa from South Africa to Ethiopia (HÖLZEL, OHM & DUELLI 1999).

*Nesochrysa grandidieri* NAVÁS, 1910

*Nesochrysa grandidieri* NAVÁS, 1910: 53 (odescr); ESBEN-PETERSEN 1927 (list); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (list).

*Madachrysa seyrigi* NAVÁS, 1934: 62 (odescr); FRASER 1955 (fig); TJEDER 1973 (redescr, distr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

Only known from Madagascar.

*Nesochrysa marginata* (NAVÁS, 1912)

*Leucochrysa marginata* NAVÁS, 1912: 100 (odescr); ESBEN-PETERSEN 1927 (list).

*Nesochrysa marginata* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

## Tribe Chrysopini

*Apertochrysa eurydera* (NAVÁS, 1910)

*Chrysopa eurydera* NAVÁS, 1910: 43 (odescr); ESBEN-PETERSEN 1927 (list); HÖLZEL & DUELLI 1990 (list).

*Chrysopa madegassa* NAVÁS, 1921: 69 (odescr); ESBEN-PETERSEN 1927 (list); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

*Chrysopa ictericus* ESBEN-PETERSEN, 1927: 450 (odescr); HÖLZEL & OHM 1992 (syn).

*Chrysopa crassinervis* ESBEN-PETERSEN, 1927: 452 (odescr); HÖLZEL & OHM 1992 (syn).

*Apertochrysa* sp.: HÖLZEL & DUELLI 1990 (distr).

*Apertochrysa eurydera* (NAVÁS): HÖLZEL & OHM 1991b (distr), 1992 (comb, distr), ; OHM & HÖLZEL 1995 (distr), 1997 (distr), 1998 (distr).

Seychelles: central islands Mahé, Silhouette and Praslin; on coral reefs of Amirantes (D'Arros Isl.) and Aldabra (Isl. Picard). Macarene islands Rodriguez, Mauritius and La Réunion; Madagascar and the Comoro islands Mayotte, Moheli and Grande Comore. On the continent from South Africa northward to Senegal and Somalia (HÖLZEL *et al.* 1997).

*Borniochrysa squamosa* (TJEDER, 1966)

*Chrysopa (Suarius) squamosa* TJEDER, 1966: 377 (odescr).

*Suarius squamosus* (TJEDER): SÉMÉRIA & QUILICI 1986 (comb, distr); HÖLZEL & DUELLI 1990 (distr).

*Borniochrysa squamosa* (TJEDER): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1991b (distr), 1992 (list); OHM & HÖLZEL 1995 (distr), 1997 (distr), 1998 (distr).

Mascarene islands Mauritius and La Réunion; Madagascar and the Comoro islands Mayotte and Grande Comore. In the Eastern part of the continent from the Western Cape Province to Ethiopia (HÖLZEL *et al.* 1999) in Western Africa only known from Senegal (HÖLZEL *et al.* 1994); St. Helena (TJEDER 1976) (see Fig. 3).

*Brinckochrysa lauta* (ESBEN-PETERSEN, 1927)

*Chrysopa lauta* ESBEN-PETERSEN, 1927: 451 (odescr); HÖLZEL & OHM 1992 (list).

*Neda decaryella* NAVÁS, 1933a: 106 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

*Neda pictella* NAVÁS, 1933a: 107 (odescr); HÖLZEL & OHM 1992 (syn).

*Chrysopa sobria* NAVÁS, 1933b: 110 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

*Chrysopa goniophora* NAVÁS, 1935: 59 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

*Chrysopa (Brinckochrysa) michaelsoni* auct. (nec ESBEN-PETERSEN): TJEDER 1966 part., fig. 1247–1253 (distr).

*Brinckochrysa* spec.: SÉMÉRIA & QUILICI 1986 (distr).

*Brinckochrysa goniophora* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & DUELLI 1990 (distr); HÖLZEL & OHM 1992 (syn).

*Brinckochrysa decaryella* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1991b (distr), 1992 (syn).

*Brinckochrysa lauta* (ESBEN-PETERSEN): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list); OHM & HÖLZEL 1995 (syn, distr), 1997 (distr), 1998 (distr).

Central Seychelles islands Mahé and Long Island; Mascarene islands Mauritius and La Réunion; Madagascar and Mayotte. Outside the Madagascan region found only once in Kwa Zulu Natal.

*Brinckochrysa pulchella* HÖLZEL, 1987

*Brinckochrysa pulchella* HÖLZEL, 1987: 266 (odescr); HÖLZEL & OHM 1992 (distr).

Madagascar; on the continent in South Africa (HÖLZEL 1987) and Namibia (HÖLZEL *et al.* 1997).

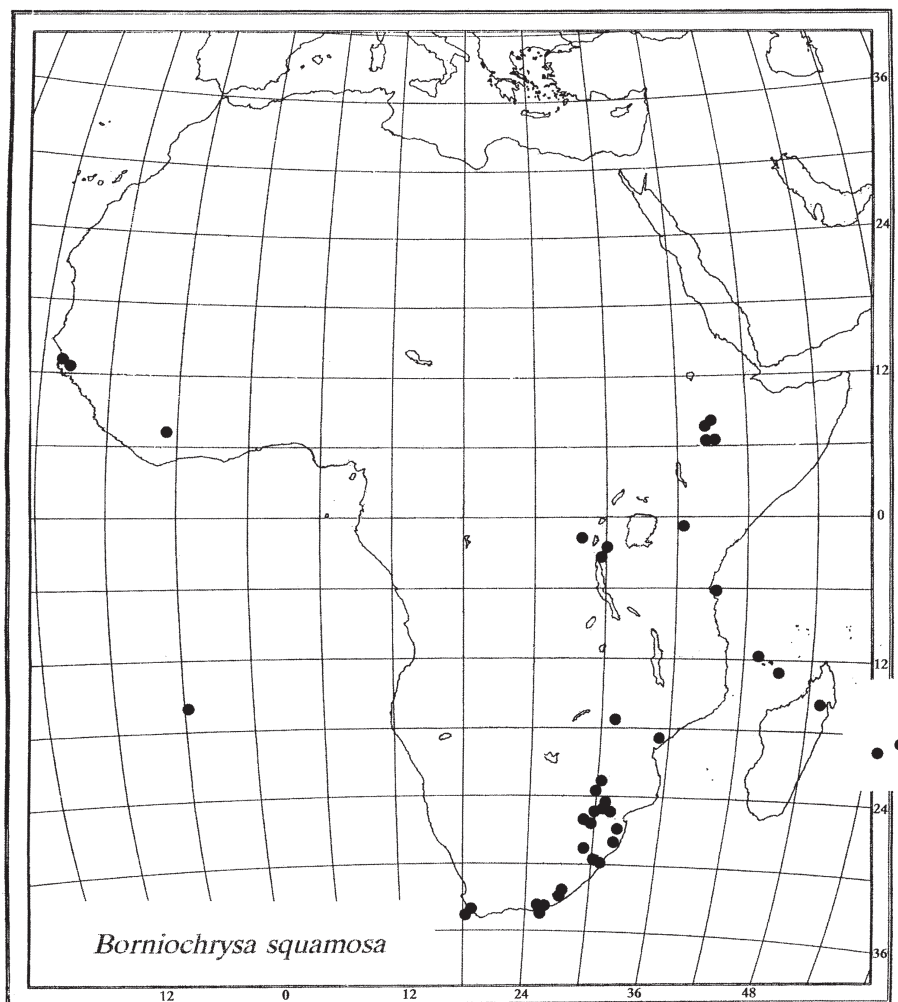


Fig. 3. Recorded distribution of *Borniochrysa squamosa* (TJEDER)



*Brinckochrysa stenoptera* (NAVÁS, 1910)

*Chrysopa stenoptera* NAVÁS, 1910: 46 (odescr).

*Chrysopa (Brinckochrysa) stenoptera* (NAVÁS): TJEDER 1966 (redescr., comb, distr).

*Brinckochrysa stenoptera* (NAVÁS): HÖLZEL 1987 (comb, syn, distr); HÖLZEL & OHM 1992 (distr).

Madagascar; on the continent known from Western Cape Province to Northern Province, Zimbabwe, Mocambique and Somalia, in Namibia, Nigeria, Gambia and Senegal (TJEDER 1966, HÖLZEL 1987, HÖLZEL & OHM 1991a, HÖLZEL, OHM & STELZL 1994).

*Ceratochrysa antica* (WALKER, 1853)

*Chrysopa antica* WALKER, 1853: 270 (odescr).

*Chrysopa nesaea* NAVÁS, 1911: 268 (odescr); ESBEN-PETERSEN 1927 (list); BARNARD & BROOKS 1984 (syn).

*Chrysopa inaequalis* NAVÁS, 1912: 103 (odescr); ESBEN-PETERSEN 1927 (syn); BARNARD & BROOKS 1984 (syn).

*Ceratochrysa antica* (WALKER) BARNARD & BROOKS 1984 (redescr, thorough syn, distr); HÖLZEL & DUELI 1990 (distr); HÖLZEL & OHM 1991b (distr), 1992 (list); OHM & HÖLZEL 1997 (distr), 1998 (distr).

Mascarene islands Mauritius and La Réunion, on Madagascar and the Comoro islands Mayotte, Moheli and Grande Comore. In Eastern Africa from Northern Province, South Africa to Uganda, in Western Africa from Namibia to Senegal (BARNARD & BROOKS 1984, HÖLZEL, OHM & STELZL 1994, 1997).

*Ceratochrysa disparilis* (NAVÁS, 1934)

*Cintameva disparilis* NAVÁS, 1934: 61 (odescr).

*Ceratochrysa disparilis* (NAVÁS): BARNARD & BROOKS 1984 (redescr, comb, distr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (list).

Only found on Madagascar.

*Chrysemosa umbralis* (NAVÁS, 1933)

*Chrysopa umbralis* NAVÁS, 1933a: 211 (odescr).

*Suarius umbralis* (NAVÁS): HÖLZEL & DUELLI 1990 (comb, distr).

*Chrysemosa umbralis* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1991b (distr), 1992 (list); OHM & HÖLZEL 1997 (distr), 1998 (distr).

Known from the Mascarene islands Mauritius and La Réunion; from Madagascar and the Comoro islands Mayotte, Moheli and Grande Comore (see Fig. 4).

*Chrysoperla brevicollis* (RAMBUR, 1842)

*Chrysopa brevicollis* RAMBUR, 1842: 427 (odescr).

*Chrysoperla brevicollis* (RAMBUR): HÖLZEL & OHM 1991b (distr), 1992 (list); OHM & HÖLZEL 1997 (tax, distr), 1998 (distr).

*Chrysoperla pudica* auct.(nec NAVÁS): BROOKS 1994 (tax).

Only known from the Mascarene islands Mauritius and La Réunion.

*Chrysoperla congrua* (WALKER, 1853)

*Chrysopa congrua* WALKER, 1853: 238 (odescr); VAN DER WEELE 1909b (distr); FRASER 1951 (distr). *Chrysopa acutella* NAVÁS, 1933b: 209 (odescr); HÖLZEL 1989 (syn); HÖLZEL & DUELLI 1990 (list).

*Chrysoperla congrua* (WALKER): SÉMÉRIA & QUILICI 1986 (distr); HÖLZEL & OHM 1992 (list); OHM & HÖLZEL 1997 (distr), 1998 (distr).

In the subregion found on La Réunion, Madagascar, Anjouan and Moheli. On the continent spread from the Western Cape Province to Principe Islands and Sierra Leone, in Eastern Africa northward to the Republic of Sudan (HÖLZEL & OHM 1991a), in Arabia in Oman and Yemen (HÖLZEL 1995) and on islands in the Pacific Ocean (BROOKS 1994).

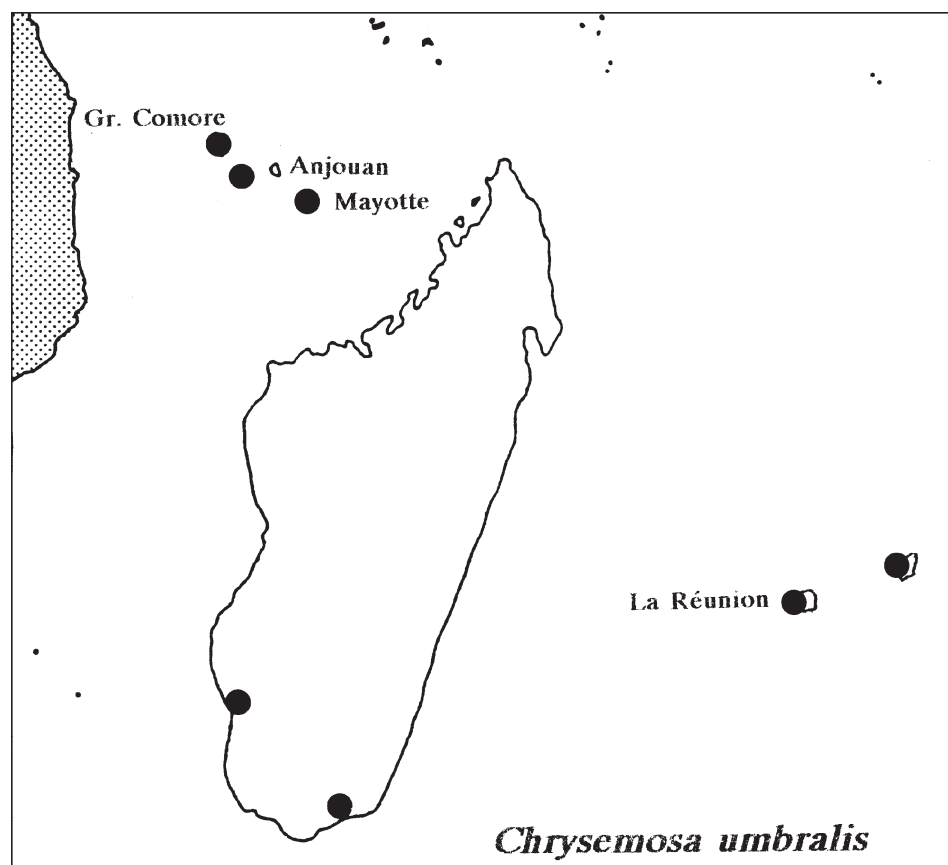


Fig. 4. The recorded distribution of *Chrysemosa umbralis* (NAVÁS)

*Chrysoperla decaryana* (NAVÁS, 1934)

*Chrysopa decaryana* NAVÁS, 1934: 60 (odescr); HÖLZEL & DUELLI 1990 (list).

*Chrysoperla decaryana* (NAVÁS): HÖLZEL 1989 (redescrip, comb); HÖLZEL & OHM 1992 (list); BROOKS 1994 (tax).

Known only from Madagascar.

*Chrysoperla insulata* (FRASER, 1957)

*Chrysopa insulata* FRASER, 1957: 26 (odescrip).

*Chrysoperla insulata* (FRASER): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1991b (distr), 1992 (list); BROOKS 1994 (tax); OHM & HÖLZEL 1997 (distr).

Known only from La Réunion.

*Chrysoperla volcanicola* HÖLZEL, OHM et DUELLI, 1999

*Chrysoperla volcanicola* HÖLZEL, OHM et DUELLI 1999: 355 (odescrip).

Grande Comore; on the continent known from Ethiopia.

*Dichochrysa decaryana* (NAVÁS, 1924) – **comb. n.**

*Chrysopa decaryana* NAVÁS, 1924: 267 (odescrip)

*Mallada decaryana* (Navas): HÖLZEL & DUELLI 1990 (distr).

*Mallada decarynus* (NAVÁS): HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

*Dichochrysa duplicata duplicata* (NAVÁS, 1934)

*Chrysopa duplicata* NAVÁS, 1934: 57 (odescrip); HÖLZEL & DUELLI 1990 (list) .

*Chrysopa diploa* NAVÁS, 1935: 60 (odescrip); HÖLZEL & OHM 1992 (syn).

*Mallada diploa*: HÖLZEL & DUELLI 1990 (comb, distr).

*Mallada duplicata* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1991 (distr); 1992 (list).

*Dichochrysa duplicata duplicata* (NAVÁS): HÖLZEL & OHM 2000 (tax, distr).

The subspecies is known only from Madagascar (see Fig. 5).

*Dichochrysa duplicata mascarenica* HÖLZEL et OHM, 2000

*Mallada duplicata* (NAVÁS): HÖLZEL & OHM 1991b (distr).

*Dichochrysa duplicata* (NAVÁS): OHM & HÖLZEL 1997 (comb, distr).

*Dichochrysa duplicata mascarenica* HÖLZEL & OHM, 2000 (stat., odescrip).

The subspecies is known from the Mascarene Islands La Réunion and Mauritius (see Fig. 5)

*Dichochrysa duplicata polyneura* (NAVÁS, 1940)

*Cintameva polyneura* NAVÁS, 1940: 100 (odescrip).

*Mallada polyneurus* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list).

*Dichochrysa duplicata* NAVÁS: OHM & HÖLZEL 1998 (distr).

*Dichochrysa duplicata polyneura* (NAVÁS): HÖLZEL & OHM 2000 (stat, redescr).

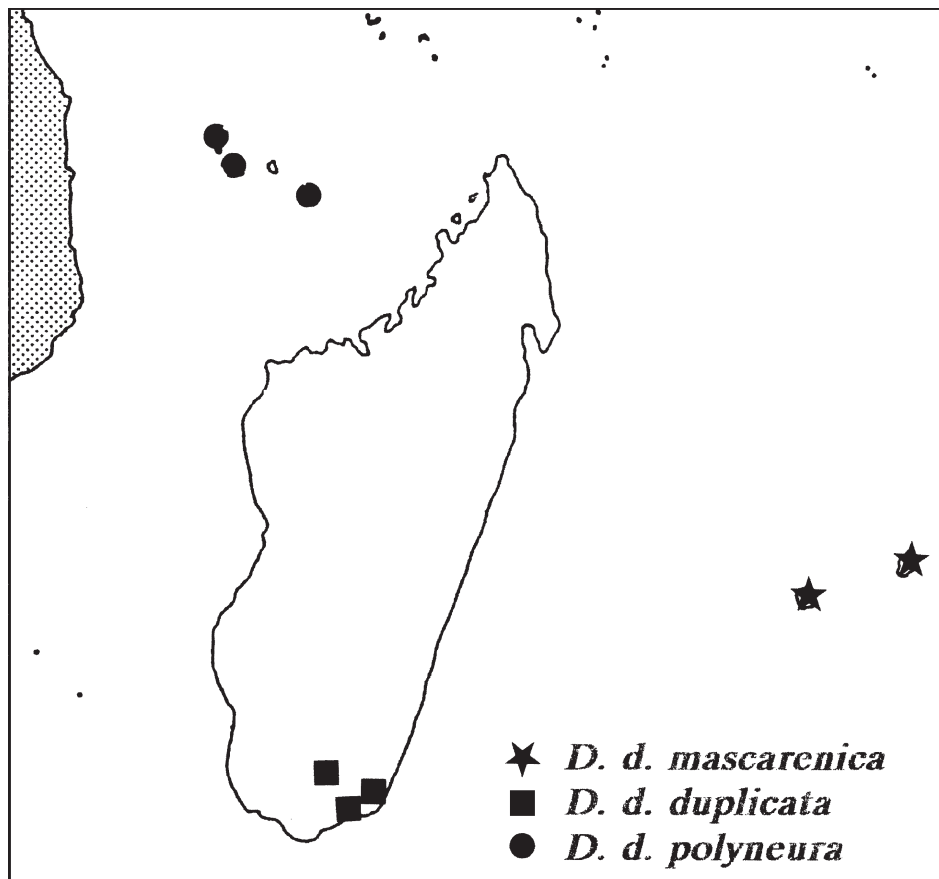
The subspecies is known from the Comoro Islands Mayotte, Moheli and Grande Comore (see Fig. 5).

*Dichochrysa hamata* (TJEDER, 1966) – **comb. n.**

*Chrysopa* (*Anisochrysa*) *hamata* TJEDER, 1966: 434 (odescr).

*Mallada hamatus* (TJEDER): HÖLZEL & DUELLI 1990 (distr); HÖLZEL & OHM 1992 (list).

In the subregion on Madagascar, on the continent from Kwa Zulu Natal (TJEDER 1966) and Northern Province of South Africa (unpubl.).



**Fig. 5.** The subspecies of *Dichochrysa duplicata* (NAVÁS)

*Dichochrysa handschini* (NAVÁS, 1929)

- Chrysopa handschini* NAVÁS, 1929b: 444 (odescr).  
*Cintameva alluaudi* NAVÁS, 1930: 8 (odescr); HÖLZEL & OHM 1992 (syn).  
*Chrysopa (Anisochrysa) handschini* (Navas): TJEDER 1966 (redescr, distr).  
*Mallada handschini* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list).  
*Dichochrysa handschini* (NAVÁS): HÖLZEL & OHM 1997 (comb, distr).

In the subregion known from Mauritius; in Eastern Africa from the Western Cape Province to Ethiopia (HÖLZEL *et al.* 1999).

*Dichochrysa hospitalis* HÖLZEL et OHM, 1994

- Dichochrysa hospitalis* HÖLZEL & OHM, 1995 (odescr); OHM & HÖLZEL 1998 (distr).

Only known from the Comoro Islands Mayotte and Grande Comore.

*Dichochrysa incongrua* (FRASER, 1951) – **comb. n.**

- Chrysopa incongrua* FRASER, 1951: 25 (odescr); HÖLZEL & DUELLI 1990 (list).  
*Mallada incongrua* (FRASER): BROOKS & BARNARD 1990 (comb).  
*Mallada incongruus* (FRASER): HÖLZEL & OHM 1992 (list).

Only known from Madagascar.

*Dichochrysa inopinata* HÖLZEL et OHM, 1995

- Mallada hamatus* auct. (nec TJEDER): HÖLZEL & OHM 1990 (distr), 1992 (list).  
*Dichochrysa inopinata* HÖLZEL & OHM, 1995: 113 (odescr); OHM & HÖLZEL 1997 (distr).

Only known from La Réunion.

*Dichochrysa luaboensis* (TJEDER, 1966) – **comb. n.**

- Chrysopa (Anisochrysa) luaboensis* TJEDER, 1966: 457 (odescr).  
*Mallada luaboensis* (TJEDER): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (distr).

Known from Madagascar; on the continent from Mozambique (TJEDER 1966) and Equatorial Guinea (HÖLZEL & MONSERRAT 1992).

*Dichochrysa mauriciana* (HÖLZEL et OHM, 1991)

- Mallada mauricianus* HÖLZEL & OHM, 1991: 343 (odescr); HÖLZEL & OHM 1992 (list).  
*Dichochrysa mauriciana*: HÖLZEL & OHM 1997 (comb, distr).

Only known from Mauritius

*Dichochrysa militaris* HÖLZEL et OHM, 2000

- Dichochrysa militaris* HÖLZEL & OHM, 2000 (odescr).

Only known from Grande Comore.

*Dichochrysa nicolaina* (NAVÁS, 1929)

*Chrysopa nicolaina* NAVÁS, 1929a: 361 (odescr).

*Chrysopa atomalis* NAVÁS, 1933b (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

*Chrysopa bourgeonina* NAVÁS, 1936 (odescr); HÖLZEL & OHM 1991a (syn).

*Chrysopa (Anisochrysa) bourgeonina* (NAVÁS): TJEDER 1966 (redescr, distr).

*Mallada nicolaninus* (NAVÁS): HÖLZEL & DUELLI 1990 (distr); HÖLZEL & OHM 1991a (syn, distr), 1992 (distr).

*Dichochrysa nicolaina* (NAVÁS): HÖLZEL 1995 (comb, distr); OHM & HÖLZEL 1998 (distr).

In the subregion on Madagascar and Mayotte; spread over the African continent from the Western Cape Province to the Cape Verde Islands, in Eastern Africa to the Republic of Sudan, Somalia and Ethiopia (HÖLZEL *et al.* 1999), also in Southern Arabia (HÖLZEL 1995).

*Dichochrysa raedarii* HÖLZEL et OHM, 2000

*Dichochrysa raedarii* HÖLZEL & OHM, 2000 (odescr).

Known only from Grande Comore.

*Dichochrysa setosa* HÖLZEL et OHM, 1995

*Mallada* sp.: HÖLZEL & OHM 1992 (distr).

*Dichochrysa setosa* HÖLZEL & OHM, 1995: 113 (odescr).

Known only from Madagascar.

*Dichochrysa sjoestedti* (VAN DER WEELE, 1909)

*Chrysopa sjoestedti* VAN DER WEELE, 1909b: 19 (odescr).

*Chrysopa (Anisochrysa) sjoestedti* (Weele): TJEDER 1966 (redescr, syn, distr).

*Mallada sjoestedti* (Van derWeele): HÖLZEL & OHM 1991a (comb, syn, distr).

*Dichochrysa sjoestedti* (VAN DER WEELE): OHM & HÖLZEL 1998 (comb, distr).

On the Comoro islands Mayotte, Moheli and Grande Comore; on the African continent from South Africa (TJEDER 1966) to Senegal (HÖLZEL *et al.* 1994) and Ethiopia (HÖLZEL *et al.* 1999).

*Glenochrysa insularis insularis* HÖLZEL, 1991

*Glenochrysa insularis* HÖLZEL, 1991: 80 (descr); HÖLZEL & OHM 1992 (list).

*Glenochrysa insularis insularis*: HÖLZEL & OHM 2000 (redescr. ssp).

The subspecies is found only on Madagascar (see Fig. 6).

*Glenochrysa insularis mayottensis* HÖLZEL et OHM, 2000

*Glenochrysa insularis*: OHM & HÖLZEL 1998 (distr).

*Glenochrysa insularis mayottensis* HÖLZEL & OHM, 2000 (odescr ssp).

The subspecies is found only on Mayotte (see Fig. 6).

*Glenochrysa insularis grancomorensis* HÖLZEL et OHM, 2000

*Glenochrysa insularis grancomorensis* HÖLZEL & OHM, 2000 (odescr ssp).

The subspecies is found only on Grande Comore (see Fig. 6).

*Mallada desjardinsi* (NAVÁS, 1911)

*Chrysopa desjardinsi* NAVÁS, 1911: 267 (odescr); ESBEN-PETERSEN 1927 (list).

*Chrysopa boninensis* Okamoto, 1914: 62 (odescr); HÖLZEL & OHM 1992 (syn).

*Chrysopa serrandi* NAVÁS, 1921: 70 (odescr); HÖLZEL & OHM 1992 (syn).

*Chrysopa rutila* ESBEN-PETERSEN, 1927: 453 (odescr); TJEDER 1966 (syn).

*Chrysopa flavostigma* ESBEN-PETERSEN, 1927: 451 (odescr); HÖLZEL & OHM 1992 (syn).

*Chrysopa inclinata* NAVÁS, 1934: 58 (odescr); HÖLZEL & DUELLI 1990 (list); HÖLZEL & OHM 1992 (syn).

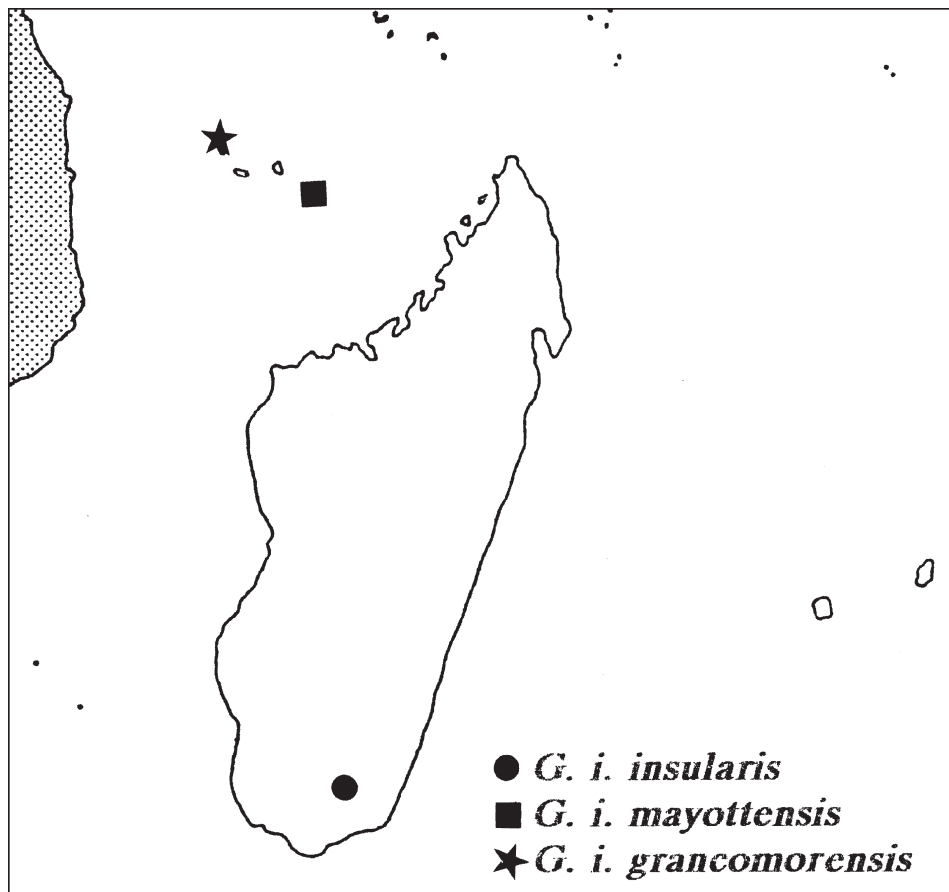


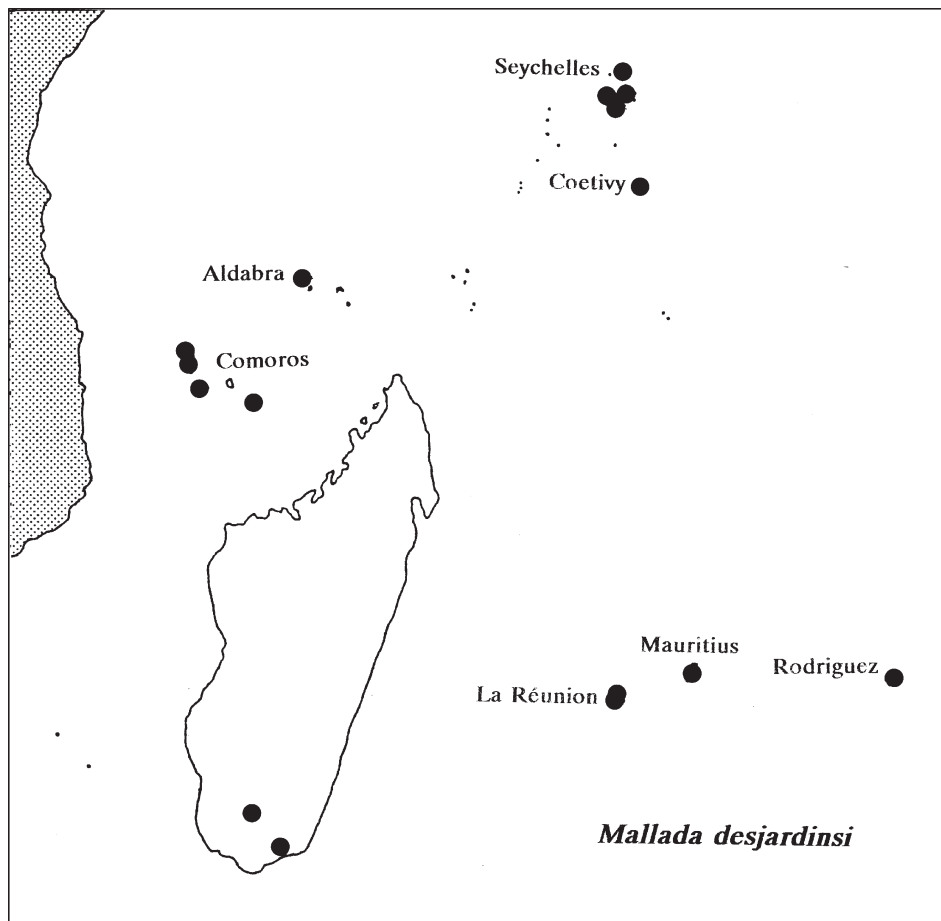
Fig. 6. The subspecies of *Glenochrysa insularis* HÖLZEL

*Chrysopa (Anisochrysa) boninensis* (Okamoto): TJEDER 1966 (redescr, syn, distr).

*Mallada boninensis* (Okamoto):; SÉMÉRIA & QUILICI 1986 (distr); BROOKS & BARNARD 1990 (comb); HÖLZEL & DUELLI 1990 (distr); HÖLZEL & OHM 1991b (distr).

*Mallada desjardinsi* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (syn); OHM & HÖLZEL 1995 (distr), 1997 (distr), 1998 (distr).

Widespread and common in the subregion. Seychelles: In the central group on Mahé, Long Isl., Silhouette, Praslin and the coral reef Dennis Isl.; on the Amirantes (Coetivy) and on Aldabra. – On the Mascarene islands Rodriguez, Mauritius and La Réunion. On Madagascar and the Comoro islands Mayotte, Moheli and Grande Comore. In the continent from the Cape to Senegal and Cape Verde islands, in Eastern Africa to Somalia and Ethiopia (HÖLZEL *et al.* 1997, HÖLZEL *et al.* 1999). Eastward to islands in the Pacific Ocean (TJEDER 1966) (see Fig. 7).



**Fig. 7.** *Mallada desjardinsi* (NAVÁS) in the Madagascan subregion



*Plesiochrysa litorosa* (NAVÁS, 1911)

*Chrysopa litorosa* NAVÁS, 1911: 6 (odescr); ESBEN-PETERSEN 1927 (redescr, syn, distr).

*Chrysopa meriani* NAVÁS, 1925 (odescr); ESBEN-PETERSEN 1927 (syn); HÖLZEL & OHM 1992 (syn).

*Plesiochrysa litorosa* (NAVÁS): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list); OHM & HÖLZEL 1995 (distr).

Known from the central Seychelles on Mahé, Long Isl., Silhouette, Praslin, Marie Anne and on the coral reef Dennis Isl.; in the Amirantes group the coral reef Poivre.

*Plesiochrysa scotti* (ESBEN-PETERSEN, 1927)

*Chrysopa scotti* ESBEN-PETERSEN, 1927: 449 (odescr).

*Plesiochrysa scotti* (ESBEN-PETERSEN): BROOKS & BARNARD 1990 (comb); HÖLZEL & OHM 1992 (list); OHM & HÖLZEL 1995 (distr).

Only known from the Seychelles islands Mahé, Praslin and La Digne.

## Species undescribed

*Chrysoperla* sp. (♀ Grande Comore).

*Dichochrysa* ? sp. 1 (♂ Grande Comore).

*Dichochrysa* ? sp. 2 (♀ Moheli).

*Dichochrysa* ? sp. 3 (♀ La Réunion).

*Dichochrysa* ? sp. 4 (♀ La Réunion).

*Dichochrysa* ? sp. 5 (♀ La Réunion).

## DISCUSSION

180 chrysopid species and subspecies are known from the entire Afrotropical region (HÖLZEL & OHM 2002). 54, i.e. 30% of them occur also or live exclusively in the Madagascan subregion. Among these 54 taxa 37 (68%) are endemics of the subregion (Table 1), so that ca 20% of the whole Afrotropical chrysopid fauna consists of endemics of the Madagascan subregion.

The fauna of the subregion is composed of different elements. The origin of the widespread species (Table 2) is exclusively the Afrotropical region, some distributed over the whole continent (e.g. *Borniochrysa squamosa*, Fig. 3); others are restricted to Eastern Africa (e.g. *Ankylopteryx pallidula*, Fig. 2). Among the endemics, only *Plesiochrysa scotti* and *P. litorosa*, from the Seychelles, belong to the *oceanica* group of the genus *Plesiochrysa*, which is spread from Pacific islands and Australia to Southern India.

**Table 1.** Distribution of Chrysopidae endemic in the Madagascan subregion (Up to now no endemic Chrysopidae were found on the islands of Anjouan and Rodriguez). GC: Grande Comore, MO: Moheli, MY: Mayotte, MA: Madagascar, RE: La Réunion, MS: Mauritius, SE: Central Seychelles

	GC	MO	MY	MA	RE	MS	SE
<i>Plesiochrysa scotti</i>	–	–	–	–	–	–	#
<i>Plesiochrysa literosa</i>	–	–	–	–	–	–	# <sup>1</sup>
<i>Ankylopteryx alluaudi</i>	–	–	–	#	–	–	#
<i>Dichochrysa mauriciana</i>	–	–	–	–	–	#	–
<i>Chrysoperla insulata</i>	–	–	–	–	#	–	–
<i>Dichochrysa inopinata</i>	–	–	–	–	#	–	–
<i>Dichochrysa</i> sp. 3	–	–	–	–	–	#	– <sup>2</sup>
<i>Dichochrysa</i> sp. 4	–	–	–	–	–	#	– <sup>2</sup>
<i>Dichochrysa</i> sp. 5	–	–	–	–	–	#	– <sup>2</sup>
<i>Chrysoperla brevicollis</i>	–	–	–	–	#	#	–
<i>Dichochrysa duplicata mascarenica</i>	–	–	–	–	#	#	–
<i>Dichochrysa duplicata duplicata</i>	–	–	–	#	–	–	–
<i>Dichochrysa duplicata polyneura</i>	#	#	#	–	–	–	–
<i>Dichochrysa</i> sp. 2	–	#	–	–	–	–	– <sup>2</sup>
<i>Dichochrysa hospitalis</i>	#	–	#	–	–	–	–
<i>Dichochrysa militaris</i>	#	–	–	–	–	–	–
<i>Dichochrysa raedarii</i>	#	–	–	–	–	–	–
<i>Dichochrysa</i> sp. 1	#	–	–	–	–	–	– <sup>2</sup>
<i>Chrysoperla</i> sp. 1	#	–	–	–	–	–	– <sup>2</sup>
<i>Glenochrysa insularis grancomorensis</i>	#	–	–	–	–	–	–
<i>Glenochrysa insularis mayottensis</i>	–	–	#	–	–	–	–
<i>Glenochrysa insularis insularis</i>	–	–	–	#	–	–	–
<i>Ankylopteryx tanana</i>	–	–	–	#	–	–	–
<i>Parankylopteryx multipunctata</i>	–	–	–	#	–	–	–
<i>Chrysacanthia varicella</i>	–	–	–	#	–	–	–
<i>Italochrysa boueti</i>	–	–	–	#	–	–	–
<i>Italochrysa limbata</i>	–	–	–	#	–	–	–
<i>Italochrysa madagassa</i>	–	–	–	#	–	–	–
<i>Italochrysa nossibensis</i>	–	–	–	#	–	–	–
<i>Nesochrysa grandidieri</i>	–	–	–	#	–	–	–
<i>Nesochrysa marginata</i>	–	–	–	#	–	–	–
<i>Ceratochrysa disparilis</i>	–	–	–	#	–	–	–
<i>Chrysoperla decaryana</i>	–	–	–	#	–	–	–

**Table 1** (continued)

	GC	MO	MY	MA	RE	MS	SE
<i>Dichochrysa decaryana</i>	–	–	–	#	–	–	–
<i>Dichochrysa incongrua</i>	–	–	–	#	–	–	–
<i>Dichochrysa setosa</i>	–	–	–	#	–	–	–
<i>Chrysemosa umbralis</i>	#	#	#	#	#	#	#

<sup>1</sup>Also on the Seychelles coral reef group Amirantes.

<sup>2</sup>The species *Chrysoperla* sp. 1 and *Dichochrysa* sp. 1, 2, 3, 4 and 5 are available only as single females respective a very immature male. So they are not described hitherto.

**Table 2.** Distribution of Madagascan Chrysopidae not endemic in the subregion. SEY: Seychelles, MAR: Mascarene Islands, MAD: Madagascar, COM: Comoros, EA: Eastern Africa, AC: Wider spread on the African continent south of Sahara, PAZ: African continent and eastward to the Pacific Region

	SEY	MAR	MAD	COM	EA	AC	PAZ
<i>Ankylopteryx pallidula</i>	–	–	–	#	#	–	–
<i>Italochrysa variegata</i>	–	–	#	#	#	–	–
<i>Chrysoperla volcanicola</i>	–	–	–	#	#	–	–
<i>Dichochrysa sjoestedti</i>	–	–	–	#	#	#	–
<i>Dichochrysa hamata</i>	–	–	#	–	#	–	–
<i>Dichochrysa luaboensis</i>	–	–	#	–	#	–	–
<i>Dichochrysa handschini</i>	–	#	–	–	#	–	–
<i>Brinckochrysa pulchella</i>	–	–	#	–	#	#	–
<i>Brinckochrysa stenoptera</i>	–	–	#	–	#	#	–
<i>Anapochrysa voeltzkowi</i>	–	–	#	#	#	#	–
<i>Dichochrysa nicolaina</i>	–	–	#	#	#	# <sup>1</sup>	–
<i>Borniochrysa squamosa</i>	–	#	#	#	#	#	–
<i>Ceratochrysa antica</i>	–	#	#	#	#	#	–
<i>Brinckochrysa lauta</i>	#	#	#	#	#	–	–
<i>Apertochrysa eurydera</i>	# <sup>2</sup>	#	#	#	#	#	–
<i>Mallada desjardinsi</i>	# <sup>2</sup>	#	#	#	#	#	#
<i>Chrysoperla congrua</i>	–	#	#	#	#	#	# <sup>1</sup>

<sup>1</sup>Also in Southern Arabia

<sup>2</sup>Also on coral reefs of Amirantes and Albarda

*The chrysopid fauna of the different archipelagos (Fig. 8)*

Only 6 chrysopid species are found in the Seychelles. The two endemic *Plesiochrysa* species, *A. alluaudi* (restricted to the subregion), *Brinckochrysa lauta* (also living in Eastern Africa), and the widespread species *Apertochrysa eurydera* and *Mallada desjardinsi*. The endemic species occur at all altitudes and the two widespread species are found only in lower sites near the coast and on some of the atolls.

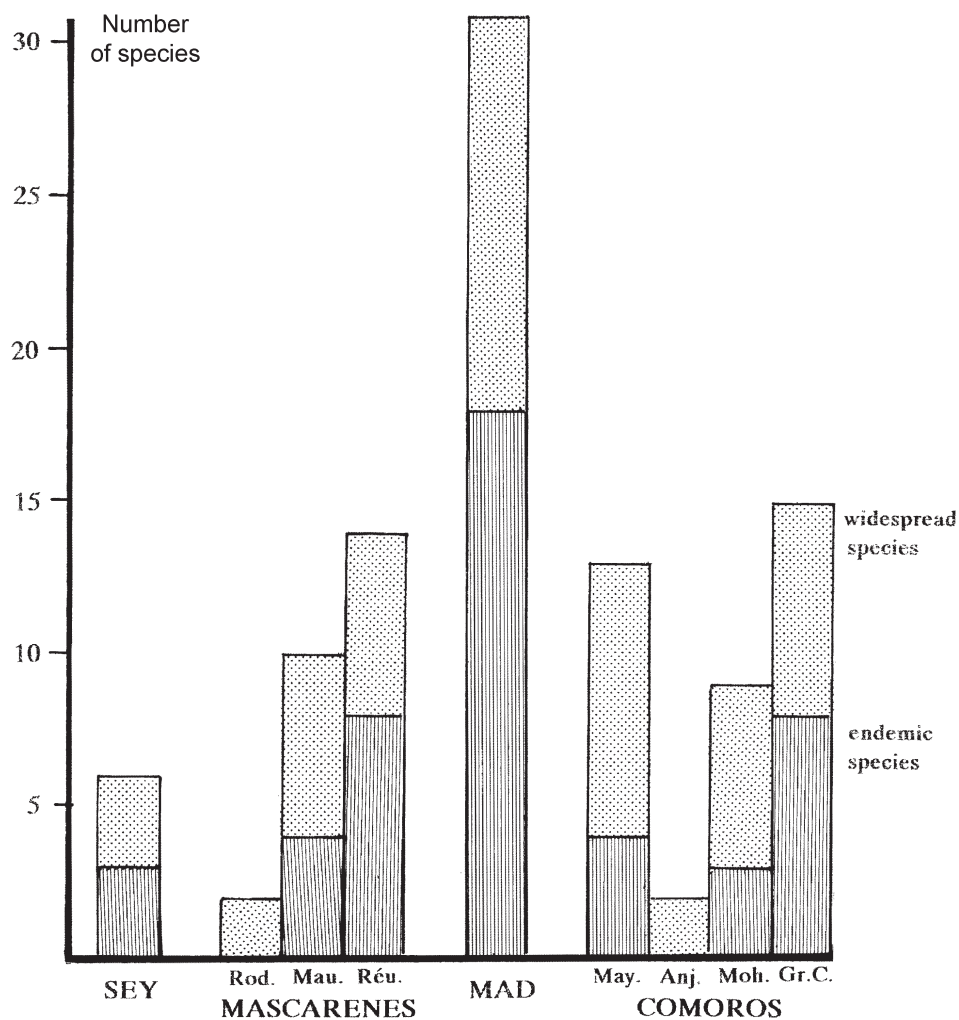


Fig. 8. The chrysopid fauna in the different archipelagos

In the Mascarene archipelago the small Eastern island of Rodriguez was visited in an unfavourable season and is poorly known. Only the two widespread species which occur also on some atolls were found.

Mauritius reaches an altitude of 828 metres, in higher parts bearing some remnants of indigenous forests. The lower parts are intensively cultivated. The island harbours 6 widespread species and 4 endemics, among them *Dichochrysa mauriciana* that is exclusive to this island. *Chrysoperla brevicollis* and *Dichochrysa duplicata mascarenica* are shared with La Réunion, *Chryseмоса umbralis* with all Madagascan archipelagos except the Seychelles (Fig. 4).

La Réunion, the highest island of the archipelago, reaches 2632 metres. Higher parts and the moist southeastern slopes bear a partly distorted indigenous forest. In higher sites extensive heather formations are found. Besides the 2 endemics shared with Mauritius, one shared with all archipelagos except the Seychelles, the island harbours the endemic *Chrysoperla insulata*, *Dichochrysa inopinata* and 3 undescribed, probably endemic species, all living mainly in higher or moist sites. The 6 species also living on the continent were found mainly in lower, cultivated aereas.

Madagascar is by far the richest and most diverse of all islands of the subregion. It harbours 31 chrysopids, including 18 endemic and 13 widespread species. Among 33 endemics of the whole subregion 16 are only known from this island.

The high percentage of Belonopterygini (with 45 species occurring in the entire Afrotropical region) in the fauna of this island is remarkable. Seven species of this tribe whose larvae probably live in the nests of ants or termites are endemic in Madagascar. The only other species of this tribe that is known from the subregion is *Italochrysa variegata*, which is widespread in eastern Africa. By contrast, only 7 Chrysopini, a much more numerous tribe (with about 100 species in the entire Afrotropical region), are endemic here. One reason for this impression of the Madagascan fauna may be the intensity of work done in the island and the history of research. Research emphasising Neuroptera did not occur, but in the available material in museum collections the larger, more conspicuously coloured Belonopterygini are overrepresented.

The Comoro archipelago harbours 12 widespread and 10 endemic species or subspecies. *C. umbralis* inhabits large parts of the subregion, while the other 9 occur only in this archipelago, 5 of them only occur on the largest and highest island of Grande Comore. *Glenochrysa insularis* has developed the subspecies *G. i. grancomorensis* and *G. i. mayottensis* in Grande Comore and Mayotte respectively.

Besides *Glenochrysa insularis* with two subspecies in the Comoros and *G. i. insularis* in Madagascar (Fig. 6), *Dichochrysa duplicata* is also represented in the

subregion with 3 subspecies: *D. d. mascarenica* on Mauritius and La Réunion, *D. d. duplicata* on Madagascar and *D. d. polyneura* on the Comoro islands Mayotte, Moheli and Grande Comore (Fig. 5).

Among the 17 widespread species living in the subregion (Table 2), 7 occur on the continent only in eastern Africa. Among the remaining 10 species living in wider parts of the continent are several common species of ecological (e.g. *Dichochrysa sjoestedti*, *Borniochrysa squamosa*), sometimes also agronomical importance (*Apertochrysa eurydera*, *Chrysoperla congrua*, *Dichochrysa nicolaina*, *Ceratochrysa antica* and *Mallada desjardinsi*). In the higher islands La Réunion and Grande Comore they occur mainly or exclusively in lower, cultivated areas. Some of them may be introduced by man via agriculture or fruit cultivation.

Among the species also found on the continent, *Ankylopteryx pallidula*, *Chrysoperla volcanicola* and *Dichochrysa sjoestedti* reached only the Comoros, 7 species Madagascar and 7 also the Mascarenes or even the Seychelles, among them all species of possibly economical value. *Mallada desjardinsi* is the most widespread species, from Southern Africa and the Cape Verde Islands (see HÖLZEL *et al.* 1994, fig. 14) eastward to the Bonin Islands in the Pacific Ocean (see TJEDER 1966, fig. 1746) as well as in the Madagascan subregion (Fig. 7).

\*

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