

**ODONATA FROM THE ENNEDI AND OUNIANGA REGIONS
OF NORTHERN CHAD, WITH A NOTE OF THE STATUS
OF *ORTHETRUM KOLLMANNSPERGERI* BUCHHOLZ,
AND A CHECKLIST OF SPECIES CURRENTLY KNOWN
FROM THE REPUBLIC OF CHAD**

H.J. DUMONT and D. VERSCHUREN

Limnology Group, Ghent University, Ledeganckstraat 35, B-9000 Ghent, Belgium

Received May 25, 2004 | Updated and Accepted February 20, 2005

A hydrobiological survey of scarce permanent aquatic environments in the Ennedi and Ounianga regions of northern Chad yielded a small collection of 7 odon. spp. It adds 3 new spp. to the known fauna of Chad: *Ischnura senegalensis*, *Pseudagrion hamoni*, and *Orthetrum sabina*. The presence of *O. sabina* at Ounianga represents the westernmost record of this oriental sp. in N. Africa. Another oriental element, *O. taeniolatum*, may not exist in Africa W. of the Nile, possibly being replaced there by the closely related *O. kollmannspergeri* Buchholz. The 44 spp. hitherto reported from the Republic of Chad likely represent only a third or less of those to be expected in the country.

INTRODUCTION

To date only three publications have dealt fully or in part with the Odonata of Chad (North-Central Africa): NAVAS (1936) reported 6 species from the Tibesti mountain range in the far North of the country; BUCHHOLZ (1959) reported 6 species from the Ennedi mountains in the desertic Northeast, and an additional 7 species from the sahelian Biltine region South and South-East of it; and dipterologist C. DEJOUX (1968) provided a list of 31 taxa, of which 26 identified to species, from around N'Djamena and Lake Chad in the West (identifications by E.C.G. Pinhey). The scrub and wooded savannah regions in southern Chad remain unexplored. Hence, all new information on this huge (1.2 million km²) country, which covers 16 degrees of latitude and the full North African ecotone from wet savannah in the South to absolute desert in the North, is most welcome. Also, although knowledge on the Odonata of the Sahara desert has greatly in-

creased over the past two decades (summarized in DUMONT, 1988), the Chadian part of the Sahara has been covered only fragmentarily at best. The present collection, although small, therefore adds significant information to our knowledge of dragonfly biogeography in North Africa.

STUDY REGION

Hand-net collections of adult dragonflies were made in December 2003 and October 2004 as part of a general hydrobiological survey of the scarce permanent water bodies in the semi-desert and desert regions of northern Chad. These include the gueltas of Archei and Bechikélé (also known as Beskére) in the southwestern Ennedi mountains, and the fresh to hypersaline lake systems of Ounianga Kebir and Ounianga Serir located west of the Mourdi Depression and Southeast of the Tibesti mountains. The gueltas of Archei (Loc. 1) and Bechikélé (Loc. 2) are relicts of much more extensive aquatic systems draining the Ennedi during the Early Holocene pluvial (~10,000-4,000 ¹⁴C yr BP, or 12,000-4,500 calendar years ago), and today provide regionally unique conditions for survival of tropical African gallery-forest trees such as *Ficus* and *Boscia*. They both consist of a steeply incised rock canyon with a series of rock pools fringed with *Phragmites* and Cyperaceae, exiting via a short permanent water course onto the surrounding desert plain as a seasonally flooded wadi (oued) fringed with dum palms and *Acacia* trees.

The Ounianga lakes are Pleistocene deflation basins filled like oases by continuous input of presumably early-Holocene fossil groundwater. Surrounded by absolute desert, their shoreline is today fringed by dum and date palms, and some scattered *Acacia* trees. Shoreline dissection by dune migration into Lake Yoa, the largest and deepest (26 m) lake at Ounianga Kebir, locally formed a short inlet where freshwater inflow exceeds its rate of mixing with the hypersaline lake water, so creating a freshwater brook with *Phragmites* and *Potamogeton* (Loc. 5). Similar dune migration across the shallower basin of Ounianga Serir (8-12 m) has over time dissected the basin into the large central Lake Teli (Loc. 4), which is hypersaline, and about seven smaller lakes to the East and West which are fresh. Most of these fresh lakes are partly or fully covered by floating *Phragmites* mats; only Lake Boku (Loc. 3) and Lake Edem provide sufficient open water for establishment of submerged aquatics such as *Potamogeton* and *Chara*. Under the hyperarid climate conditions prevailing at Ounianga, these permanent fresh standing-water environments are unique dragonfly habitat for a large region of the Central Sahara.

Dragonflies were collected at the following sites:

- Loc. 1. 26-XI-03: Ennedi, guelta of Archei, interconnected rock pools at head of guelta
- Loc. 2. 23-XI-03: Ennedi, guelta of Bechikélé, permanent stream inside guelta canyon
- Loc. 3. 02-XII-03 and 24/12/04: Ounianga Serir, Lake Boku, freshwater lake
- Loc. 4. 02-XII-03: Ounianga Serir, Lake Teli, hypersaline lake
- Loc. 5. 07-XII-03 and 18/10/04: Ounianga Kebir, Lake Yoa, Girki spring, and brook flowing from spring into hypersaline lake
- Loc. 6. 27-X-04: Ounianga Serir, Lake Edem.

RESULTS AND DISCUSSION

SPECIES LIST (first records for Chad are asterisked, *):

- *Ischnura senegalensis* Rambur: loc. 5 (6 ♂, 4 ♀), loc 6, ♂.
- *Pseudagrion hamoni* Fraser: loc. 1 (1 ♂); more specimens seen at loc. 2.
- *Trithemis annulata* (P. de Beauvais): loc. 3, 1 ♂.
- *T. arteriosa* (Burmeister): locs. 1, 2 (3 ♂), 3 (1 ♀)

- *Crocothemis erythraea* (Brullé): loc. 1 (1 ♂), loc. 5 (1 ♂);
- *Orthetrum chrysostigma* (Burmeister): loc. 1 (2 ♂); also seen at loc. 2.
- **O. sabina* (Drury): loc. 4 (1 ♂, on the wing)
- *Brachythemis leucosticta* (Burmeister): 1 ♂, 3 ♀.
- *Pantala flavescens* (Fabricius): loc. 3, 1 ♂.

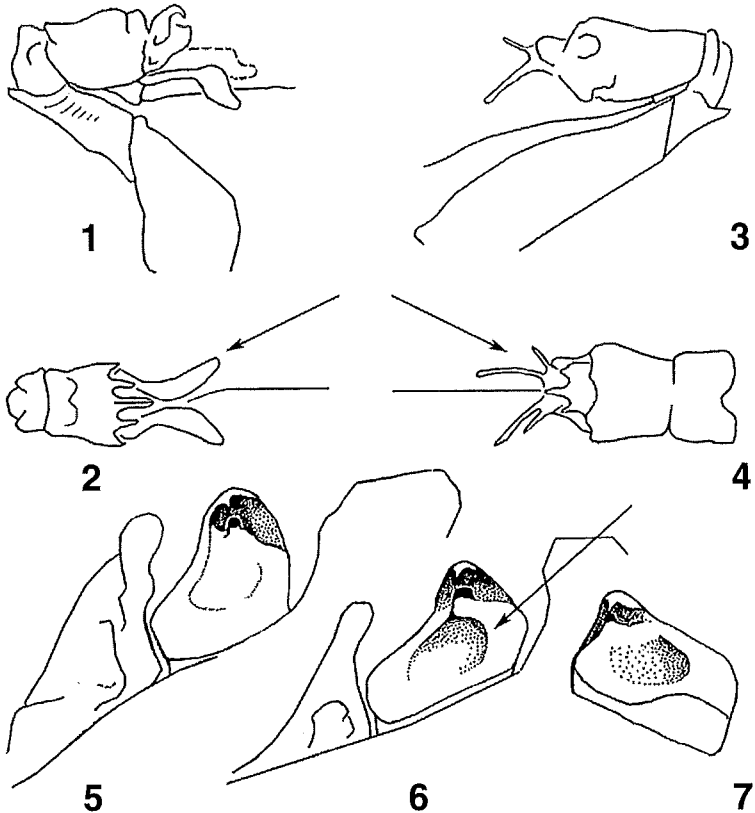
This small collection of 28 specimens strikingly adds three species (*Ischnura senegalensis*, *Pseudagrion hamoni*, and *Orthetrum sabina*) to the known dragonfly fauna of Chad, which now stands at 44 species. Review of the reported collection locations reveals that no single zone of this large country has been adequately surveyed, suggesting that the total species number will be significantly higher than that currently on record. Even the ubiquitous afrotropical-oriental species *I. senegalensis* had not previously been recorded from Chad! It is, however, interesting that exactly this *Ischnura* species occurs at Ounianga in the desert of northern Chad, and not *I. saharensis* or *I. fontaineae*, already known from other isolated aquatic systems in the Sahara desert (DUMONT, 1979).

Also significant is the new record of *Pseudagrion hamoni*. This species occurs in all major mountain massifs of the Sahara between the Atlantic coast and the Nile valley, but had not previously been recorded from the Ennedi (gap now closed) or the Tibesti (still a question-mark). Its closest known population is from the Sahelian Jebel Marra Massif in northwestern Sudan (DUMONT, 1988). The presence of the Oriental species *Orthetrum sabina* at Ounianga may well represent its limit of westward extent into Africa. It was previously found in the desertic Meidob Hills NE of Jebel Marra but not at Jebel Marra itself (DUMONT, 1988), suggesting that it may be incapable to extend its range into the more humid environments of sub-Saharan Africa.

Among "blue" *Orthetrum* species, the present collection includes only *O. chrysostigma* found at the gueltas of Archei and Bechikélé in the western Ennedi, where BUCHHOLZ (1959) had already recorded this species. The possibility of finding another species, *O. kollmannspergeri* Buchholz, at those localities prompted re-evaluation of other available *Orthetrum* material from the region. BUCHHOLZ (1959) described *O. kollmannspergeri* from Adré, on the Chad-Sudan border southeast of the Ennedi. Earlier, LONGFIELD (1936) had identified small blue *Orthetrum* from several localities around the Jebel Marra massif (Karanga, Kirima, Kurra, Killing) as the Oriental species *O. taeniolum*. In his 1988 paper, DUMONT thought specimens from Sjachacha springs in the Meidob Hills NE of Jebel Marra to represent the second record of *O. taeniolum* from the Darfur region of northwestern Sudan. He did not consider that they might be *O. kollmannspergeri*, as the latter was tacitly assumed to be a synonym of *O. taeniolum*, or of *O. ransonneti* (as stated in DUMONT, 1987). The synonymy with *O. ransonneti*, a much larger and robust animal (abdomen length of specimens from the Sahara about 32 mm, against only 24 mm for the Meidob specimens), can in fact be ruled out. Here, we re-examine six male *Orthetrum* from the Meidob

Hills and compared them with Buchholz' (1959) published figures, and with true *O. taeniolatum* from India, Iran and Turkey.

This analysis reveals that the Meidob specimens listed in DUMONT (1988) conform exactly to Buchholz' description of *O. kollmannspergeri*, especially with regard to the shape of the apical alae of the vesica seminalis. These are deeply bifid and asymmetric (Figs 3-4), whereas in *O. taeniolatum* they form two broad lobes (Figs 1-2). The macromorphology of the two species is otherwise identical, suggesting that they share a common ancestor, with *kollmannspergeri* probably a recent offshoot of *taeniolatum*. Micromorphological differences between these taxa include the anterior lamina, which in *O. kollmannspergeri* is slightly higher



Figs 1-7. Comparison of male genitalia of *Orthetrum taeniolatum* from Keoladeo nature reserve, India (1-2, 6) and *O. kollmannspergeri* from Sjachacha wells, Meidob, Sudan (3-5, 7); (1-2) vesica seminalis of *O. taeniolatum* in lateral and ventral view; - (3-4) the same of *O. kollmannspergeri* (alae arrowed); - (5) lamina anterior and hamulus of *O. kollmannspergeri*, lateral view; - (6) lamina anterior and hamulus of *O. taeniolatum* (posterior fold arrowed); - (7) hamulus of *O. kollmannspergeri* with apical hook adpressed to internal outgrowth by vesica spermalis.

and more robust than in *O. taeniolatum*, and with a more strongly swollen apical lip; and the hamulus, which apically forms an outwardly turned hook that overhangs a hollow and faces a small, dark outgrowth arising directly from the hamulus body (Fig. 5). In the hamulus of *O. taeniolatum*, the outgrowth that faces the apical hook forms the end of a fold that runs along most of the hind part of the hamulus, and causes the hamulus body to look more hollowed-out (Fig. 6, arrow). In both species, extrusion of the vesica pushes it against the inner wall of the hamuli, causing the apical hook to bend outward and make contact with the outgrowth on the side of the hamulus, effectively forming an 'eye' (Fig. 7); we suspect that this had occurred in the specimen figured by PINHEY (1970).

We conclude that *O. kollmannspergeri* Buchholz is a good species, as already indicated by PINHEY (1970). Its known distribution is still limited to a small Sahel region in eastern Chad and northeastern Sudan. However, the present findings warrant re-examination of *Orthetrum* collections from Ethiopia, Somalia, Eritrea (PINHEY, 1962), Sudan (LONGFIELD, 1936), and even Nigeria (PINHEY, 1970) to determine the true distribution of *O. kollmannspergeri*, *O. taeniolatum*, and related species in the eastern and central Sahel.

CHECKLIST OF ODONATA RECORDED FROM CHAD.

CD = DEJOUX (1968), KFB = BUCHHOLZ (1959), LN = NAVAS (1936)

LESTIDAE

- *Lestes pallidus* Rambur: N'Djamena (CD)
- *L. dissimulans* Fraser (sub *L. simulans*): N'Djamena (CD)

COENAGRIONIDAE

- *Agriocnemis exilis* Selys: N'Djamena (CD)
- *Ischnura senegalensis* Rambur: this paper
- *Pseudagrion coeleste* Longfield: N'Djamena (CD)
- *P. hamoni* Fraser: this paper
- *P. nubicum* Selys: N'Djamena (CD)
- *P. (?) kersteni*: Adré (KFB)
- *Ceriagrion glabrum* (Burmeister) (presumed): N'Djamena (CD)

PLATYCNEMIDIDAE

- *Platycnemis* sp. (larvae): macrophyte zone of eastern part of Lake Chad (CD)

AESHNIDAE

- *Anax parthenope* (Selys): Oued Yokou, N. fringe of Ennedi (ssp "geyri") (KFB)
- *A. tristis* Hagen: N'Djamena (CD)
- *Hemianax ephippiger* (Burmeister): Guelta in Oued Zebre, E. Ennedi (KFB); spring at Torros, 1750 m asl, Tibesti (LN); around N'Djamena, lakes Fianga and Tikem (CD)

GOMPHIDAE

- *Ictinogomphus* sp.: Tandjilé River between Moundou and Pola (larvae) (CD)

- *Lestinogomphus* sp.: Lac Fianga (larvae) (CD)
- *Paragomphus* sp.: River Chari, including delta; lakes Fitri and Léré (larvae) (CD)
- *Phyllogomphus* sp.: Tandjilé River between Moundou and Pola; Chari River at N'Djamena (larvae) (CD)
- MACROMIIDAE
- *Phyllomacromia* sp. (*picta*?): N'Djamena (CD)
- LIBELLULIDAE
- *Acisoma panorpoides ascalaphoides* (Rambur): floodplain of Chari River (CD)
- *Brachythemis leucosticta* (Burmeister): all around lake Chad; also Moundou, Deli, Bongor, Lac Léré, Tikem, Fianga, Lakes of Mombolo, Rivers of Kanem, along Chari River (CD); Fort Lamy (=N'Djamena) and Adré (KFB).
- *Crocothemis erythraea* (Brullé): around N'Djamena and elsewhere (CD); Miski valley, S. Tibesti and between Guezenti and Bardai, N. Tibesti (LN); this paper.
- *C. sanguinolenta* (Burmeister): Anéché (KFB)
- *Diplacodes lebebvrii* (Rambur): temporary swamps near N'Djamena and eastern zone of Lake Chad (CD)
- *Hemistigma albipunctum* (Rambur): around N'Djamena and in eastern Chad (CD)
- *Olpogastra lugubris* Karsch: near N'Djamena and along river Chari (CD)
- *Orthetrum brachiale* (P. de Beauvais): N'Djamena (CD)
- *O. caffrum* (Burmeister): Adré on border with Sudan (KFB)
- *O. chrysostigma* (Burmeister): Béskééré and Archei in Ennedi (KFB); this paper.
- *O. icteromelas* Ris: N'Djamena (CD)
- *O. kollmannspergeri* Buchholz: Adré on border with Sudan (KFB)
- *O. sabina* (Drury): this paper
- *Palpopleura lucia* (Drury): shores of Logone River at Bebo, 50 km S. of Doba (CD)
- *P. deceptor* (Calvert): Abou Goulem between Abéché and Adré (KFB)
- *Pantala flavescens* (Fabricius): shores of Lake Fianga and across most of Chad (CD)
- *Philonomon luminans* Karsch: near N'Djamena (CD)
- *Sympetrum fonscolombii* (Selys): Wadi Rei, Ennedi (KFB); Miski valley, Tibesti (LN)
- *Tholymis tillarga* (Fabricius): common around N'Djamena and along River Chari (e.g. at Niellim) (CD)
- *Tramea basilaris* (P. de Beauvais): along Chari River between Niellim and Djuntilo and around N'Djamena.
- *Trithemis annulata* (P. de Beauvais): Chari River near Niellim and N'Djamena (CD); this paper
- *T. arteriosa* (Burmeister): Ennedi, several stations (KFB); Bardai, Yebbi, Cen-

- tral Tibesti and Toros spring, Eastern Tibesti (LN); this paper
- *T. hecate* Ris: Chari River near Niellim (CD)
 - *T. kirbyi ardens* Gerstäcker: "Ennedi" (KFB); between Bardai and Yebbi, ca 1100 m a.s.l., Central Tibesti (LN)
 - *T. furva* (Karsch) (sub *T. risi*): Adré (KFB)
 - *Urothemis edwardsii* (Selys): all around lake Chad, Bol, all islands in the East, Ndjora, Lakes Fitri, Tikel and Fianga (CD)

ACKNOWLEDGEMENTS

Dirk Verschuren thanks STEFAN KRÖPELIN for the opportunity to participate in geological and limnological fieldwork in northern Chad, funded by the Deutsche Forschungsgemeinschaft through the programme ACACIA "Arid Climate, Adaptation and Cultural Innovation in Africa".

REFERENCES

- BUCHHOLZ, K.F., 1959. Odonaten aus dem Ennedigebirge, nebst Bemerkungen über einige aethiopische Arten. *Bonn. Zool. Beitr.* 10: 75-98.
- DEJOUX, C., 1968. Contribution à l'étude des insectes aquatiques du Tchad. *Cah. ORSTOM, Hydrobiol.* 2: 51-78 (Odonata 65-69).
- DUMONT, H.J., 1979. *Limnologie van Sahara en Sahel*. D. Sci thesis, Univ. of Ghent.
- DUMONT, H.J., 1987. Region 2. Sahara. In: M.J. Burgis & J.J. Symoens [Eds], *African wetlands and shallow water bodies*, pp.79-154. Orstom, Paris, (Chad; pp. 134-144).
- DUMONT, H.J. 1988. On the composition and palaeoecological significance of the odonate fauna of Darfur, western Sudan. *Odonatologica* 17: 385-392.
- LONGFIELD, C., 1936. Studies on African Odonata, with synonymy and descriptions of new species and subspecies. *Trans. ent. Soc. Lond.* 85: 467-498.
- NAVAS, I., 1936. Mission au Tibesti (1930-31), dirigée par M. Marius Dalloni. Paranevroptères et Neuroptères. *Mém. Acad. Sci. Inst. Fr.* 62: 72-73 (Odonata).
- PINHEY, E.C.G., 1962. A descriptive catalogue of the Odonata of the African continent (up to December 1959), 2. *Publicões cult. Co. Diam. Angola* 59: 165-322.
- PINHEY, E.C.G., 1970. A new approach to African Orthetrum (Odonata). *Occ. Pap. natn Mus Rhod.* (B)4 (30): 261-321.