THERMORTHEMIS MADAGASCARIENSIS (RAMBUR): SOME OBSERVATIONS ON ITS HABITAT AND REPRODUCTIVE BEHAVIOUR (ANISOPTERA: LIBELLULIDAE)

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Abstract – The sp. is peculiar to Madagascar, where it is restricted to forest ponds at elevations above 900 m. Based on colour field photographs, both sexes (adult) are redescribed. The reproductive behaviour is characterized by scooping oviposition and by incidental multiple guarding. Some records of *Crocothemis striata* Lohmann are appended.

Introduction

Thermorthemis madagascariensis is endemic to Madagascar and it is certainly one of the larg-

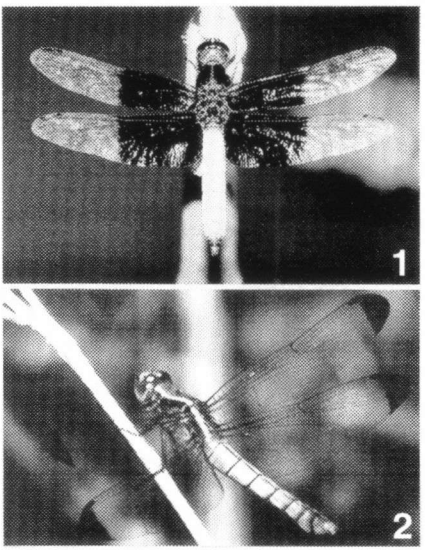
est and most conspicuous libellulids worldwide. Closely related to *T. comorensis* FRASER (1958) of the Comores, it is widespread in Madagascar, therefore its conservation was recently considered by DIJKSTRA & CLAUSNITZER (2004) as a "secondary concern" only.

Since little is known on the ecology and behaviour of the Malagasy Odonata, we present here a few observations, gathered by the second and third author during their January-February trips in 2001-2002. The oviposition was in part video-recorded by L. Röder.

Species description

Measurements, in mm, after FRASER (1956): abdomen 34-36, hindwings 44.

The following description is based on colour field photographs of both sexes (cf. Figs 1-2). – M a l e: Forewings black from base to nodus, in hindwings the spot reaching 2 or 3 cross veins farther distad. Eyes dark brown. Thorax mainly black. Abdomen (in fully mature individuals) covered by a bluish pruinescence. – F e m a l e: Eyes brown above, greyish laterally. Front part of thorax dark brown, its sides yellowish-brown; dorsally a whitish band reaches from prothorax, between wing bases, to the end of the thorax. Abdomen yellowish-brown, segment 9 with a transverse, darker brownish band at its distal end, rounded basally; segment 10 also brownish. Wing tips darkend between basis and mid of pterostigma. – T e n e r a l males are similar to females, but there are no brown markings on the tip of the abdomen, and the wings are clear. The dark regions seem to appear with the increased age of the individual.



Figs 1-2. *Thermorthemis madagascariensis* (Antananarivo Botanical Gardens, January 2002): (1) male; – (2) female.

Habitat

T. madagascariensis seems to prefer forest ponds of medium or large size, or habitats with dense vegetation in most shore sections, such as, e.g. the Botanical Gardens of Antananarivo (alt. ca 1245 m). During our two 5-week trips (see above) we have covered most regions of the island, but have encountered this species only in the region between Antananarivo and the eastern slopes, down to the "Réserve de Faune de Perinet-Analamazaotra" (alt. 930-1040 m). It is not rare there, but it does not occur in the less wooded areas and at lower elevations. The Perinet region is a typical example of mountain rain forest.

Notes on behaviour

The males show a pronounced territorial behaviour, defending their territory against any intruders, including also other dragonfly species of approximately similar size. They perch on any protruded plant, taking off only for short feeding and patrolling flights. Although they were generally rather numerous around suitable ponds, we never saw any non-ovipositing females there. They dwell in vegetation stands, at some distance from the respective ponds, where teneral males were also regularly found.

The reproductive behaviour was watched and video-recorded at the ponds of Perinet and Antananarivo (Botanical Gardens), late in January and early in February. Oviposition took place in the well-vegetated shore stretches. The typical behaviour is shown in Figure 3: (1) The female flies along narrow, vertical, elliptically-shaped orbits. When flying forward, she hits the water surface with the tip of her abdomen, scooping droplets of water together with eggs onto the shore vegetation, sometimes much higher up

than the position of her head was at that moment. – (2) Without any interruption, she continues the circle with a short up- and backwards flight before descending again for the next run. This may continue for 5-6 minutes. – (3) During this process, the male renders "air coverage" by flying along the shore vegetation. – In summary: scooping oviposition in *T. madagascariensis* is performed in solo flight, male guarding the female by flying nearby. This seems to be the usual pattern. The mode and mechanics of scooping oviposition in the New World *Libellula composita* (Hag.) were recently described in much detail by BECKEMEYER (2004).

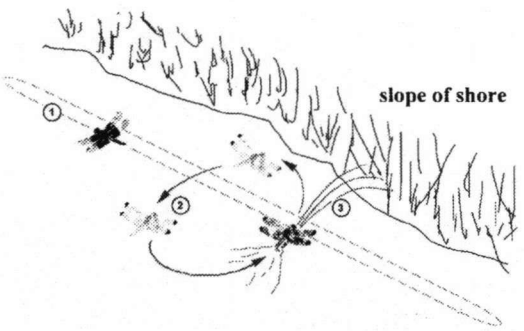


Fig. 3. *Thermorthemis madagascariensis*: oviposition behaviour. Drawing by U. Röder, based on an undisturbed field observation at the Antananarivo Botanical Gardens. For explanation see text.

We were also able to record some deviations from the above. In Perinet we have watched 2 females ovipositing close to each other, causing thereby some stress to the vigilant male that was still occupied in territorial disputes. While he was fighting, the females remained unattended for some time.

In 2002, at Lac Vert, bordering the Analamazaotra Reserve, we have watched the process in which 2 males and 2 females were involved. From a perch on an exposed twig, a male was repeatedly making short flights back and forth along the shoreline of his territory, and a female was ovipositing in a "bay" nearby, characterized by shallow, warm water, low (grass-type) vegetation and strong sun exposure. While engaged in scooping, a mating pair suddenly appeared at this presumably favoured place. The territorial male took off, the newly arrived female commenced ovipositing close to the other, and the newly arrived male got immediately involved in territorial disputes with the original holder of the territory. After chasing each other over long distances for some time, only one of the males returned. After a moment of rest at the exposed twig, he immediately started patrol flights along the shoreline. The two females continued to oviposit, both guarded by the male that was the father of the offspring of only one of them. This kind of oviposition behaviour is to be regarded as a "multiple guarding". It has been first noticed by HEYMER (1970, 1972) in *Calopteryx*, and defined, described and reviewed by CORBET (1999).

Concluding remarks

The above description is based on observations and video evidence provided by the second and third author, who are odontologically untrained nature photographers, therefore more field work would be required to ascertain and complete the details.

The latest checklist of the odonate fauna of Madagascar was published by DONNELLY & PARR (2004), covering 181 named species and subspecies, of which 132 are endemic and 111 are considered by DIJKSTRA & CLAUSNITZER (2004) of "primary concern", hence their conservation status needs to be assessed. Among these are 13 libellulids, including *Crocothemis striata* LOHMANN (1981), on the occurrence of which we have some photographic evidence (2001-2002) from the following localities: Antananarivo (Botanical Gardens), National Park Perinet-Analazamaotra, the Onive river nr Ambohimandroso, nr Isalo, and from the Pangalanes Canal on the eastern coast.

During our trips, we photographed ca 20 Anisoptera species, of which 5 do not seem to match any of the available taxonomic descriptions. Currently much photographic work is being done on various insect groups in Madagascar. However, a reliable species identification from photographs is often difficult or impossible, therefore it would

be opportune to try to adapt classical taxonomic keys to the requirements and possibilities of photographic recording.

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Received August 16, 2004