

**ANDROMORPHIC FEMALE OF THE DRAGONFLY
NEUROTHEMIS TULLIA TULLIA (DRURY)
(ODONATA: LIBELLULIDAE), CENTRAL INDIA**

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Most anisopteran libellulid odonates are sexually dimorphic when mature. The males acquire bright colouration since colours and patterns on the wings and body may play an important role in territoriality and courtship (Andrew et al. 2008). *Neurothemis tullia tullia* is a common Indian dragonfly which occurs in large colonies in swamps and heavily-weeded tanks. It lies close to the herbage, perched on twigs, aquatic weeds along the border not more than five feet above the ground and has a weak, slow fluttering flight. It is a libellulid which shows an extreme case of sexual dimorphism in colour and patterns on the wings.

In *Neurothemis tullia tullia*, the male has a black face and the eyes are blackish-brown above and olive green below. The thorax is black with a mid-dorsal cream stripe. The basal half of the wings is opaque blue black which is bordered by a milky white patch towards the tip. The wing tips are transparent. The abdomen is black with a mid dorsal creamy white stripe on the upper side. The female differs significantly from the male in body marking, colouration and wing spots. The face is olive green while the eyes are pale brown above and pale olive green towards the sides and below. The thorax is greenish-yellow with a bright yellow mid dorsal stripe which is bordered with a black stripe. The wing base is amber yellow while the front edge is blackish-brown which forms a very

large brown black spot. In the hind wing, this spot is irregular and sickle shaped. The wing tips are broadly blackish-brown. The abdomen is bright yellow with a broad black band above. The underside is black (Subramanian 2005). Observation of andromorphs is very rare in Anisoptera and generally restricted to certain genera such as *Crocothemis*, *Neurothemis* and *Sympetrum* (Kumar 1988; Kotarac 1996; Corbet 1999; Prasad et al. 2000).

The collection site of this odonate was the western border of Telenkhedi Pond (20°9'N & 79° 9'E) located at the foothills of the Seminary Hillock of Nagpur City of central India (Image 1). This section of the pond is rich with submerged (*Hydrilla* sp.), floating (*Nymphaea* sp., *Eichornnia* sp.) and marginal (*Ipomea* sp., *Eleocharis* sp., *Fimbristylis* sp., *Cleome* sp., *Alternanthera* sp. and *Eriocaulon* sp.) aquatic flora. Along with *Neurothemis tullia tullia*, the other anisopteran libellulids found



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Image 1. Site of collection - west border of Telenkhedi Pond of Nagpur City

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breeding around this vicinity were *Crocothemis servilia*, *Orthetrum sabina sabina*, *Rhyothemis variegata variegata*, *Brachythemis contaminata* and *Acisoma panorpoides panorpoides*. The odonates were identified with the help of identification keys provided by Fraser (1936) and aquatic plants were determined using Ugemuge (1986).

Observation

On 02 November 2010, we were observing the dragonflies of Telenkhedi Pond (west end) when we noticed a typical "male" of *Neurothemis t. tullia* behaving in an unusual manner. It was hovering above the shallow shore and flying low at regular intervals so as to dip the terminal abdominal segment in water, which is a typical female ovipositing behaviour of this species.

We managed to collect this specimen and were surprised to observe that although it appeared like a male,

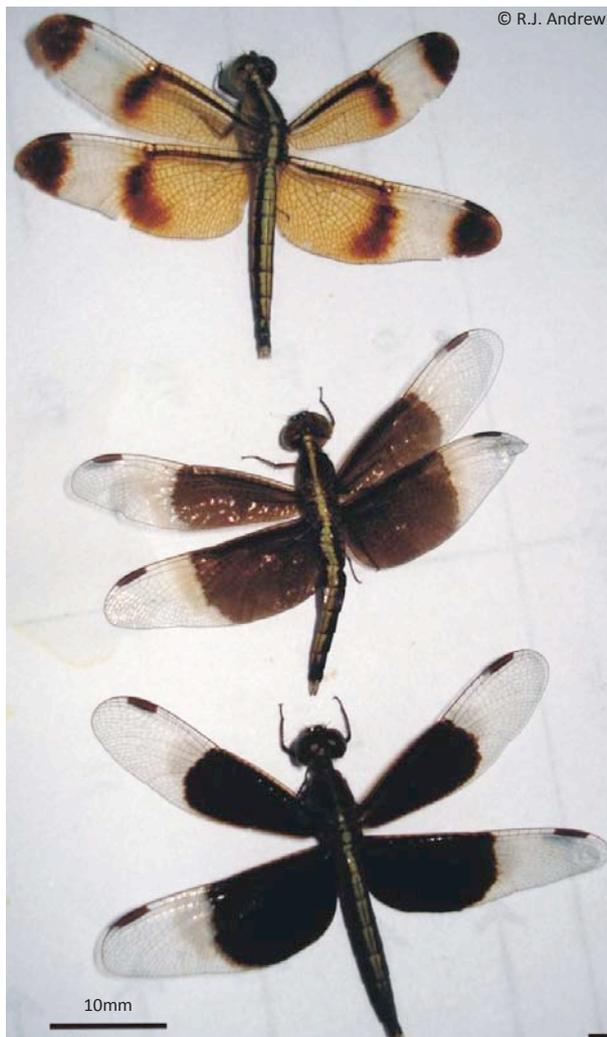


Image 2. *Neurothemis t. tullia* - female (top), andromorphic female (middle) and male (bottom).

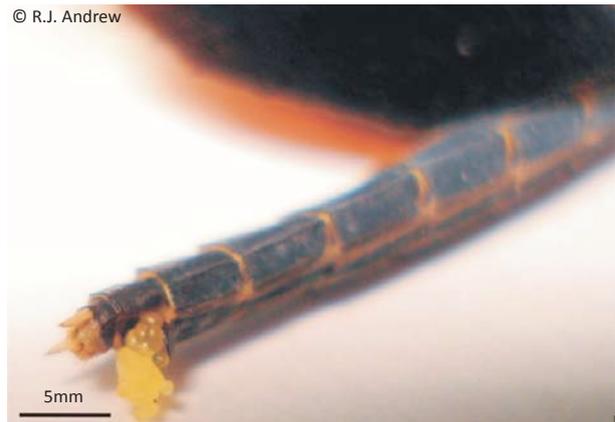


Image 3. Andromorphic *Neurothemis t. tullia* releasing egg clutch.



Image 4. Viable eggs of andromorphic *Neurothemis t. tullia*.

the male secondary copulatory apparatus on the venter of the second and third abdomen was missing (Image 2). Further observation revealed that it had only two anal appendages, a typical character of female odonates. Later in the laboratory we dipped her abdomen in water, mimicking oviposition behaviour and this 'male-like' specimen released a clutch of spherical eggs (Image 3). The shape and size of the eggs was comparable with the eggs deposited by normal females. We collected the eggs (Image 4) and they developed within an average period of 11–15 days to produce first larva (or nymph). This specimen was a sexually mature, gravid andromorphic female of *Neurothemis t. tullia*. Table 1 describes and compares the various colour and wing spot patterns of the andromorphic female with the normal male and female of *Neurothemis t. tullia* (Image 2).

Discussion

Andromorphs are very rare in libellulid Anisoptera and their frequency is variable among populations and varies positively with male density. Andromorph females are commonly found in Zygoptera where it represents true polychromatism (Corbet 1999). In Zygoptera,

Table 1. Comparison of the colour and wingspot pattern of andromorphic female with normal male and female of *Neurothemis t. tullia*

<i>Neurothemis tullia tullia</i>	Male	Andromorphic female	Female	Remark
Head- Face	Black	Black	Olive green yellow	Similar to male.
Eyes	Black brown above with olive green below	Dark brown above olive green below	Pale brown above, pale olive green below	Similar to male.
Thorax	Black with a mid-dorsal cream stripe.	Blackish-brown with a mid-dorsal cream stripe. An olive green band along the lateral upper level is present	Greenish-yellow with a bright yellow mid dorsal stripe bordered black.	Similar to male, except for the lateral olive green band.
Legs	Black	Black	Outer surface yellow, inner black	Similar to male.
Wings	Basal half opaque blue/ brown black with a white broad border towards the tip. Wing tips transparent.	Basal half opaque brownish black with a white broad border towards the tip. Wing tips transparent.	Base of wings amber yellow. Front edge of the wing blackish brown which forms a broad large dark brownish spot. In the hind wing this spot is irregular sickle-shaped. Wing tips are broadly blackish brown.	Similar to male in patterning but the basal half spot is one shade lighter.
Abdomen	Black with a broad mid-dorsal creamy white stripe on the upper side.	Dark brown with a broad mid-dorsal creamy white strip on the upper side, but a thin strip of olive green along the lateral margins of the first four abdominal segment.	Bright yellow, olive green with a broad black band above. Underside is black.	Similar to male except for the olive green thin strip of olive green along the lateral margins of the first four abdominal segment.

andromorphs are found in 54% of European genera (Cordero & Andres 1996) and in most cases there is an autosomal locus with sex-limited expression and two or three alleles, one per phenotype (Cordero & Egido 1998). One of the hypothesis put forward suggests that andromorphs are male-mimics and for this reason they are not recognized by mate searching males and therefore, after first mating they can avoid additional unnecessary mating (Robertson 1985), dedicating this time to feeding and egg maturation. The other hypothesis suggest that andromorphs would be favoured at high population density, because of its male like appearance would result in reduced male disturbance, but at lower population density, they have the risk of never mating (Hinnekindt 1987). Although andromorphic females are quite common in Zygoptera, very few andromorphic females have been reported in the libellulids (Corbet 1999). Till date only four andromorph forms of *Neurothemis t. tullia* have been documented (Lahiri 1979; Asahina 1981; Kumar 1988; Mitra 1991) from the northeastern states of India and one from central India (Prasad et al. 2000). Although this is the second report of an andromorph female of *Neurothemis t. tullia* from peninsular India; it is for the first time that an andromorphic female of *Neurothemis t. tullia* has been reported in gravid condition with viable eggs. Although andromorphy is extremely uncommon in *Neurothemis t. tullia*, the potential for andromorphy to evolve in this species clearly exists. Further studies are required to estimate the frequency of andromorphy in *Neurothemis t. tullia* population and to determine whether there is sufficient selective pressure for it to be maintained in this species or whether it is simply an artifact of recurrent mutation.

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