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# The immature stages and biology of two *Xenapates* species in West Africa (Hymenoptera, Tenthredinidae)

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## Abstract

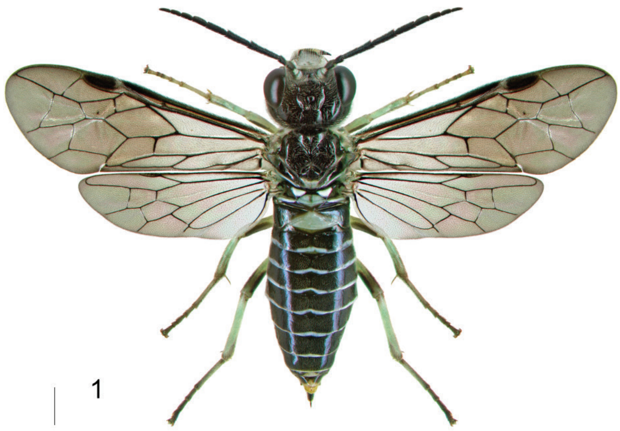
The immature stages and host plants of *Xenapates* Kirby, 1882 were hitherto unknown. We describe the larvae, prepupae and pupae of *X. braunsi* (Konow, 1896) and *X. gaullei* (Konow, 1896), and record observations on aspects of their biology. The relationship of *Xenapates* to other taxa currently placed in the Allantinae and Blennocampinae of the Tenthredinidae remains unclear. Most larval characters of *Xenapates* resemble those described for West Palaearctic Allantini (Allantinae) and some Blennocampinae, but unique amongst exophytic larvae of Tenthredinoidea is the complete absence of cuticular appendages on the dorsum of the trunk in the two *Xenapates* species studied. The setose outer surface of the abdominal prolegs of *Xenapates*, and the presence of a mesal ridge only on the left mandible, are character states that have not so far been recorded in other genera currently placed in the Allantinae or Blennocampinae. Larval host plants of *X. braunsi* are *Digitaria horizontalis*, *Pennisetum purpureum*, *Setaria barbata* and *Zea mays* (all Poaceae). *X. gaullei* larvae feed on two *Commelina* species (Commelinaceae). Larvae of both species are easy bleeders.

## Introduction

*Xenapates* Kirby, 1882 contains forty-seven described species that are currently considered to be valid (Taeger et al. 2010, Koch 2012a, b) and is thus one of the largest genera of Tenthredinidae in the Afrotropical Region, to which it is confined. It has been placed by most recent specialists in the subfamily Allantinae. Benson (1938) erected the tribe Xenapateini for *Xenapates* and some similar Oriental taxa, based solely on characters of wing venation that have since proved to be of limited value in the taxonomy of Blennocampinae and Allantinae (Koch and Liston 2012). Koch (1996) redefined the Xenapateini using characters of the adult mouthparts. As applies to many Afrotropical sawflies (Koch 2005), nothing was known about the larvae of *Xenapates* or their host plants. Here, we document observations on the immature stages of *X. braunsi* (Konow, 1896) and *X. gaullei* (Konow, 1896). Both species have extensive ranges in western and central parts of the Afrotropical Region, where their adults are the most frequently encountered *Xenapates* and can be locally abundant. *X. braunsi* was placed by Koch (1995) in the *africanus* species group, and *X. gaullei* in the *variator* group.

## Material and methods

By chance, *Xenapates braunsi* and *X. gaullei* were found to occur in the vegetation of fallow areas on the campus of the International Institute of Tropical Agriculture (IITA), near Cotonou, Republic of Benin, 6.44°N 2.33°E. All specimens were collected or reared, and field observations made there, by Georg Goergen (hereafter abbreviated to GG), between June 2011 and August 2014. Larvae of *X. gaullei* were first detected



**Figures 1–2.** *Xenapates* adult females, reared from larvae: **1.** *X. braunsi*. **2.** *X. gaullei*. Scale bars = 1 mm.

by close examination of *Commelina communis* plants, growing near to where adults had been observed courting. Further searching led to the discovery of a few larvae of *X. braunsi*, feeding on adjacent plants of *Setaria barbata*. The first attempts to rear larvae in the laboratory, using rearing cages, ended with the death of all larvae after only a few days. After several failed attempts, larvae of both species were reared (Table 1) to the adult stage on their respective potted host plants by enclosing them under netting supported by wire frames, and placing the pots in the open air at the corner of a building, under an approximately 80 cm wide roof overhang, in a position mostly shaded from direct sunlight. Conditions during rearing were thus close to ambient climatic conditions, i.e. at near to the locally recorded values for mean annual temperature of 27.4°C (mean minima 24.3°C; mean maxima 30.1°C) and mean annual relative humidity of 80.5%. Further, the size of pot used was increased to 35 cm diameter and 10 cm depth in response to complete mortality caused by nematodes, of prepupae reared on hosts planted in smaller pots. The amount of sand in the soil mixture was simultaneously increased, to provide better drainage. Before use, the sand was spread in a thin layer and baked in the sun for several days, to make it more sterile. These modifications led to greatly improved survival during rearing. After the first successful rearing, larval development of each species was studied separately, by introducing adults of both sexes to cages containing potted host plants, in which they laid eggs. *Setaria barbata* was usually offered as a host to *X. braunsi*, but a few larvae collected on *Zea mays* in the field were allowed to complete their development on the same host in captivity. *Commelina communis* was offered to *X. gaullei*. Adults were provided throughout with 50% honey solution. The pupal stage proved particularly challenging to observe, because of its short duration. Some cocoons were extracted from the soil in the rearing pots and an aperture was cut in the wall of each cocoon. They were kept in dark, ventilated containers next to the rearing pots and checked every week for up to six months (November–April). Determination of the sawfly species by Frank Koch is based on reared adults (Figs 1, 2). AC Tehou and PO Agbani (National Herbarium of Benin, Abomey-Calavi University, Benin) determined the host plants, or confirmed the initial identifications by GG.

Habitus images were taken by GG of living or freshly prepared adults and various immature stages, with a Q Imaging Micropublisher 5.0 RTV digital camera mounted on a Leica Wild M10 binocular microscope. Stacks of photographs were processed using Auto-Montage Pro (version 5.03) software (Syncroscopy) to produce composite images, then enhanced using Adobe Photoshop CS5 software. Specimens of larvae, prepupae and pupae were preserved in ethanol and deposited together with dry mounted adults in the collections of the Biodiversity Centre (IITA, Calavi, Benin) and the Museum für Naturkunde (Berlin, Germany).

Larvae preserved in ethanol were subsequently studied by Andrew Liston. Vouchers are deposited in the Senckenberg Deutsches Entomologisches Institut (Müncheberg, Germany).

It was not possible to establish to which instars these belonged. *Xenapates braunsi* material comprised four larvae of probably at least two instars, based on their head capsule widths: 1.2, 1.5–1.7 mm). *X. gaullei* was represented by twelve larvae, probably of at least three instars: head capsule widths 0.5–0.8, 1.2, 1.7, 2.1 mm. Some body parts were photographed with a Leica DFC295 camera through an Olympus SZX12 microscope. Composite images with an extended depth of field were created from stacks of images using the software CombineZ5.3, and finally arranged and partly enhanced with Ulead PhotoImpact X3.

Morphological terminology follows Viitasaari (2002). Setal counts are for the whole of the body part referred to. Note that Lorenz and Kraus (1957) give setal counts only for one half of the body, or for half of a bilaterally symmetrical organ.

# Results

## Descriptions of larvae

Descriptions are based mainly on the final feeding instars. Examination of larvae by GG, and his photographs of reared larvae at various stages, showed that the mature larvae differ very little in morphology or colouration from earlier instars. However, the colour pattern, particularly the black markings, becomes more strongly developed as the larva matures.

### *Xenapates* Kirby, 1882

Figs 3–12

[based on the larvae of *X. braunsi* and *X. gaullei*]

**Description.** *Head*. Slightly wider than high (to epistomal suture). Without surface sculpture. Antenna with 5 antennomeres on large subconic antacorium. 4 basal antennomeres ring-like, apical antennomere peg-like. Clypeus with 4 setae. Postclypeus about half as long as preclypeus. Preclypeus with medial, laterally sclerotised (brown), transverse division (ca. medial third unsclerotised). Labrum slightly asymmetric (right lobe larger than left), undivided by longitudinal or transverse depressions, with 6 setae. Stipes and palpifer of maxilla each with a prominent lobe directed towards mandibles. Left mandible (Figs 3, 4) with straight-edged blade on outer (dorsal) surface, ending with a tooth on left side; a long tooth medially, contiguous with a well-developed mesal ridge, its edge produced in two rounded lobes, separated by a wide, rounded emargination (Fig. 3); inner surface with three well-defined teeth. Right mandible (Fig. 5) outer surface similar to left mandible, but straight-edged blade not ending in tooth; medial tooth very broad; inner surface with one wide, asymmetrical tooth closely adjoined by a pair of short, narrow teeth on a shared, rectangular flange; to left of this a straight, unsclerotised edge, about as long as three adjacent teeth together, and much lower than these; no mesal ridge present.

*Cuticle of thorax and abdomen*. Without dorsal macrostructures such as tubercles, spines, or longer setae, but with reticulate-spiculate surface structure on dorsum reaching to just above spiracles (Fig. 7), sometimes also on subspiracular and surpedal lobes (Fig. 8). To the naked eye, these parts appear “velvety”, but at magnifications of 40–90× under a stereo microscope they might almost be described as “scaly”. The cuticle thus strongly resembles that of the easy bleeder species *Rhadinoceraea micans* (Klug, 1816) (Blennocampinae) as described by Boevé (2009).

*Thorax*. Meso- and metathoracic substigmal lobes strongly protruding laterally. Prothorax with more or less strongly developed dorso-lateral lobes. Legs with 5 articles, bearing numerous long setae. Coxa longer than basal width. Trochanter wider than long; about half as long as coxa. Femur apically expanded on inner surface (Fig. 6); femur thus much wider apically than apical width of trochanter, and about twice as wide as base of tibia.

*Abdomen*. Segments 1–8 with 6 dorsal annulets. Prolegs on segments 2–8 and 10; 1.5–1.7× as long as basal width, with 16–20 setae on outer surface (Fig. 8) and 12–20 on inner surface. Apex of suranal lobe and antero-dorsal surface of subanal lobe with numerous short setae.

### *Xenapates braunsi* (Konow, 1896)

Figs 3–5, 8–9, 11

**Description.** *Colour* (Fig. 9). Head including posterior vertex yellow, changing to white on genae. A black patch, not more than 4× as long as ocularium, surrounds stemmatum and does not reach an imagined horizontal line extended from dorsal apex of frons. Thoracic legs pale brown, except for black coxal suture. Trunk pale green, appearing dorsally darker because contents of gut show through; subspiracular lobes and anal area including anal prolegs pale orange.

*Head* (Fig. 11). With a pair of large, pale depressions, one each side of coronal suture dorsal of junction with frontal suture. Setae on vertex and parietals very short (less than third diameter of antennomere 1) and pale. Some setae on genae and mouthparts as long as antenna. Right lobe of labrum about twice as long as visible part of left lobe.

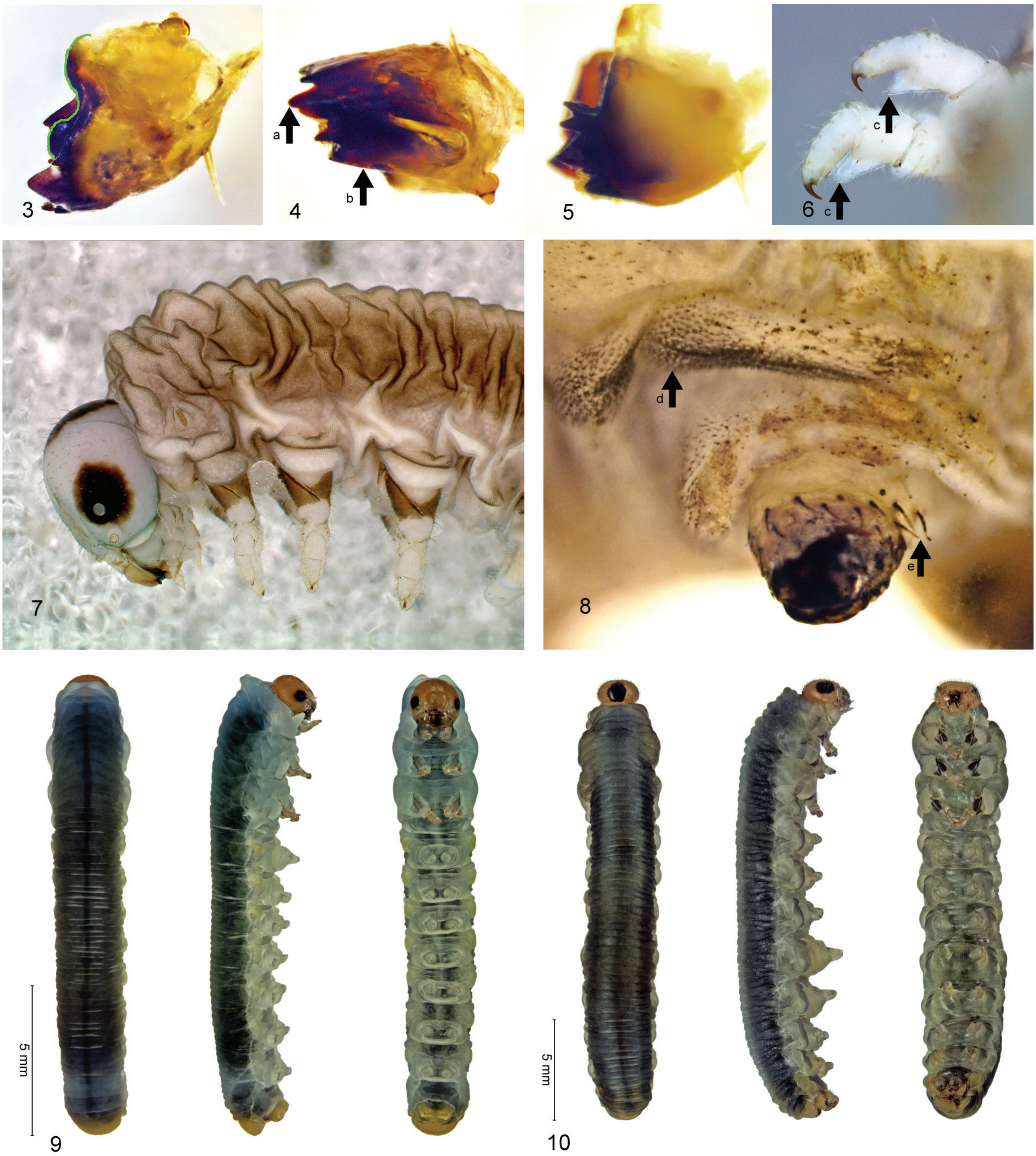
*Trunk*. Prothorax dorsal annulets 1 and 2 laterally fused. Annulet 2 medially divided; lateral lobes very much higher than lateral parts of 1 or 3. Dorsal surface of lobes on annulet 2 with partly pigmented spicules that are more strongly developed than on other parts of thoracic dorsum. Surface of integument of abdomen above spiracles almost smooth, with very minute, unpigmented spicules. Some partly dark spicules on hypopleurite, surpedal and substigmal lobes (Fig. 8).

*Length of fully grown larvae*: 19–20 mm (n = 16).

### *Xenapates gaullei* (Konow, 1896)

Figs 6–7, 10, 12

**Description.** *Colour* (Fig. 10). Head yellow, with large medial black fleck on posterior vertex. Fleck about as long as wide and not reaching to vertical furrows or frons. Large black patch, at least 5× as long as ocularium, surrounds stemmatum and extends above level of dorsal apex of frons. Trunk dorsally grey to supraspiracular line, paler below this except for grey ventral edges of subspiracular and surpedal lobes. Coxae basally ringed with black. Anal area including anal prolegs pale orange. Note: dark coxal markings only become conspicuous in last feeding instars.



**Figures 3–10.** *Xenapates* larvae: **3.** *X. braunsi* left mandible, outer face; green line along edge of mesal ridge. **4.** *X. braunsi* left mandible, ventral; (**a**) medial tooth, (**b**) inner face. **5.** *X. braunsi* right mandible, inner face. **6.** *X. gaullei* right pro- and mesothoracic legs; (**c**) expanded apex of femur. **7.** *X. gaullei* thorax, lateral. **8.** *X. braunsi* proleg and ventral part of abdominal segment 8, external surface; (**d**) reticulate-spiculate surface structure on surpedal lobe; (**e**) setae on proleg (some missing). **9.** *X. braunsi* mature larva; dorsal, lateral and ventral (from left). **10.** *X. gaullei* mature larva.

*Head* (Fig. 12). No depression present on each side of coronal suture dorsal of junction with frontal suture. Setae on vertex and parietals slightly darkened and as long as diameter of antennomere 1. Setae on lower frons and genae longer (as long as antenna) and paler. Right lobe of labrum only slightly larger than left.

*Trunk*. Prothorax with dorsal annulets clearly separated. Annulet 3 medially divided and lateral lobes slightly higher than lateral parts of 1 and 2. Entire surface of integument on dorsum above spiracles, and partly on subspiracular and surpedal lobes, densely and uniformly spiculate (Fig. 7); each spicule apically darkened.

*Length of fully grown larvae*: 20–21 mm (n = 7).

### Prepupae and pupae

Figs 13–16

The colour pattern of the larva of *Xenapates gaullei* is largely lost at the moult to the prepupal stage (Fig. 14), whereas the prepupae of *X. braunsi* (Fig. 13) retain, for example, extensive black markings on the head, and the orange anal area. The pale depressions on the faces of larvae of *X. braunsi* (not present in *X. gaullei*) at the base of the coronal suture adjoining the frons are retained in the prepupa (Fig. 13), thus further facilitating their separation. The pupae are at first only weakly pigmented. At this stage they can nevertheless be distinguished by colour: *X. braunsi* (Fig. 15) is predominantly bright green, whereas *X. gaullei* (Fig. 16) has a yellow ground colour with only the abdomen tinged slightly green. As pigmentation develops, the much more extensively dark colour pattern of *X. braunsi* easily distinguishes it from *X. gaullei*.

### Host plants

*X. braunsi*: Poaceae: *Digitaria horizontalis* Willdenow (Jamaican crabgrass), *Pennisetum purpureum* Schumacher (elephant grass), *Setaria barbata* (Lamarck) Kunth (bristly foxtail grass), *Zea mays* Linnaeus (maize).

All four plant species were observed to be hosts under field conditions. Though adults were regularly found on *Z. mays* during the wet seasons, larvae were rarely observed feeding on this species, compared to the other host plants. A few larvae collected in the field on maize were successfully reared to the cocoon stage on potted maize plants.

*X. gaullei*: Commelinaceae: *Commelina benghalensis* Linnaeus (Bengal dayflower) and *C. communis* Linnaeus (Asiatic dayflower). Both species were found to be hosts under field conditions.

### Biology

Adults of *Xenapates braunsi* and *X. gaullei* were frequently observed courting and mating on leaves of *Alternanthera brasiliana* (Linnaeus) Kuntze (Amaranthaceae), which offer a relatively large surface area on which the sawflies can engage with each other. These activities took place particularly during sunny periods following rainfall. Neither oviposition nor occurrence of larvae was observed on *A. brasiliana*. Despite the provision of honey solution, adults never lived longer than three days in captivity. Compared to other sawflies, the incubation period of *X. braunsi* and *X. gaullei* eggs is extremely short (lasting a maximum of five days: see Table 1 and below). Larvae of both species are easy bleeders (Boevé 2009). Rupture of the cuticle and emission of haemolymph was induced even by light contact with a 000 size paint brush. No parasitoids were observed or reared, but attacks on cocoon stages by nematodes were frequent when the soil was too wet.

***X. braunsi***: Oviposition was not observed during this study, but 3 mm long larvae were detected on young leaves of *Setaria barbata* five days after the introduction of adults to the experimental cages. Larval feeding followed a similar pattern to *X. gaullei*, except that early instars first grazed on the leaf surface without perforating it. Later, the still young larvae moved to the leaf edge and fed on its margin. They were then also observed to feed on older leaves. When mature, larvae stopped feeding and entered the ground, without moulting. The cocoon (Fig. 17), made of sand grains bound together by a secretion, was ellipsoidal with largest dimensions approximately 7 by 11 mm. The external surface of the cocoon was rough, the inner surface smooth. It was not possible to remove the sand grains from the fabric of the cocoon without destroying it. The larva moulted slowly to the prepupal stage, shedding its exuvia caudally. The pupa became fully developed only a few days before emergence of the adult. The intensely green-coloured haemolymph of the cocoon stages of *X. braunsi* was striking, and remained highly visible through the integument of freshly emerged adults (Fig. 1).

***X. gaullei***: Eggs were found mostly singly on sub-apical leaves, but not on the youngest, apical leaves. Oviposition was into a slit cut in the mesophyll from the upper side of a leaf, at no specific locus: eggs were found close to the leaf edge or at some distance from it, but never in the mid-rib. On average, larvae left their egg cavities (Fig. 18) to feed externally 5 days after oviposition (n = 11). The first moult, however, takes place just before the larva exits the leaf. It seems likely that larvae of the first instar, which must be of very short duration, feed within the leaf. Although such feeding was not observed directly, the cavities surrounding hatched eggs appeared too large to have been caused by mere disruption during oviposition, or eclosion of the larva. Whereas young larvae made feeding holes in the leaf blade, close to where they eclosed (Fig. 18), older instars fed directly on the leaf margin. One to two days before they burrowed into the soil, mature larvae stopped feeding, evacuated their gut and thereby became slightly smaller. Each larva then made a cocoon in the earth, close to the bottom of the plant pot. Cocoons were never recovered from within the root system of the host plant. The cocoon resembled that of *X. braunsi*.

### Phenology and voltinism

Although too few adults were reared to allow definite conclusions to be drawn on voltinism, field observations of adults in 2012 through 2014 indicated that *Xenapates braunsi* and *X. gaullei* are multivoltine, with two or three generations per year. Possibly the number of generations depends on prevailing weather conditions. The first generation emerges at the beginning of the main wet season, which lasts from April to late July. In years with early and sustained rainfall such as 2013, a second generation of *X. braunsi* can emerge as early as 11–14 days after the first larvae have burrowed into the ground, i.e. 34–36 days after the egg was laid (Table 1). In *X. gaullei* the equivalent

**Figures 11–18.** *Xenapates* immature stages: Larva; head frontal. **11.** *X. braunsi* **12.** *X. gaullei.* Prepupa; ventral, lateral and dorsal (from left). **13.** *X. braunsi* **14.** *X. gaullei*. Pupa; ventral, lateral and dorsal (from left). **15.** *X. braunsi* **16.** *X. gaullei*. **17.** *X. braunsi*: cocoon containing pupa. **18.** Vacated egg pocket of *X. gaullei*, exuvia of first instar larva visible in perforation, with feeding hole (at left) made by second instar. Scale bars = 1 mm.

**Table 1.** Ex ova rearing chronologies of *Xenapates braunsi* and *X. gaullei*, using respectively *Setaria barbata* and *Commelina communis* as host plants, between 2012 and 2014. Numerous unsuccessful rearings are not listed.

| Year | Introduction of adults to cages | First observation of larvae | Larvae burrowed into soil | Adult emergence |
|---|---|---|---|---|
| *X. braunsi* | | | | |
| 2012 | 26 October | 31 October | 15–17 November (n=3) | No emergence |
| 2013 | 18 May | 23 May | 8–9 June (n=4) | 19–22 June (n=3) |
| 2013 | 03 October | 08 October | 28–30 October (n=9) | 13–14 April 2014 (n=3) |
| *X. gaullei* | | | | |
| 2012 | 4 May | 9 May | 25–26 May (n=4) | No emergence |
| 2013 | 6 June | 11 June | 1–2 July (n=5) | 18–20 July (n=2) |
| 2013 | 27 September | 4 October | 27–28 October (n=4) | 17 April 2014 (n=2) |

period spent in the ground was 19 days, and complete development from the egg took 40–42 days (Table 1). However, in years with normal onset of rain (e.g. 2012 and 2014), the immature stages take longer to develop, and adults of the second generation emerge during the short, less intense wet season that starts between late September and early November. Offspring that have developed during the latter period undergo a prolonged diapause and adults emerge in April of the following year, after having spent about 193 days in the soil in *X. braunsi* and 202 days in *X. gaullei* (Table 1). Under field conditions in southern Benin, three generations were less often observed in *X. gaullei* than in *X. braunsi.* Whereas *X. braunsi* appeared to have an approximately 1:1 sex ratio during the short wet season, females of *X. gaullei* seemed far less frequent than males during the same period. During the long wet season, females were apparently equally frequent in both species. Slight protandry was observed to be usual, in both species.

## Discussion

### Phylogenetic position of Xenapates

The phylogenetic position of *Xenapates* within the Tenthredinidae, as in several other lineages traditionally placed in the Allantinae, remains unclear. *Xenapates* larvae differ from previously described exophytic tenthredinid larvae (Lorenz and Kraus 1957), in lacking on the dorsal annulets of the trunk any cuticular appendages such as tubercles or setae. Other sawfly taxa whose larvae have an extremely reduced complement of macroscopic cuticular structures belong notably to the tribes Waldheimini (e.g. *Waldheimia*) and Blennocampini (e.g. *Tomostethus*) of the Blennocampinae (Smith 1969, Smith and Williams 2014). The complete absence of these structures might be an apomorphy of *Xenapates*. However, as long as this character state remains unknown in most other Afrotropical and Oriental genera placed in the Allantinae and Blennocampinae, its taxonomic significance cannot be evaluated. Of the taxa that were included in the Xenapateini by Koch (1996), only the larva of *Takeuchiella pentagona* Malaise, 1935 has been described (Okutani 1959): annulets 2 and 4 of the abdominal segments carry conical tubercles and setae. In some characters, the larvae of *Xenapates* agree with those of Allantini as characterised by Lorenz and Kraus (1957): antenna with 5 members, clypeus with 4 setae, abdominal segments with 6 annulets, and abdominal prolegs on abdominal segments 2–8 and 10. However, the same combination of character states is also found in some Blennocampinae (Smith 1969). Noteworthy is that the lobed stipes and palpifer of the maxilla of *Xenapates* are found together only in the allantine genera *Allantus* and *Taxonus*, and Tenthredininae (Lorenz and Kraus 1957). On the other hand, larvae of the Allantinae and Blennocampinae taxa described by Lorenz and Kraus (1957) and Smith (1969, 1979) are without setae on the external surface of the abdominal prolegs, whereas *Xenapates* has at least 16 setae. According to Lorenz and Kraus (1957), in the Tenthredinidae some Athaliinae, Nematinae, Selandriinae and Tenthredininae share this character. The abdominal prolegs of the larva of *T. pentagona* are setose only on the inner surface (Okutani 1959). The mandibles of *Xenapates* larvae resemble those of Blennocampinae in that only one mandible has a mesal ridge, rather than the Allantinae, in which both mandibles have a mesal ridge (Smith 1969, 1979). However, in all the Blennocampinae studied by Smith (1969), the right mandible has a mesal ridge, whereas in *Xenapates* it is only developed on the left mandible. *Xenapates* also differs from Allantini in its use of monocots as larval hosts. The easy bleeding trait exhibited by *X. braunsi* and *X. gaullei* larvae is shared by a number of species in various lineages of Tenthredinidae: Athaliinae, Selandriinae, Tenthredininae and particularly the Blennocampinae, but is not known in the Allantinae (Boevé 2009; note subsequent alteration to family group taxonomy by Malm and Nyman 2014). Although we called the structure made by the last larval instar of *Xenapates* a cocoon, one could alternatively regard it as a cell formed in the soil, which is held together by a secretion. Smith (1969) notes that Blennocampinae which enter the ground form a cocoon. On the other hand, Smith (1979) states that Allantinae rarely, if ever, spin cocoons and that those which enter the soil form an earthen cell. However, it has seldom been recorded whether or not any secretion was used to hold the walls together, and perhaps in some cases this does occur.

### Monocots as host plants of Afrotropical sawflies

The spectrum of host plants utilised by Tenthredinoidea is very large, with larvae of most taxa feeding on angiosperms, but a large minority on gymnosperms, and rather fewer on ferns, horsetails and mosses (Liston 1995, Vikberg and Nuorteva 1997). However, most available data on host plant associations relate to the temperate zones of the Palaearctic and Nearctic. Very little is known about host plant associations of Afrotropical sawflies, and the pattern in this region might therefore ultimately prove to be quite different. All hosts of the two *Xenapates* species in this study are placed in the monocots, within a clade called the commelinids, respectively in the Commelinaceae of the Commelinales (*X. gaullei*) and Poaceae of the Poales (*X. braunsi*) (APG 2009). Worldwide, the number of tenthredinoid lineages so far known to be attached to monocots in general, and grasses (Poales) in particular, is relatively low. The grass-feeders comprise only some tenthredinid species in the Holarctic and partly Oriental genera *Selandria*, *Dolerus* (Selandriinae), *Eutomostethus* (Blennocampinae), *Tenthredo*, *Tenthredopsis* (Tenthredininae) and *Euura* (as *Pachynematus* in Lorenz and Kraus 1957; see Prous et al. 2014 on generic placement) (Nematinae) (Lorenz and Kraus 1957). As far as we are aware, *X. braunsi* is so far the only sawfly whose larvae have been found feeding on *Zea mays*.

Until now, only one record existed of an Afrotropical sawfly species using a member of the Poales as a larval host. Larvae of a *Distega* species (Blennocampinae), identified as *Distega* aff. *nigeriae* Fors.[ius, 1927], were stated to feed on "Mil" (French for millet; cultivated *Pennisetum* spp.) in Senegal by Risbec (1950). He noted that during his stay in Senegal, feeding damage to crops by this sawfly did not seem very significant. It is difficult, because of the brevity of the published information and lack of voucher material, to assess the accuracy of identification of the sawfly involved in this record. In particular, it is not stated whether adults were reared from the larvae. The drawing of the larva in Risbec (1950) lacks any indication of the presence of cuticular processes on the dorsum, and its very strongly developed prothoracic lobes also closely resemble those of *X. braunsi*, which in this study was found to use *Pennisetum* as a host. Furthermore, Risbec referred only to the presence of setae on the front of the head and on the abdominal prolegs, not mentioning any setae on other parts of the body. This resembles the distribution of setae that we observed in *Xenapates* larvae. The velvety appearance of the cuticle described by Risbec suggests that it, too, was an easy bleeder. On the other hand, his larvae exhibited a conspicuous row of lateral black spots, just above the spiracles, which are not found in *X. braunsi* or *X. gaullei*. We conclude that Risbec's identification of *Pennisetum* as a host of *Distega* requires reinvestigation, because the sawfly larva involved may have been misidentified.

In the Holarctic, some species of Selandriinae and Nematinae whose larvae feed on Poaceae reach levels of abundance sufficient to make them ecologically important in grasslands (for example, the larvae are a major source of nutrition for some bird species: Potts 1986), and occasionally they may damage crops of grass fodder (Mühle and Wetzel 1965), or grain crops (Miller and Pike 2002). It remains to be seen, if grass-feeding sawflies perform similar roles in the Afrotropical Region.

## Conclusions

All four of the larval hosts of *X. braunsi* identified in this study are of greater or lesser importance as cereal or fodder crops in Benin and throughout tropical and sub-tropical Africa (Akoegninou et al. 2006). The host plants of *X. gaullei* are also of direct interest to man. Leaves of *Commelina benghalensis* are eaten as a vegetable in Africa and parts of Asia (Grubben and Denton 2004), whereas *C. communis* is better known internationally as a troublesome invasive weed, for example in parts of Europe and North America (Zheng et al. 2006). Both *Xenapates* species could therefore be regarded as potential crop pests. On the other hand, *X. gaullei* might be a candidate for biological control of invasive *Commelina* spp. We therefore recommend that additional studies on the biology of *Xenapates* species be undertaken. Ideally, some attention should also be paid to identifying the still unknown hosts and larvae of other relatively speciose genera of Afrotropical tenthredinids, such as *Distega*.

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