

## On the presence of the rare *Paragus tibialis* (Fallén, 1817) in Belgium (Diptera: Syrphidae)

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### Abstract

*Paragus tibialis* (Fallén, 1817) is a rare syrphid species in Western-Europe and Belgium. In Belgium, very few records have been published including one century-old record from the north, one 70 year old record from the south and a cluster of more recent observations between 1978 and 1986 from the eastcoast of Belgium. All records now have been critically re-evaluated. No specimens appear to have been collected for the coastal cluster and for several reasons these observations now could be considered doubtful. A nearly 70 year old female *Paragus* subgenus *Pandasyophthalmus* from the Gaume ecoregion is not a *P. tibialis* but a *Paragus haemorrhous* Meigen, 1822. The nearly 100 year old record from the Campine area (Mol, Postel) is confirmed, and another equally old record from the same ecoregion can be added (Turnhout). In 2015, *P. tibialis* was discovered near Arlon in a heathland and a railway yard. Heathland and dune systems are the principal habitats of the species in Western-Europe, but our observations indicate that anthropogenic habitat may be used as well.

**Keywords:** Piemelkrieltje, *Pandasyophthalmus*, heathland, dunes

### Samenvatting

*Paragus tibialis* (Fallén, 1817) ofwel het Piemelkrieltje is een zeldzame zweefvlieg in West-Europa en België. Tot op heden zijn van deze soort in België slechts enkele gegevens gepubliceerd: een aantal meer recente waarnemingen aan de oostkust, en een meer dan een halve eeuw oude waarneming van zowel de Kempen als de Gaume. Een evaluatie van de gegevens van *P. tibialis* in België toonde aan dat voor de waarnemingen aan de Belgische kust (periode 1978-1986) geen bewijsmateriaal beschikbaar is, en dat bovendien om verschillende redenen twijfel is ontstaan over deze waarnemingen. Een bijna 70 jaar oud vrouwelijk exemplaar *Paragus* subgenus *Pandasyophthalmus* uit de Gaume ecoregio dat geboekstaafd stond als *P. tibialis* vertoont kenmerken van *Paragus haemorrhous* Meigen, 1822 waardoor de waarneming komt te vervallen. Enkel de ondertussen bijna 100 jaar oude waarneming uit de Kempen (Mol, Postel) kan bevestigd worden. Bovendien werd een exemplaar uit dezelfde ecoregio (Turnhout) en periode aangetroffen. In 2015 werd *P. tibialis* voor België herontdekt bij Arlon, in de Gaume ecoregio. De soort vliegt hier op een heideterrein en op een treinstation. Heide en duinen vormen samen de voornaamste habitat van deze soort in West-Europa, maar de waarneming bij Arlon toont aan dat ook antropogene habitat gebruikt worden.

### Résumé

*Paragus tibialis* (Fallén, 1817) est un syrphidé rare en Europe occidentale. Pour la Belgique, il y a également très peu de données pour cette espèce. Une observation rapportée il y a une centaine d'années de la Campine (Mol, Postel) est aujourd'hui confirmée et une autre ancienne donnée de la même écorégion (Turnhout) peut être ajoutée. Par contre, une femelle de *Paragus* (*Pandasyophthalmus*) rapportée il y a 70 ans de Gaume n'est pas une *P. tibialis* mais une *Paragus haemorrhous* Meigen, 1822 et des observations faites dans la région côtière entre 1978 et 1986 seraient douteuses. En 2015, *P. tibialis* a été découvert près d'Arlon dans une lande et sur des voies de

chemin de fer. Les landes ainsi que les dunes constituent les habitats principaux de l'espèce en Europe occidentale, mais nos observations indiquent que les habitats liés aux activités anthropiques peuvent également être exploités.

## Introduction

The recent surge in observations of hoverflies (Syrphidae) in Belgium has considerably improved our knowledge of their distributions and statuses (VAN DE MEUTTER, 2011), for example by rediscovering species that were not seen for many decades. Such new findings can be an incentive for the revision of collection material of that species, ultimately generating a changed, sometimes completely new, improved view on that species (e.g., *Chrysogaster rondanii* Maibach & Goeldlin de Tiefenau, 1995: VAN DE MEUTTER, 2015a; *Melanogaster aerea* (Loew, 1843): VAN DE MEUTTER, 2015b). A similar situation now has occurred for the species *Paragus tibialis* in Belgium.

*Paragus tibialis* is a small blackish syrphid with very few observations in Belgium: one century-old record from the north, one 70 year old record from the south and a cluster of more recent observations between 1978 and 1986 from the east coast of Belgium. In an effort to assess the current distribution and status of this fly, the coastal area and nearby sites with similar suitable habitat have been revisited multiple times during the past seven years. None of these visits were successful in finding *P. tibialis*. Unexpectedly, the second author discovered *P. tibialis* at the other side of the country in the Gaume area in 2015. Later, several individuals were found by the first author at a railway yard nearby, indicating the presence of a population.

Critical evaluation of all existing records for *P. tibialis* in Belgium has raised doubt on the reliability of some of these records. Some records proved to be incorrect or insufficiently proven, but a hitherto overseen specimen could be added as well. The conclusion of this work is that a century ago, *P. tibialis* occurred in the Campine area in northern Belgium, but has not been seen there nor elsewhere in Belgium thereafter, until its rediscovery in 2015.

Below we will first give a full account of the arguments why some records of *P. tibialis* are no longer accepted, and secondly we describe the locations and environmental conditions where it was rediscovered in Belgium.

## Material and methods

The list of records of *P. tibialis* to be subjected to evaluation was retrieved from BELSYRPHDAT, the Belgian Syrphidae database which is hosted by the first author. To re-evaluate historical records of *P. tibialis*, the single largest collection of Belgian Syrphidae, at the RBINS in Brussels, was visited to re-identify all *Paragus* subgenus *Pandasyophthalmus*. Identifications are based on information found in state-of-the-art keys (BYGEBJERG & SÖRENSEN, 2009; HAARTO & KERPPOLA, 2007; SPEIGHT & SARTHOU, 2015; VAN VEEN, 2004).

## Results

### Diagnosics

Key identification features to discriminate *P. tibialis* from *P. haemorrhous* are the narrow sternite 4 (Fig. 1) and a comparatively larger genital apparatus, especially the gonostylus, in male *P. tibialis* (illustrated in VERLINDEN, 1991). *Paragus tibialis* can be discerned from *Paragus constrictus* Simič, 1986 by the shape and size of the gonostylus (e.g. BYGEBJERG & SÖRENSEN, 2009). Female *P. tibialis* cannot be told apart from *P. constrictus* nor *P. haemorrhous*. However, some authors (HAARTO & KERPPOLA, 2007; SPEIGHT & SARTHOU, 2015) have suggested *P. tibialis* and *P. constrictus* can be separated from *P. haemorrhous* (both males and females) by the white abdominal hairs (at least some black hairs are present in *P. haemorrhous*), yet we have seen male *P. haemorrhous* from southern Europe with all abdominal hairs whitish, suggesting this trait difference may be sensitive to geographical variation, and needs to be further elaborated on. It remains, however, possible that for Belgian specimens this trait (difference) may work, as the three



Fig. 1. Photographs of the underside of the abdomen of *Paragus tibialis* (left) and *Paragus haemorrhous* (right). Note the difference in shape of sternite 4. (*Paragus tibialis*: Split, Croatia, 25.VII.1970, leg. Verlinden Lucien, det. Verlinden Lucien, coll. Verlinden Lucien /*Paragus haemorrhous*: Stockem (Arlon), Belgium, 31.VII.2015, leg. Van de Meutter Frank, det. Van de Meutter Frank, coll. Van de Meutter Frank). Photographs are made by the first author.

male *P. tibialis* from Stockem (Arlon, this paper) all had white hairs, whereas all Belgian male *P. haemorrhous* in the private collections of the authors (N=8) and the collection of the RBINS (N=36) to a variable extent showed intermixed black hairs on the abdomen. This trait deserves further attention and it would be worth searching for copula of *Pandasyophthalmus* (both *P. haemorrhous* and *P. tibialis* occur here in number) at the Stockem location to further verify this criterion for females. For the time being, and until more evidence is provided, we draw no definite conclusions for females.

#### *Re-evaluation of historical records*

In the collection of the RBINS, all specimens labeled *P. tibialis* or *P. haemorrhous* have been re-identified.

Sixty-eight specimens of *Paragus* subgenus *Pandasyophthalmus* are present in the collection of the RBINS (box N° 16 of the Belgian Syrphidae collection). The box shows a label indicating it has been revised by Lucien Verlinden in December 1979. Sixty-six specimens are grouped under *P. haemorrhous* (36 males, 30 females) and two under *P. tibialis* (Postel [Mol], male, 22.VIII. 1922, leg. anonymous, det. anonymous, coll. RBINS; Croix-Rouge (Etalle), 1 female, 23.VII.1950, leg. anonymous, det. anonymous, coll. RBINS). A revision of all *Paragus haemorrhous* in the RBINS collection revealed that two males belong to a different species. One male is a *P. tibialis* and comes from Turnhout (Liereman, male, 25.IV. 1921, leg. anonymous, det. Van de Meutter Frank, coll. RBINS). The other is a dark male of *P. flammeus* (Aye [Marche-en-Famenne], male, 26.VII.1951, leg. anonymous, det. Van de Meutter Frank, coll. RBINS). The record of the female *P. tibialis* (also shown on the maps in VERLINDEN, 1991; 1994) is to be disregarded as we consider females cannot be identified with certainty until more information is available on the suggested differences. In any case, the specimen shows extensive black pile on the abdomen, contraindicative of *P. tibialis* (HAARTO & KERPPOLA, 2007; SPEIGHT & SARTHOU, 2015). Among the female *Paragus* subgenus *Pandasyophthalmus*, all individuals show mixed black and white hairs on the abdomen except for one individual with white hairs only (Lovegnée [Gives], ravin des Solières, 23.VII.1936, leg. Collart A., det. Collart A., coll. RBINS), which may indicate it is not *P. haemorrhous*.

Five records of *P. tibialis* are reported for Belgium between 1976 and 1986, all from the municipality of Knokke-Heist at the eastern part of the coast (BELSYRPHDAT; VERLINDEN, 1991; 1994). An overview of these records is presented in Table 1. No specimens are known to have been collected and preserved. The first two records are by Bart Vandepitte, but for the latter three observations the observer is unknown. Two records are nearly identical (3.VIII.1976, Park 58, Knokke-Heist) and may be duplicates. The above mentioned observer could not be contacted as he has moved abroad, but it is very unlikely that any material has remained, if it ever was collected. It is, thus, in the absence of any material, impossible to tell whether the observed specimens belonged to *P. tibialis*, its then unknown ally *P. constrictus*, or even *P. haemorrhous*. In the absence of pinned specimens or similarly good

evidence, in the light of the possibly limited expertise of the single known observer (we find 60 records of rather common species in the database under his name) and because of the lack of observations of *P. haemorrhous* in this set of records (it may be relevant to mention that *P. tibialis* has long been the taxon name for all three above mentioned *Pandasyopthalmus* species), there remains too little evidence to retain the records of this rare species in Table 1.

Table 1. Chronological overview of all reports of *P. tibialis* in the Belgian coastal region. Column headings are self-explanatory.

Date	#males	#females	Tot_adults	Locality	Toponym	Leg. & det.
16/08/1978	0	0	1	Knokke	Park 58	Bart Vandepitte
3/08/1979	0	0	1	Knokke	Park 58	Bart Vandepitte
3/08/1979	0	0	2	Knokke	Park 58	Anonymous
15/08/1986	0	0	1	Knokke-Heist	Zwin	Anonymous
3/09/1986	0	0	2	Knokke-Heist	Zwin	Anonymous

### New observations

During a field trip on 21.VII.2015 mainly looking for bees, the second author found a male *P. tibialis* at Stockem (Arlon) visiting the flowers of *Thymus pulegioides*. This location is at the top of a sandy outcrop surrounded by some hectares of heathland. This site is divided from the larger heathlands of the military camp “Lagland” by the international highway E411. Despite being a rather small area, this site abounds in rare heathland insects, such as *Decticus verrucivorus* Linnaeus, 1758 and *Bembix rostrata* (Linnaeus, 1758) indicating its high faunistic value.

On 31.VII.2015, the first author visited the same locality and found a female *Paragus pecchiolii* Rondani, 1857 and 21 (14 male, 7 female) *Paragus haemorrhous* but no *P. tibialis*. Inspection of the close by abandoned sand pit of Stockem with seemingly suitable habitat again revealed a number of *P. haemorrhous* only.

Finally, at the railway yard of Stockem, some 1.8 km northeast of the first location, three males of *P. tibialis* were found among a large number of *P. haemorrhous* (>40). As for most railway yards, the foreign substrate (sand, stones) here forms a xerothermic environment with a sparse vegetation of e.g. *Festuca* sp., *Conyza* sp. and locally some larger *Rubus* sp. and *Betula* sp.

A map showing all 5km grid cells containing currently accepted records of *P. tibialis* in Belgium is shown in figure 2.



Fig. 2. Map of Belgium indicating the UTM 5km squares with reviewed and accepted records for *P. tibialis*. Open circles indicate historical records (prior to 1980), black squares indicate records since 1980.

## Discussion

*Paragus tibialis* is a rare syrphid in Western-Europe. Its exact distribution is poorly known because of confusion with *P. constrictus*, but it is now confirmed from most countries (Norway, Sweden, Denmark, France, Germany, the Netherlands and England). In southern Europe, *P. tibialis* is a rather common species in both natural and anthropogenically disturbed habitats, but in Western Europe it is a habitat specialist of natural, open, sandy places within heathlands, and in dune systems (BALL *et al.*, 2011; REEMER *et al.*, 2009; TORP, 1994). The above natural habitats are in decline or otherwise in a deteriorated state in Western-Europe (WEBB, 1998; ODÉ *et al.*, 2001) and this may be one of the reasons why this species is or has become (very) rare (BALL *et al.*, 2011; DOCZKAL *et al.*, 1993;

REEMER *et al.*, 2009; STUKE *et al.*, 1998). This study reveals that in Belgium, the situation is not much different: all historical finds are in the Campine area – the hotspot area of heathland and inland dune systems in Belgium. The contemporary population(s) is at or near the heathlands around Arlon, that for some reasons seem to have preserved much of the historical heathland fauna.

Since two decades, several species of the genus *Paragus* are prospering in Belgium: *Paragus albifrons* (Fallén, 1817), *Paragus bicolor* (Fabricius, 1794) and *Paragus quadrifasciatus* Meigen, 1822 all have recently expanded in number and distribution in Belgium (Van de Meutter F., unpublished results). The majority of *Paragus* species in Europe are xerothermophilous species and this may relate to the observed shift in their distribution, probably in response to a changing climate. On their way northwards they make use of heath islands in our landscapes (railways, quarries, cities,...). In view of that, the first author systematically collected and identified *Pandasyophthalmus* in Belgium at sites where some of the above *Paragus* species have appeared during the past 10 years, but all catches turned out to be *P. haemorrhous*. We neither know of foreign reports of *P. tibialis* expanding recently, as other *Paragus* species seem to do. Despite being a primarily southern species in Europe that could benefit from the changing climate, we therefore currently assume the population(s) of *P. tibialis* near Arlon to be relics rather than the forefront of new colonizations.

A female *Pandasyophthalmus* caught near Lovegnée in the collection of RBINS exhibited only white hairs on the abdomen, which may indicate it is a *Pandasyophthalmus* species other than *P. haemorrhous*. Even if this trait would prove reliable, the identity of this *Pandasyophthalmus* remains undecided, because *P. tibialis* and *P. constrictus* females cannot be told apart. It may be of interest that habitats in and around Lovegnée are rather different from the sandy heathlands or dune systems at the sites where *P. tibialis* has been observed so far. Further research and explorations are needed to first establish whether the collected female indeed is not a *P. haemorrhous*, and second to find out whether *P. tibialis* or maybe *P. constrictus* can be found at other places and possibly in other habitats in Belgium, such as Lovegnée.

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