

On the genus *Potthastia* Kieffer, 1922 from Corsica and continental France with description of three new species [Diptera, Chironomidae, Diamesinae]

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According to ASHE & O'CONNOR (2009), SÆTHER & SPIES (2013), the genus *Potthastia* Kieffer, 1922 is represented worldwide by four species: *P. gaedii* (Meigen, 1838); *P. longimanus* Kieffer, 1922; *P. montium* (Edwards, 1929) and *P. pastoris* (Edwards, 1933). The male and female imagoes and the pupal exuviae of the four latter *Potthastia* species are examined and reviewed, based on a large material collected in Corsica and continental France between 1975 and 2015. Additional material composed of stored slides previously collected between 1980 and 1997 in Lebanon and Algeria is also studied that enriched our knowledge and updated the list of known *Potthastia* species from these two countries. In this paper a description of three new species (*P. dominicii* sp. n., *P. giudicellii* sp. n., *P. valserina* sp. n.) is provided based on a material recently collected in the rhithral of some pristine permanent low mountain streams and rivers respectively located in western Corsica, the Pyrenees and the Jura Massif. While *P. dominicii* sp. n. and *P. giudicellii* sp. n. are described as male and female adults and pupal exuviae, only the description of the male adult of *P. valserina* sp. n. is provided.

Male imaginal and pupal characters of *P. dominicii* sp. n. are quite similar to those of *P. gaedii*. Based on some features found in the male adult of *P. giudicellii* sp. n. this new species is keyed near *P. montium*. The male adult of *P. valserina* sp. n. is keyed near *P. gaedii* and *P. longimanus*. While *P. dominicii* sp. n. is known from both Corsica and the Pyrenees, the geographical distribution of *P. giudicellii* sp. n. is apparently restricted to the western Province of Corsica. *P. valserina* sp. n. is only known from its type locality, which is situated in the Valserine karstic stream (Jura Massif). Consequently, the description of *P. dominicii* sp. n., *P. giudicellii* sp. n. and *P. valserina* sp. n. increases the total number in the genus to six for Corsica and continental France. Currently, there are three *Potthastia* species known from Lebanon (*P. gaedii*, *P. longimanus* and *P. pastoris*) and only two from Algeria (*P. gaedii* and *P. pastoris*).

Additional material, obtained more recently from Corsica, continental France and Lebanon revealed the presence of three more undescribed species including two distinct new morphotypes (*P. sp. 1* and *P. sp. 2*, *gaedii*-group) and one other distinct male adult labelled as *P. sp. 3* (*montium*-group). The first morphotype (*P. sp. 1*) is known from Corsica, the Pyrenees and the Maritime Alps, while the second (*P. sp. 2*) is reported from Lebanon. The male adult of *P. sp. 3* is only known from Corsica. Therefore, the recent updated list of 740 species provided by MOUBAYED-BREIL & ASHE (2016) on the Chironomidae of continental France, is currently upgraded to 742 known valid species, which actually include the two new species *P. dominicii* sp. n. and *P. valserina* sp. n.

For each of the seven currently known valid *Potthastia* species mensural features and main distinguishing characters of the male adult and pupal exuviae are provided in Tables I (male adults p. 35) and II (pupal exuviae p. 36) which can supplement and correct some previous data from the literature. Taxonomic Remarks on some related species with key to male adults and pupae, discussion and comments on the ecology and geographical distribution of the new species are provided.

Sur le genre *Potthastia* Kieffer, 1922 connu de Corse et de France continentale avec la description de trois nouvelles espèces [Diptera, Chironomidae, Diamesinae]

Mots-Clés : genre *Potthastia*, nouvelles espèces, Diptera Chironomidae, biogéographie, conservation.

Le genre *Potthastia* Kieffer, 1922 est représenté seulement par quatre espèces au niveau mondial (ASHE & O'CONNOR, 2009, SÆTHER & SPIES, 2013). Il s'agit de : *P. gaedii* (Meigen, 1838) ; *P. longimanus* Kieffer, 1922 ; *P. montium* (Edwards, 1929) ; *P. pastoris* (Edwards, 1933). Les adultes mâle et femelle et l'exuvie nymphale des quatre espèces précédemment citées sont examinés et revus à partir d'un large matériel collecté en Corse et en France continentale entre 1975 et 2015. L'examen de plusieurs montages microscopiques de *Potthastia* en provenance du Liban et d'Algérie (1980-1997) nous a également permis d'enrichir nos connaissances taxonomiques sur ce genre et de réactualiser la liste d'espèces connues de ces deux pays. Dans ce travail, la description de trois nouvelles espèces de *Potthastia* est effectuée à partir d'un matériel collecté récemment dans le rhithral de certains ruisseaux froids permanents de Corse (Asco, Regino, Focolara, Prezzuna, Fangu, Porto, Rizzanèze, Restonica, etc.), des Pyrénées (Massane, Tech, Têt, Nohèdes, Saison, Videssos, Gave de Pau, Adour, etc.) et du Massif du Jura (Valserine). Les adultes mâle et femelle et l'exuvie nymphale de *P. dominicii* sp. n. et de *P. giudicellii* sp. n. sont décrits à partir d'un matériel composé de pharates et d'exuvies nymphales. Seule la description de l'adulte mâle de *P. valserina* sp. n. est fournie.

Les caractères de l'adulte mâle et de l'exuvie nymphale de *P. dominicii* sp. n. se rapprochent de ceux de *P. gaedii*. L'adulte mâle et l'exuvie nymphale de *P. giudicellii* sp. n. ressemblent à ceux de *P. montium*. Sur la base de certains caractères déterminants chez l'adulte mâle de *P. valserina* sp. n., cette nouvelle espèce se place près de *P. gaedii* et *P. longimanus*. Alors que *P. dominicii* sp. n. est connue de Corse et des Pyrénées, l'aire de distribution géographique de *P. giudicellii* sp. n. est apparemment limitée à la province occidentale de la Corse. *P. valserina* sp. n. n'est actuellement connue que de la rivière Valserine (localité type) située dans le Massif du Jura. Par conséquent, la description de *P. dominicii* sp. n., *P. giudicellii* sp. n. et de *P. valserina* sp. n. porte le nombre total des espèces appartenant au genre *Potthastia* à six en Corse et en France continentale. Par ailleurs, trois espèces de *Potthastia* sont actuellement connues du Liban (*P. gaedii*, *P. longimanus* et *P. pastoris*) et seulement deux d'Algérie (*P. gaedii* et *P. pastoris*). Toutefois, la liste de **740** espèces, récemment réactualisée par MOUBAYED-BREIL & ASHE (2016) sur les Chironomidae connus de France continentale, regroupe maintenant **742** espèces valides dont font partie *P. dominicii* sp. n. et *P. valserina* sp. n..

Les larves de toutes les espèces appartenant au genre *Potthastia* sont exclusivement rhéophiles et colonisent de préférence les habitats lotiques délimités par les radiers et les chutes de faible dénivelé. Celles de *P. dominicii* sp. n. et de *P. giudicellii* sp. n. sont typiquement sténothermes d'eau froide, principalement du rhithral ombragé des ruisseaux de basse et de moyenne montagne riches en cascades et en radiers de petite taille. En Corse et dans les Pyrénées Orientales et Occidentales, ces deux nouvelles espèces se rencontrent dans des habitats où l'on note : - une forte minéralisation de l'eau (conductivité 350-420 µS/cm) ; - un écoulement permanent avec un apport important d'eau phréatique ; eau de surface constamment froide (température 8-12 °C) ; - des secteurs ombragés riches en cascades et en radiers de petite taille ; - une abondante microflore algale composée de Chlorophycées, Xanthophycées, Cyanophycées et surtout une riche couverture biologique de l'algue rouge *Hildenbrundia rivularis*.

Selon les données fournies dans ce travail, l'aire de distribution de *P. giudicellii* sp. n. semble se restreindre aux cours supérieurs des ruisseaux délimités par l'écosystème côtier insulaire de la façade occidentale de la Corse (Prezzuna et Focolara, altitude 30-650 m) alors que celle de *P. dominicii* sp. n. est beaucoup plus étendue aux ruisseaux et rivières que délimite l'écosystème méditerranéen côtier (altitude 30-1000 m) de Corse et des Pyrénées. Dans ces deux contrées biogéographiques, *P. dominicii* sp. n. se rencontre dans des habitats plus variés et répartis selon un gradient altitudinal beaucoup plus vaste. Sa présence est notée dans les bassins versants de Corse (Asco, Regino, Focolara, Prezzuna, Fangu, Porto, Rizzanèze, Restonica) et des Pyrénées (Massane, Tech, Têt, Nohèdes, Saison, Videssos, Gave de Pau, Adour).

Les bassins versants de la Prezzuna et du Focolara font partie intégrante du Parc Régional de Corse et de l'écosystème côtier insulaire qui délimite certains affluents représentatifs de la province occidentale Corse. Ces derniers sont à la fois difficilement accessibles, mais surtout bien préservés et épargnés de l'impact des diverses perturbations (crues accidentelles, activités humaines, écotourisme, modification des habitats, etc.). Ils sont fortement protégés par plusieurs chaînes de montagne dressées comme des barrières géographiques : - au nord, le Monte Cintu (2706 m) ; - au sud et au sud-est, Paglia Orba (2525 m) et Monte Rotando (2622 m). Celles-ci assurent à la fois un isolement biogéographique et un environnement aquatique favorables et très bénéfiques au développement et à l'épanouissement d'espèces remarquables comme *P. giudicellii* sp. n., *P. dominicii* sp. n. ainsi qu'à d'autres espèces indicatrices ou d'intérêt patrimonial telles que : *Corynoneura tyrrhena* Moubayed-Breil, 2016 ; *Orthocladius vicentei* Moubayed-Breil, 2013 ; *Pseudorthocladius* sp. 1 (sp. n.) ; *Rheocricotopus thomasi* Moubayed-Breil, 2016 ; *R. meridionalis* Moubayed-Breil, 2016 ; *Trissocladius orsinii* Moubayed-Breil & Ashe, 2015 ; *Rheotanytarsus dactylophoreus* Moubayed-Breil, Langton & Ashe, 2012 ; *Paratanytarsus corsicanus* Moubayed-Breil, Ashe & Langton, 2012. Pour chacune des six espèces de *Potthastia* examinées, des mensurations ainsi que des données sur les principaux caractères distinctifs de l'adulte mâle et de l'exuvie nymphale sont regroupées dans deux tableaux : adulte mâle (Tableau I p. 35), exuvie nymphale (Tableau II p. 36). Enfin, des clés d'identification se rapportant aux adultes mâles et aux exuvies nymphales de chacune des six espèces de *Potthastia* sont également élaborées. Un commentaire et des discussions sur la position systématique, l'écologie, la conservation et la distribution géographique des deux nouvelles espèces sont fournis.

1. Introduction

Based on knowledge provided on the taxonomy, geographical distribution and ecology of the known *Potthastia* species from Europe and the Palaearctic Region (SERRA-TOSIO 1969, 1971a, 1971b, 1973, SÆTHER 1977, FERRERERESE & ROSSARO 1981, DOUGHMAN 1985, MAKARCHENKO 1985, OLIVER 1986, 1989, LANGTON & MOUBAYED 1990, LANGTON & PINDER 2007, ASHE & O'CONNOR 2009, SÆTHER & SPIES 2013, MOUBAYED-BREIL & ASHE 2016), the genus *Potthastia* Kieffer, 1922 comprises worldwide four valid species: *P. gaedii* (Meigen, 1838); *P. longimanus* Kieffer, 1922; *P. montium* (Edwards, 1929) and *P. pastoris* (Edwards, 1933). The male and female imagoes and the pupal exuviae (Pe) of the four latter *Potthastia* species are examined and reviewed, on the basis of a large material recently collected in Corsica and continental France between 1975 and 2015. Additional material composed of stored slides of *Potthastia* species previously collected between 1980 and 1997 in Lebanon and Algeria is also studied that enriched and updated our knowledge on this genus from these two countries. On the other hand, the presence of few distinctive adults and morphotypes collected in Corsica, continental France and Lebanon allowed us to dedicate a first taxonomic note to the genus *Potthastia*, which includes exclusively rheophilic species mainly encountered in lotic habitats delimited by the rhithral of both middle and down basins of streams and large rivers.

In this paper a description of three new species (*P. dominicii* sp. n., *P. giudicellii* sp. n. and *P. valserina* sp. n.) is provided based on a material recently collected in the rhithral and potamal of some permanent mountain rivers and pristine streams located in the western Province of Corsica (Focolara and Prezzuna, Regional Park of Corsica), the Pyrenees (E-Pyrenees: Massane, Tech, Têt, Nyer, Mantet, Nohèdes. W-Pyrenees: Saison, Vicdessos, Gave de Pau, Adour) and the Jura Massif (Valserine River). While *P. dominicii* sp. n. and *P. giudicellii* sp. n. are described as male and female adults and pupal exuviae, *P. valserina* sp. n. is only described as male adult.

Male imaginal and pupal characters of *P. dominicii* sp. n. are quite similar to those of *P. gaedii* (anal point distinctly elongated and narrowed, crista dorsalis consisting of two lobes; thorax of the Pe densely covered with granulations, abdomen with numerous forked lateral setae, apical projection of anal lobe entirely toothed, macrosetae with curved apex). Based on main features found in the male adult and the male Pe of *P. giudicellii* sp. n. (anal point broad and sub-triangular, dorsal tubercle on apical part of gonocoxite present; Pe lacking granulations on thorax, abdomen bearing few forked lateral setae, only the anterolateral area of the apical projection is toothed, macrosetae with straight apex), this new species is keyed near *P. montium*. The male adult of *P. valserina* sp. n. is bearing some relevant characters found also in those of both *P. gaedii* and *P. longimanus*: phallapodeme paddle-like and anal point present as in *P. gaedii*; sternapodeme arc-shaped, inferior volsella with one distinct lobe and crista dorsalis consisting of one large blackish lobe placed proximally as in *P. longimanus*.

While the first new species (*P. dominicii* sp. n.) is occurring in both Corsica and the Pyrenees, the geographical distribution of the second (*P. giudicellii* sp. n.) is apparently restricted to the western Province of Corsica. The third new species (*P. valserina* sp. n.) is currently only known from the Valserine karstic River (Jura Massif) where the holotype was collected. Consequently, the description of *P. dominicii* sp. n., *P. giudicellii* sp. n. and *P. valserina* sp. n. increases the total number in the genus to 6 for both Corsica and continental France. Currently, there are three *Potthastia* species known from Lebanon (*P. gaedii*, *P. longimanus* and *P. pastoris*) and only two from Algeria (*P. gaedii* and *P. pastoris*). Therefore, *P. pastoris* can be considered as a circummediterranean element, which is actually reported for the first time from Corsica, continental France, Algeria and the Near Eastern Region.

Other additional material, more recently obtained from Corsica, continental France (central and southern sub-regions) and Lebanon revealed the presence of three more distinctive new species, which includes two new morphotypes (*P. sp. 1* and *P. sp. 2*, *gaedii*-group) and one other distinct male adult labelled as *P. sp. 3*. The first morphotype (*P. sp. 1*) is collected in Corsica, the Pyrenees and the Maritime Alps. The second (*P. sp. 2*) is occurring only in some coastal streams located in Lebanon (central and northern areas). The male adult of *P. sp. 3*, collected in the Prezzuna stream (E-Corsica), belongs to the *montium*-group. Therefore, the recent updated list of **740** species provided by MOUBAYED-BREIL & ASHE (2016) on the Chironomidae of continental France is currently increased to **742** known valid species, which actually include *Potthastia dominicii* sp. n. and *P. valserina* sp. n.

Main distinguishing characters and mensural features of the male adults and male Pe of the 7 reviewed *Potthastia* species are provided in Tables I (male adults, p. 35) and II (male Pe, p. 36). The three new described species (*P. dominicii* sp. n., *P. giudicellii* sp. n., *P. valserina* sp. n.) and the remaining reviewed members of the genus *Potthastia* including the new morphotypes (*P. sp. 1* and *P. sp. 2*) and the male adult of *P. sp. 3* can be classified into three tentative groups primarily based on both imaginal and pupal features as follows:

- the *gaedii*-group, includes *P. gaedii*, *P. dominicii* sp. n., the two morphotypes *P. sp. 1* and *P. sp. 2* and the male adult of *P. valserina* sp. n.;
- the *montium*-group, includes *P. giudicellii* sp. n., *P. montium* and the male adult of *P. sp. 3*;
- the *pastoris*-group, includes *P. pastoris* and probably *P. longimanus*.

For each of the six examined *Potthastia* species including the four currently known valid species from the Palaearctic Region (*P. longimanus*, *P. montium*, *P. gaedii* and *P. pastoris*), some of the differentiating features provided in the literature can be supplemented or corrected

based on the recapitulated combination of characters illustrated in Tables I-II. Moreover, additional mensural features and morphological database are also given in the latter two tables. Nevertheless all the *Potthastia* species, examined, described or reviewed here (male and female adults and male Pe), belong, in one hand to the type material of both *P. dominicii* sp. n., *P. giudicellii* sp. n. and *P. valserina* sp. n., and in another hand, to that of the previously cited *Potthastia* species, which are listed and geographically distributed as below:

- *P. dominicii* sp. n., *P. longimanus* and *P. montium*: associated male and female pharate adults and Pe collected in Corsica (Asco, Regino, Marsolino, Fangu, Piriù, Prezzuna, Focolara, Porto, Restonica, Rizzanèze) and continental France (E-Pyrenees: Massane, Tech, Têt, Nyer, Mantet, Nohèdes; W-Pyrenees: Saison, Vicdessos, Pau, Adour);

- *P. giudicellii* sp. n.: associated male and female pharate adults and Pe collected in W-Corsica (Focolara and Prezzuna streams);

- *P. gaedii* and *P. pastoris*: associated male and female pharate adults, Pe previously collected in Corsica, continental France, Lebanon and Algeria;

- *P. valserina* sp. n.: male adult, probably *gaedii*-group, (Valserine River, Jura Massif, Auvergne-Rhone-Alps Region, zone 4b as given in MOUBAYED-BREIL & ASHE 2016);

- *P. sp. 1* and *P. sp. 2* (male morphotypes): *gaedii*-group: Pe golden brown, tergite I bearing or occasionally lacking rows of small smooth spines, conjunctives present on tergites I/II-VII/VIII and sternites III/IV-VII/VIII, posterior transverse rows of spines and fields of point are present on tergites II-VIII and sternites III-VIII (East and W-Corsica, Pyrenees, Maritime Alps, Lebanon);

- *P. sp. 3* (male adult): *montium*-group, dorsal tubercle present on apical part of gonocoxite, gonostylus large and narrowed distally, resembles that of *P. giudicellii* sp. n. (rhithral, Prezzuna stream, W-Corsica).

Larvae of *P. dominicii* sp. n. and *P. giudicellii* sp. n. are both rheophilic species commonly encountered in lotic habitats delimited by the rhithral and potamal of streams and large rivers. Localities where material was collected consist of shaded pristine stretches and cold mountain streams including waterfalls and small riffles on stony to gravely and sandy substrata. Bryocolous and hygropetric habitats including waterfalls probably represent the most common aquatic areas for larval populations. Such lotic habitats, which are endangered by ecotourism and both natural and accidental flooding, deserve much greater consideration, protection and preservation. The new species are typically rheophilic and representative of helocrenes and cold stenothermic streams. They belong to the crenobiontic and crenophilous community of species as documented by LINDEGAARD (1995).

Geographical distribution of *P. giudicellii* sp. n. and *P. valserina* sp. n. is apparently restricted to pristine and well preserved streams located in western Corsica and the Jura Massif, while *P. dominicii* sp. n. is likely more widespread and occurring in the rhithral of streams and rivers located in both Corsica and the Pyrenees. In particular, lotic habitats delimited by the upper and middle basins of Focolara and Prezzuna streams (W-Corsica) where populations of *P. giudicellii* sp. n. are encountered, consist of a significantly spared area from the impact of various perturbation factors including accidental flooding, human activities, ecotourism, modification of habitats, etc. Moreover, this well preserved area is entirely surrounded by three high geographical barriers, which provide favourable ecological conditions and beneficial local protection and isolation:

- to the north, Monte Cintu (2706 m);

- to the south and south-east, Paglia Orba (2525 m) and Monte Rotando (2622 m).

Terminology and measurements follow that of SÆTHER (1980) for the imagines and pupal exuviae. Remarks and discussion on some related *Potthastia* species with key to male adults and pupae and comments on the ecology and geographical distribution of the new species are given.

2. Material and methods

Imagines belonging to Diamesinae including in particular those of the genus *Potthastia* consist in general of more or less thickly structured species (especially the thorax and abdomen), which take a minimum of 60 minutes to be cleared up. Material composed of adults were cleared of musculature in 90% lactic acid (head, thorax, abdomen and anal segment) for about 60 to 80 minutes, which can be left overnight at room temperature without any detrimental effect or damage. The specimens were checked under a binocular microscope after 20 minutes in lactic acid to determine how the clearing was progressing. When clearing was complete the specimens were washed in two changes of 70% ethanol to ensure that all traces of lactic acid were removed. Compared to clearing with potassium hydroxide, or other clearing solutions, no deterioration of the typical "original" structure is reported by using lactic acid. All examined material (adults and pupal exuviae) was mounted in polyvinyl lactophenol; remaining material including paratypes was preserved in 70 % ethanol.

The eye on one side has been dissected from the head, which ensures that the hairs on the inner margin of eye are more clearly visible.

Before the final slide mountings (dorsally) of the type and paratype material, the hypopygium, the female genitalia and the abdomen of the Pe were viewed ventrally and laterally to examine and draw in both sides all the necessary details of the species:

- in the male adult, the IXth tergum, the anal point, the gonocoxite and the gonostylus;
- in the female adult, the genitalia including the gonapophysis VIII with different lobes, the sternite VIII, the IXth tergum and cercus;
- in the Pe, the chaetotaxy, armament and distribution pattern of shagreen, rows of spines and spinules on segments including conjunctives.

The abdomen of the Pe of all members of the genus *Potthastia* and those of some other genera including some Diamesinae (*Diamesa*, *Pseudodiamesa*, etc.) and Orthoclaadiinae (*Chaetocladius*, *Corynoneura*, *Eukiefferiella*, *Heleniella*, *Krenosmittia*, *Orthocladus*, *Parametriocnemus*, *Pseudorthocladus*, *Thienemanniella*, etc.) is characterized by a complex distribution pattern of armament on both tergites and sternites. Therefore, for a better examination of the specific features and for a more accurate description of the various taxonomic details of armament, a high number of the examined abdomen of Pe were mounted not only in dorsal and ventral view but separately in lateral view, which seems to illustrate accurately all the necessary relevant taxonomic characters.

3. Descriptions

• *Potthastia dominicii* Moubayed-Breil & Orsini sp. n.

Material examined

Holotype. **Corsica.** Prezzuna stream, waterfalls and rhithral, altitude 300-650 m, pharate adults, leg. J. Moubayed-Breil, 05.06.2015.

Paratypes (all leg. J. M-B). **Corsica.** Prezzuna stream, waterfalls and rhithral, altitude 300-650 m, 2 male adults in alcohol, pharate adults (2 males, 3 females), Pe (5 males, 6 females), 05.06.2015. Asco stream, rhithral and waterfalls, 50-100 m, pharate adults (1 male, 1 female), Pe (3 males, 2 females), 07.VI.2015. Focolara stream, W-Corsica, Nature Reserve of Scandola, Regional Parc of Corsica, rhithral and waterfalls, conductivity 420 $\mu\text{s}/\text{cm}$, water T °C 8-12, 30-250 m; Pe (1 male, 1 female), leg. J. Moubayed-Breil, 26.IV.2012. Fangu River, waterfalls and rhithral, altitude 650-850 m, pharate adults (1 male, 1 female), Pe (2 males, 2 females), 03.05.2015. Porto stream, waterfalls and rhithral, 150-350 m, pharate adults (1 male, 1 female), Pe (2 males, 1 female), 28.04.2012. Restonica River, waterfalls and rhithral, 650-850 m, pharate adults (2 males, 1 female), Pe (2 males, 3 females), 08.09.2014. Rizzanese River, waterfalls and rhithral, altitude 100-250 m, pharate adults (1 male, 1 female), Pe (1 male, 2 females), 07.09.2012. **Continental France** (biogeographical zones are cited as provided in MOUBAYED-BREIL & ASHE 2016). Massane stream, Massane Nature Reserve, W-France, Eastern Pyrenees (zone 8b), rhithral and waterfalls, 650-750 m, Pe (1 male, 1 female), 11.V.2004. Massane stream, rhithral and waterfalls, 100-500 m, pharate adults (2 males, 3 females), 09.06.2013, E-Pyrenees (zone 8b). Tech River, rhithral and waterfalls, 300-850 m, Pe (1 male, 1 female), 05.06.2002, E-Pyrenees (zone 8b). Saison River, gorges of Kakueta, rhithral and waterfalls, 350-500 m, pharate adults (3 males, 2 females), Pe (1 male, 2 females), 23.V.1987, Western Pyrenees (zone 6b).

Holotype (on one slide, including the male adult and its pupal skin), paratypes (two slides with 2 additional male and female Pe, Prezzuna and Porto streams) are deposited in the collections of the National Museum of Ireland, Kildare Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection. Type material was preserved in 75% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid before mounting on slides.

Etymology: the new species is named *domicii* after our colleague J.-M. Dominici (Regional Park of Corsica) who kindly provided help, hospitality and support on the ground to collect the material of the new species. He is active as head director of the Nature Reserve of Scandola, which is considered as the most preserved marine and terrestrial areas in Corsica.

Diagnostic characters

P. domicii sp. n. is keyed near *P. gaedii* in the male adult (anal point elongated and narrowed distally) and Pe (colour brown in general, thorax with dense granulation, abdomen bearing many forked lateral setae, tergite I bearing few rows of smooth spines, macrosetae with curved apex). It can be separated from the other related members of the genus on the basis of the following features found in the male and female adult and Pe.

- In the male adult. Temporal setae 8 (6 outer verticals and 2 postorbitals). Anteprenotals 9-10. AR 2.10-2.30. Wing with blackish anterior veins, squama with 55-60 setae in 1-3 rows. Tergite IX large and bilobed laterally; anal point markedly present, slender and hairy with rounded apex. Gonocoxite. Dorsally: apex truncate; medially bearing a plate-like superior volsella, sub-triangular with a distinct nose-lobe apex which is bent downwards; distally with 2 separate roughly shaped inferior volsella distinctly visible in dorsal and lateral view. Ventrally: base rounded and smooth, with stout setae; ventral margin concave medially, bilobed distally. Gonostylus elongated and nearly linear, crista dorsalis blackish and bilobed, proximal lobe much larger.

- In the female adult. Antenna. Last flagellomere parallel-sided in its $\frac{1}{2}$ proximal part and narrowed distally, with an apical seta at short distance to apex, antennal groove absent, apical seta inserted pre-apically, AR 0.75-0.78. Anterior wing veins blackish, as in the male; squama

with 35-38 setae in 1-2 rows. Dorsomesal lobe entirely swollen, ventrolateral lobe sub-rectangular, apodeme lobe arc-like; sternite VIII with 24-26 setae (12-13 on each side); presence of 3 seminal capsules, spherical, well sclerotized in both lateral and dorsoventral part; tergite IX distinctly divided in 2 semi-circular lobes, bearing 22-24 setae on each lobe.

- In the Pe. General colour golden to brownish, anal lobe not wrinkled, genital sac blackish. Frontal setae very long, 340-380 μm long; frontal apotome domed and bearing granulation; cephalothorax with dense granulation, Dc_1 distinctly forked; distance between Dc_2 and Dc_3 410-450 μm ; abdomen with numerous forked lateral setae; apophyses absent; tergite I with 1-2 rows of small smooth spines; posterior transverse rows of spines and fields of points present on tergites II-VIII and sternites III-VIII; conjunctives present on tergites I/II-VII and sternites IV/VI; segment VIII with 4 lateral setae (2 medially and 2 caudolaterally); apical projection of anal lobe entirely toothed; macrosetae curved apically. More mensural features and morphological database are provided in Table II.

Male imago

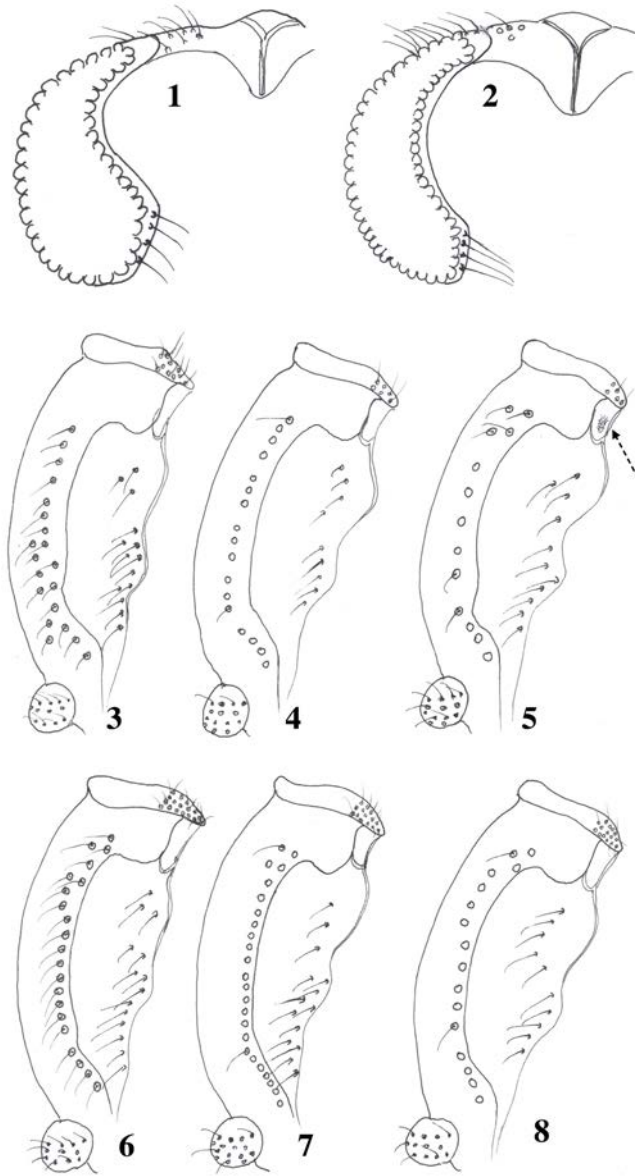
(n = 6: 3 pharate adults + 3 adults; Figs 1, 3, 9-13, 53, 59)

Medium to big sized species. Total length 4.00-4.20 mm. Wing length 2.60-2.70 mm. General colouration brown to dark brown with blackish head and legs; thorax brown to dark brown, mesonotal stripes distinct; wing with blackish anterior vein; Legs spotted, femur and tibia dark brown, tarsomeres 1-5 of PI, PII and PIII blackish; crista dorsalis blackish.

Head (Fig. 1). Eyes and inner eye margin bare; proximal part of eye narrowed inwards, distal part broadened outwards and truncate. Temporals consist of 8 setae (6 outer verticals and 2 post-orbitals); distal area of the eye bearing 4 stout setae. Palp 5-segmented; first palpomere weakly developed; length (μm) of palpomeres 55, 85, 150, 175, 220; sensilla clavata present on distal part of fifth segment. Antenna 1070-1080 μm long, 13-segmented; antennal groove beginning on segment 2 and reaching ultimate flagellomere; last flagellomere distinctly clubbed apically, bearing 1 stout apical seta and numerous fine setae distally. Segments 1-12 nearly sub-equal; last flagellomere 760-770 μm long; AR 2.10-2.30. Thorax (Fig. 3). Acrostichals absent. Anteprenotal lobes separated by a V-shaped notch dorsally; anteprenotum separated from scutum by a distinct rounded notch (Fig. 3). Lateral anteprenotals 9-10; dorsocentrals with 19-20 setae in 1-2 rows, prealars 8-9. Scutellum with 26-28 setae placed in 3-4 rows. Wing. Brachiolum with 3 setae. Distribution of setae on veins: R, 10-11; R_1 , 6-7; R_{2+3} , 0; R_{4+5} , 0. Squama with 55-60 setae in 1-3 rows. Legs. Tarsomere 4 of PI, PII and PIII respectively 120, 95 and 100 μm long, heart-shaped, bilobed apically and significantly shorter than tarsomere 5 (150, 120, 140 μm long). Sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII. Length (μm) and proportions of legs:

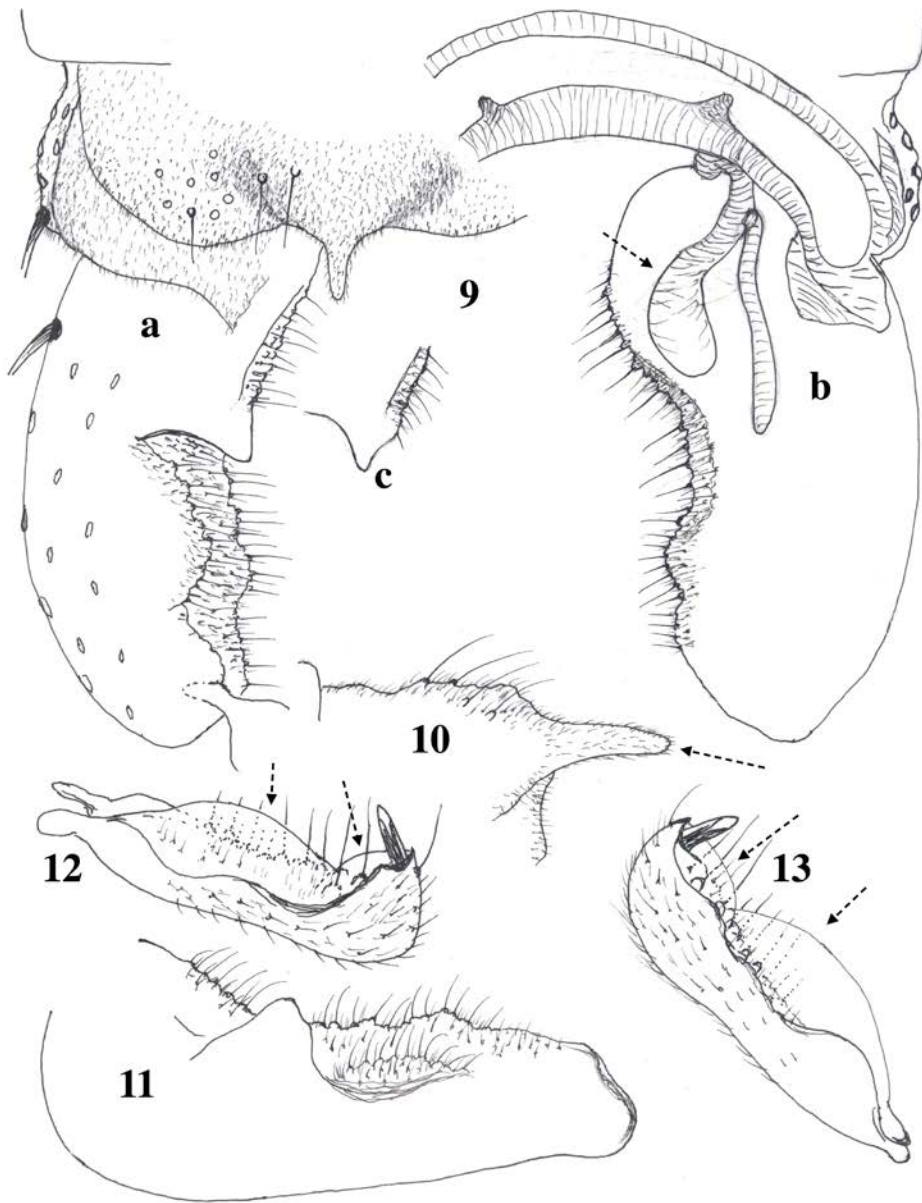
	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	1030	1250	1020	490	310	120	150	0.80	3.08	2.24	1.40
PII	1650	1125	550	320	180	95	120	0.50	4.65	5.05	2.40
PIII	1380	1420	570	410	260	100	140	0.40	3.70	4.90	1.30

“LR = Length of tarsomere ta₁ divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and ta₁ divided by combined length of tarsomeres ta₂-ta₅; SV = Ratio of femur plus tibia to tarsomere ta₁; BR = Ratio of longest seta of ta₁ divided by minimum width of ta₁, measured one third from apex.”



Figures 1-8. Male imagoes of *Potthastia* spp. Distribution of temporals and setae on distal part of eye: (1), *P. dominicii* sp. n.; (2), *P. giudicellii* sp. n. Distribution of antepronotals, dorsocentrals and scutellars on thorax of: *P. dominicii* sp. n. (3); *P. gaedii* (4); *P. pastoris* (5); *P. giudicellii* sp. n. (6); *P. montium* (7); *P. longimanus* (8).

Figures 1-8. Imagos mâles de *Potthastia* spp. Distribution des soies temporales et des soies distales de l'œil : *P. dominicii* sp. n. (1) ; *P. giudicellii* sp. n. (2). Distribution des soies antépronotales, dorsocentrales et scutellaires sur le thorax de : *P. dominicii* sp. n. (3) ; *P. gaedii* (4) ; *P. pastoris* (5) ; *P. giudicellii* sp. n. (6) ; *P. montium* (7) ; *P. longimanus* (8).



Figures 9-13. Male imago of *Potthastia dominicii* sp. n. Hypopygium, dorsal (left, 9a) and ventral (right, 9b); superior volsella (9c); anal point, lateral view (10); gonocoxite, lateral view (11); left gonostylus, lateral view (paratype, 12); right gonostylus, dorsal (holotype, 13).

Figures 9-13. Imago mâle de *Potthastia dominicii* sp. n. Hypopyge, vue dorsale (à gauche, 9a) et ventrale (à droite, 9b) ; volselle supérieure (9c) ; pointe anale en vue latérale (10) ; gonocoxite en vue latérale (11) ; gonostyle gauche en vue latérale (12, paratype) ; gonostyle droit, vue dorsale (holotype, 13).

Abdomen. Hypopygium in dorsal, ventral and lateral view (Figs 9-13, 53, 59). Tergite IX broadly bilobed laterally, lateral projections absent. Anal point 23-27 μm long, maximum width 8-10 μm , slender, hairy, long and narrowed apically; apex of anal point is rounded in both dorsal (Fig. 9a) and lateral view (Fig. 10). Aedeagal lobe, phallapodeme and sternapodeme as in Fig. 9b. Sternapodeme arc-like orally produced, lateral sternapodeme weak; phallapodeme curved paddle-like to S-like shaped, projecting outwards distally. Gonocoxite with a distinct basal plate and well represented median field. Dorsally and laterally (Figs 9a, 11): base with a plate-like superior volsella (Fig. 9a), terminating distally with a distinct nose-like lobe which is bent downwards (Figs 9a-9c); apically, truncate; medially with 2 separate roughly shaped inferior volsella (Figs 9a, 11) distinctly visible in dorsal (Fig. 9a) and lateral view (Fig. 11). Ventrally (Figs 9b, 53): base rounded and smooth, with stout setae; ventral margin concave medially, bilobed distally. Gonostylus (Figs 12-13, 59) 150-165 μm long, maximum width 50 μm , minimum width 30 μm ; anterior margin sinuous; crista dorsalis blackish, consists of 2 distinct unequal lobes, proximal lobe 60 μm long, 15 μm maximum wide, much larger than the distal one. For mensural features and additional morphological database, see Table I.

Female imago

(n = 3; Figs 14, 18-20, 69-70)

Medium to big sized species. Total length 4.10-4.30 mm. General colouration as in the male adult. Wing with blackish anterior veins.

Head (Fig. 1). Eyes sub-oval, bare; distal part broadened outwards and lacking setae. Temporals consist of 6 setae including 4 outer and 2 postorbitals; distal area of the eye lacking stout setae. Palp 5-segmented; first palpomere weakly developed; length (μm) of palpomeres 55, 85, 150, 175, 220; sensilla clavata present on distal part of fifth segment. Antenna (Fig. 14-14a), 750-760 μm long, length (in μm) of segments: 60, 35, 35, 40, 40, 165-170; last flagellomere parallel-sided in its $\frac{1}{2}$ proximal part and narrowed distally, with an apical seta placed short distance to apex (pre-apically), antennal groove absent; AR 0.75-0.78.

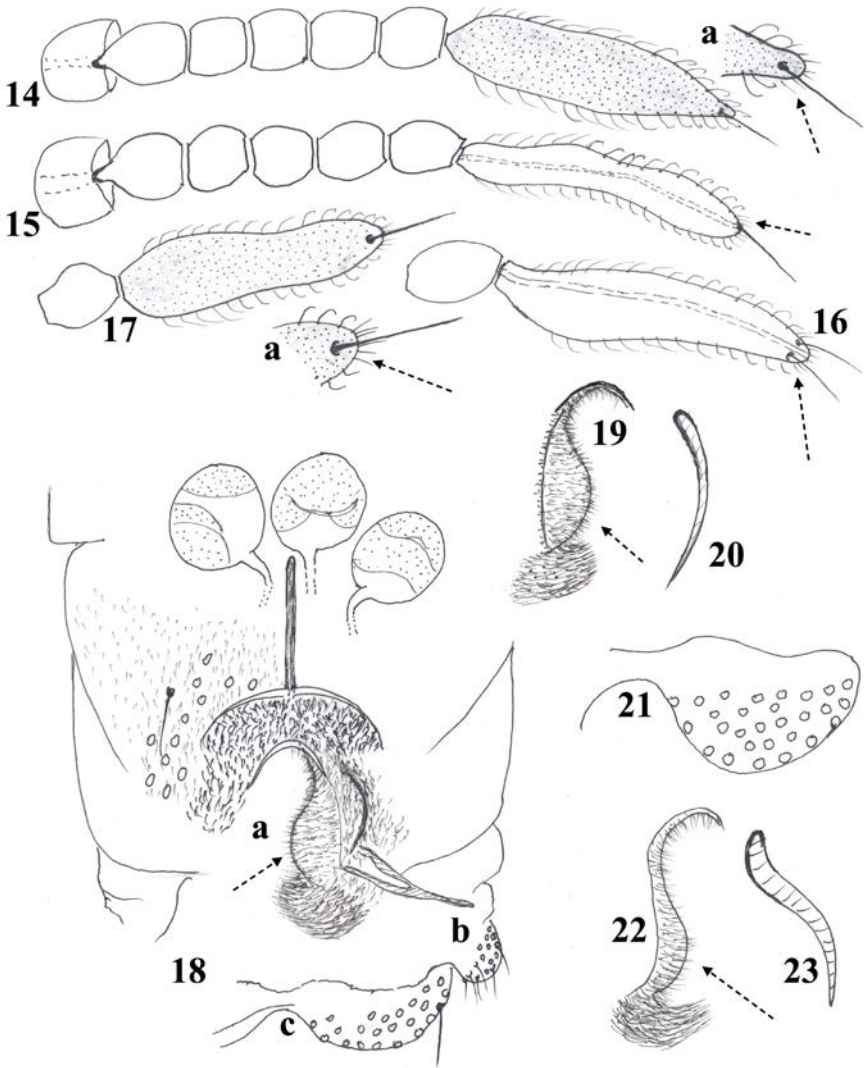
Thorax. Acrostichals absent, anteprenotals 7-8, dorsocentrals 19-21, prealars 6-8, scutellum with 24-26 setae in 3-4 rows. Wing. Brachiolium with 3 setae. R with 13 setae, R₁, 7; R₂₊₃ and R₄₊₅ bare. Squama with 55-58 setae. Legs. Tarsomere 4 of PI, PII and PIII heart-shaped, bilobed apically and significantly shorter than tarsomere 5. Sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII.

Genitalia in dorsal, ventral and lateral view as in Figs 18-20 and 69-70. Notum straight and lacking rami. Dorsomesal lobe (Figs 19, 69) distinctly swollen on its medial and distal half; ventrolateral lobe sub-rectangular, apodeme lobe (Fig. 20) arc-like; sternite VIII with 12-13 setae; gonocoxite (Fig. 18b) lobe-like with 15-17 setae; 3 seminal capsules are present, spherical and sclerotized in lateral and apical parts; tergite IX (Fig. 18c) distinctly divided in 2 semi-circular lobes, bearing 22-24 setae on each lobe; cercus (Fig. 70) sub-circular.

Male pupal exuviae

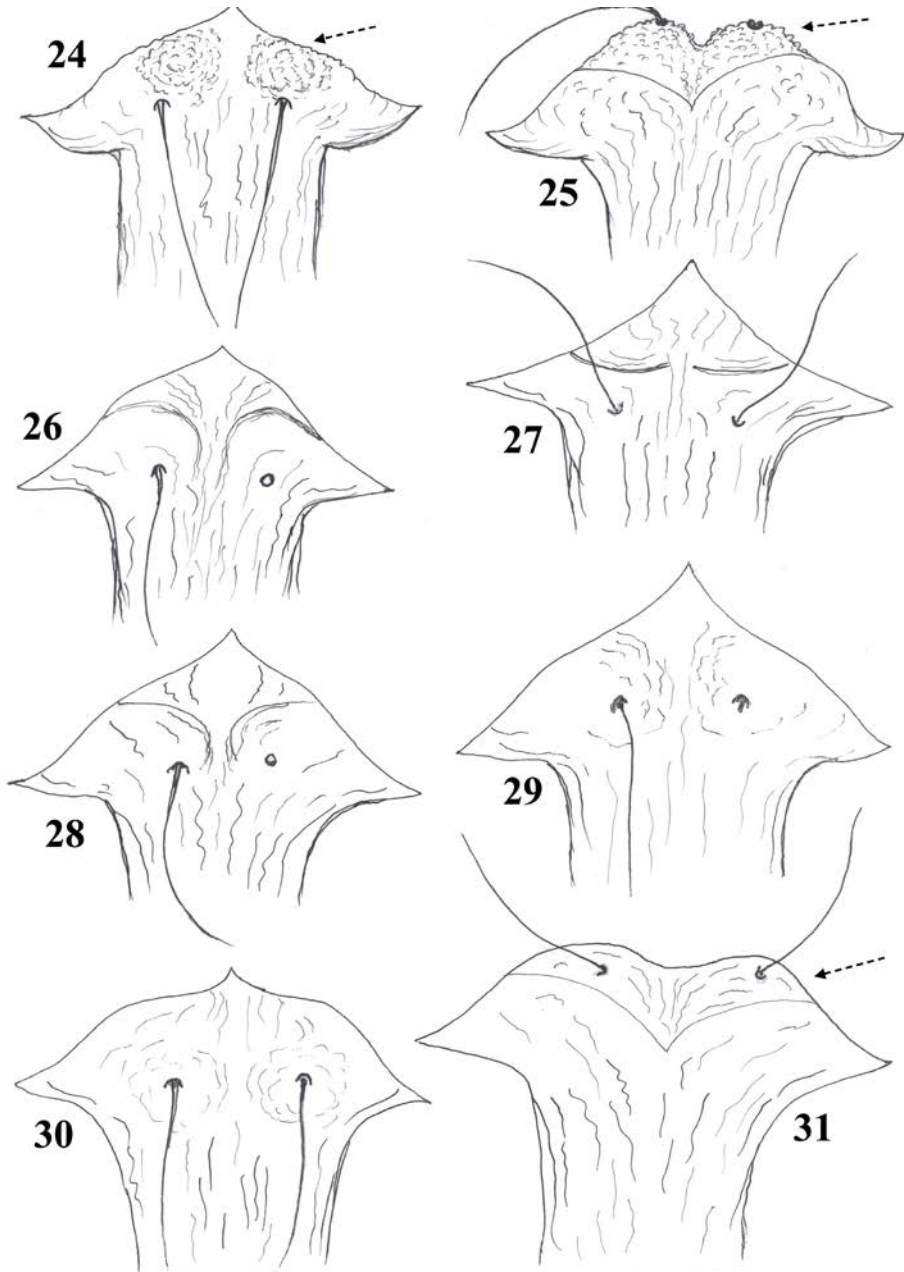
(n = 10; Figs 24-25, 32, 38, 71, 74, 74a-74b)

General colouration golden, anal lobe not wrinkled, genital sac dark brown. Frontal apotome wrinkled and rugulose with dense granulation; cephalothorax markedly wrinkled bearing 1 elongated wart below the base of the precorneal setae. Abdomen and anal lobe golden, apophyses absent. Total length 4.30-4.50 mm.



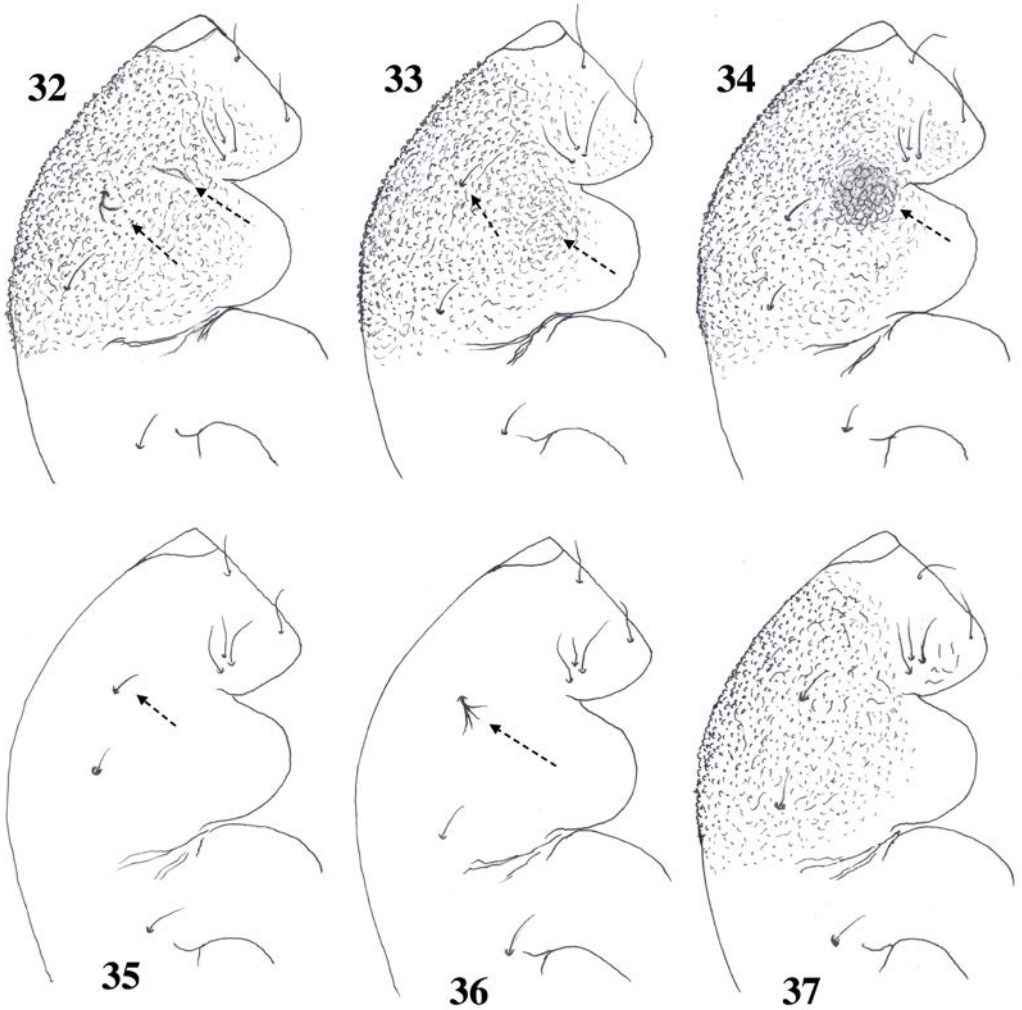
Figures 14-23. Female imagoes of *Potthastia* spp. Antenna: *Potthastia dominicii* sp. n. (14), apex of last flagellomere (14a); *P. montium* (15). Fifth and last flagellomere of: *P. giudicellii* sp. n. (16); *P. gaedii* (17), apex of last flagellomere (17a). *Potthastia dominicii* sp. n.: genitalia, ventral and dorsal view (18a) including gonapophysis VIII, sternite VIII, seminal capsule, right gonocoxite (18b) and tergite IX (18c); dorsomesal and ventrolateral lobes (19); apodeme lobe (20). *P. montium*: tergite IX, right lobe (21). *P. gaedii*: dorsomesal and ventrolateral lobes (22); apodeme lobe (23).

Figures 14-23. Imagos femelles de *Potthastia* spp. Antenne : *Potthastia dominicii* sp. n. (14), apex du dernier flagellomère (14a) ; *P. montium* (15). Cinquième et dernier flagellomère de : *P. giudicellii* sp. n. (16) ; *P. gaedii* (17), apex du dernier flagellomère (17a). *Potthastia dominicii* sp. n. : genitalia, vue ventrale et dorsale (18a) ; gonapophyse VIII, sternite VIII, capsule séminale, gonocoxite droit (18b) et tergite IX (18c) ; lobe dorsomésal et ventrolatéral (19), lobe de l'apodème (20). *P. montium* : tergite IX, côté droit (21). *P. gaedii* : lobe dorsomésal et ventrolatéral (22) ; lobe de l'apodème (23).



Figures 24-31. *Potthastia* spp., male pupal exuviae. Frontal apotome of: *Potthastia dominicii* sp. n. (24-25); *P. giudicellii* sp. n. (26); *P. montium* (27-28); *P. pastoris* (29); *P. gaedii* (30-31).

Figures 24-31. *Potthastia* spp., exuvies nymphales mâles. Pièce frontale de : *Potthastia dominicii* sp. n. (24-25); *P. giudicellii* sp. n. (26); *P. montium* (27-28); *P. pastoris* (29); *P. gaedii* (30-31).



Figures 32-37. *Potthastia* spp., male pupal exuviae. Cephalothorax of: *Potthastia dominicii* sp. n. (32); *P. gaedii* (33); *P. pastoris* (34); *P. giudicellii* sp. n. (35); *P. montium* (36); *P. longimanus* (37).

Figures 32-37. *Potthastia* spp., exuvies nymphales mâles. Céphalothorax de : *Potthastia dominicii* sp. n. (32); *P. gaedii* (33); *P. pastoris* (34); *P. giudicellii* sp. n. (35); *P. montium* (36); *P. longimanus* (37).

Cephalothorax (Figs 24-25, 32). Frontal apotome (Figs 24-25) distinctly domed, wrinkled and bearing granulation around the base of frontal setae; frontal setae 340-380 μm long; anterolateral area of thorax with an elongated convexe wart, broad granulations absent. Dorsocentrals (Fig. 32) nearly subequal; Dc_1 forked, Dc_2 and Dc_3 setae-like; distance between Dc_1 to Dc_2 180-190 μm , Dc_2 and Dc_3 separated by 410-450 μm .

Abdomen. Armament and distribution pattern of shagreen, rows of posterior transverse spines of abdominal segments as illustrated in Figs 38a-38b, 71, 74a-74b). Tergite I (Figs 38, 71) bearing 1-2 rows of smooth small spines (occasionally bare). Lateral setae mostly forked, segment VIII with 4 lateral setae (2 medially and 2 caudolaterally). Field of points present on tergites II-VIII and sternites III-VIII. Transverse rows of smooth spines present on tergites I/II-VIII and sternites III-VIII (Figs 38a-38b). Conjunctives present on tergites I/II-VII and sternites III/VI, mainly consist of smooth long orally projecting spines; segment VIII (Figs 74a-74b) with 4 lateral setae (2 medially and 2 caudolaterally). Anal lobe (Figs 38, 74) suboval; apical projection entirely toothed (Figs 74a-74b); macrosetae curved apically. More mensural features and morphological database are provided in Table II (p. 36).

Larva

Known but not described.

• *Potthastia giudicellii* Moubayed-Breil & Orsini sp. n.

Material examined

Holotype. **Corsica**. Focolara stream, W-Corsica, Nature Reserve of Scandola, Regional Parc of Corsica, rhithral and waterfalls, conductivity 420 μ S/cm, water T °C 8-12, altitude 30-250 m; 1 male pharate adult, leg. J. Moubayed-Breil, 26.04.2012.

Paratypes (all leg. J. M-B). **Corsica**. Prezzuna stream, waterfalls and rhithral, 300-650 m, 1 male adult, 05.06.2015; Pe (3 males, 2 females), 05.VI.2015.

Holotype (on one slide), paratypes (one slide) from Prezzuna stream are deposited in the collections of the National Museum of Ireland, Kildare Street, Dublin 2, Ireland. Remaining paratypes are deposited in the senior author's collection. Type material was preserved in 75% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid before mounting on slides.

Etymology: the new species is named *judicellii* after our colleague, Professor J. B. Giudicelli, University of Marseille, who devoted more than 50 years on studying aquatic insects from Corsica, Morocco, Reunion Island and southern France. He is now retired but still considered as a leading expert in entomology and systematic of Diptera (Simuliidae and Blephariceridae) and Trichoptera including biogeography, endemism and ecology of running water communities.

Diagnostic characters

P. giudicellii sp. n. is keyed near *P. montium* (anal point sub-triangular, presence of dorsal tubercle on apical part of gonocoxite) from which it can be separated on the basis of the distinctive combination of characters provided in Table I (p. 35).

- In the male adult. Temporal setae 13 including 5 outer verticals and 8 postorbitals; anteprototals 16-17. AR 2.40-2.50. Anterior wing veins pale. Tergite IX bearing 10 setae (5 on each side), broad with 2 lateral long pointed projections; anal point distinctly present, hairy and sub-rectangular, broad at base and progressively narrowed distally, ending with a broad rounded apex. Gonocoxite. Dorsally, with a plate-like superior volsella; apical area with a dorsal tubercle, broad and sub-triangular, placed over the articulation of gonostylus. Ventrally, base consists of 2 lobes, inner one larger and bearing 5-6 characteristic curved setae; ventral margin concave medially and bilobed distally. Median area covered with setae, inferior volsella broad, rounded, distinctly visible in dorsal and lateral view. Gonostylus broad on its proximal part and narrowed

distally; crista dorsalis consists of 1 distinct large lobe (more visible in lateral view), which covers the entire anterior side of gonostylus.

- In the female adult. Antenna. Last flagellomere nearly linear, swollen proximally and slightly narrowed distally, with 2 apical setae, antennal groove only present on the last flagellomere; AR 0.90. Wing. Squama with 63-65 setae. Dorsomesal lobe swollen distally, ventrolateral lobe large, apodeme lobe sickle-like; sternite VIII with 12 setae; presence of 3 seminal capsules, spherical, sclerotized in lateral and apical part; tergite IX distinctly divided in 2 semi-circular lobes, bearing 22-24 setae on each lobe.

- In the Pe. Frontal apotome wrinkled and weakly domed, frontal setae relatively short; cephalothorax lacking granulation. Dorsocentrals all setae-like and nearly subequal; distance between Dc_1 to Dc_2 180-190 μm , Dc_2 and Dc_3 separated by 350-360 μm . Abdomen with few forked lateral setae; tergite I bare; segment VIII with 2 lateral setae, ventral one is forked; field of points and posterior transverse rows of smooth spines on tergites and sternites absent. Conjunctives present on tergites II-V and sternites III/VI; apophyses present on tergites II-VI and sternites III-VI. Anal lobe rounded, apical projection not toothed medially and distally, few teeth are present basally and anterolaterally; macrosetae not curved apically. For mensural features and additional morphological data, see Table II (p. 36).

Male imago

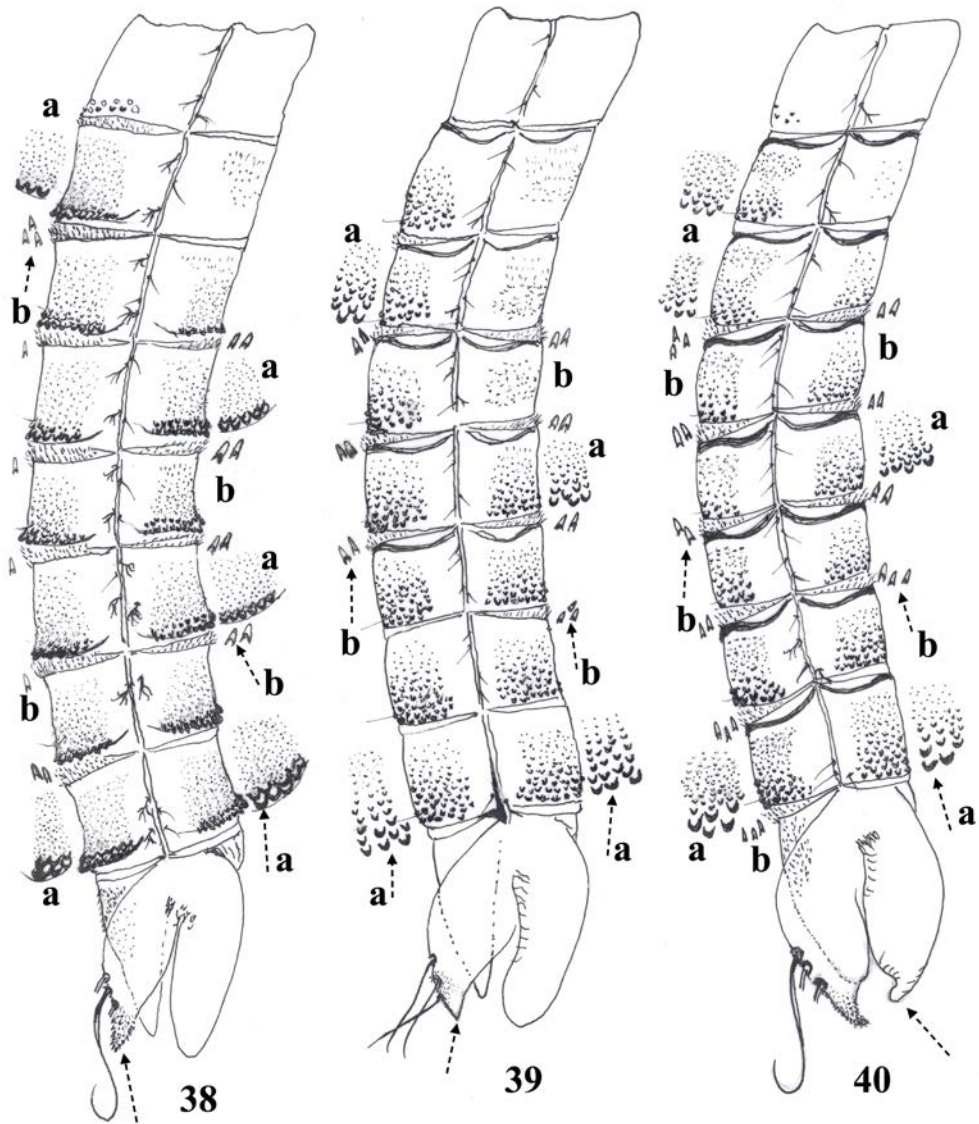
(n = 3 pharate adults; Figs 41-42, 43b-47, 49, 56, 63)

For additional morphological database and mensural features, see Table I (p. 35). Big sized species. Total length 4.10-4.30 mm. Wing length 2.75-2.80 mm. General colouration brown to dark brown. Head and thorax brown; mesonotal stripes indistinct; wing pale including anterior veins; Legs brown, femur and tibia brown, tarsomeres 1-5 of PI, PII and PIII dark brown; crista dorsalis transparent.

Head (Fig. 2). Eyes and inner eye margin bare; proximal part of eye narrowed inwards, distal part slightly broadened outwards and truncate. Temporals consist of 8 setae including 6 outer verticals and 2 postorbitals; distal area of the eye bearing 4 stout setae. Palp 5-segmented; first palpomere well developed; length (μm) of palpomeres 60, 70, 97, 190, 210, 230; sensilla clavata present on distal part of fifth segment. Antenna 1070-1080 μm long, 13-segmented; antennal groove beginning on segment 2 and reaching ultimate flagellomere; last flagellomere distinctly clubbed apically, bearing 1 stout apical seta and numerous fine setae distally; last flagellomere 760-770 μm long, remaining segments 310 μm long. AR 2.40-2.50.

Thorax (Fig. 6). Acrostichals absent. Anteprenotal lobes separated by a V-shaped notch dorsally; anteprenotum separated from scutum by a distinct rounded notch. Lateral anteprenotals 16-17; dorsocentrals with 20-22 setae in 1-2 rows, prealars 12-13. Scutellum with 26-28 setae placed in 3-4 rows. Wing. Brachiolum with 3 setae. Distribution of setae on veins: R, 12-13; R_1 , 13; R_{2+3} , 0; R_{4+5} , 0. Squama with 63-65 setae in 1-3 rows.

Legs. Tarsomere 4 of PI, PII and PIII respectively 120, 110 and 120 μm long, heart-shaped, bilobed apically and significantly shorter than tarsomere 5 (110, 120, 130 μm long). Sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII. Length (μm) and proportions of legs:



Figures 38-40. *Potthastia* spp., male pupal exuviae. Abdominal segments I-IX in lateral view. Chaetotaxy, distribution pattern of apophyses and armament of tergites (left) and sternites (right) of: *Potthastia dominicii* sp. n. (38a-38b); *P. giudicellii* sp. n. (39a-39b); *P. pastoris* (40a-40b). a = caudally directed smooth spines and chagreen; b = conjunctives, orally directed spines.

Figures 38-40. *Potthastia* spp., exuvies nymphales mâles. Segments abdominaux I-IX en vue latérale. Chétotaxie, mode de distribution des apophyses et ornementation des tergites (à gauche) et sternites (à droite) de : *Potthastia dominicii* sp. n. (38a-38b) ; *P. giudicellii* sp. n. (39a-39b) ; *P. pastoris* (40a-40b). a = champs de points et d'épines émoussées d'orientation caudale. b = conjonctives, oralement dirigées vers la tête.

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	1150	1320	920	440	280	120	110	0.70	4.23	2.68	1.85
PII	1250	1240	670	310	170	110	120	0.50	3.98	3.72	2.50
PIII	1420	1530	730	390	220	120	130	0.40	4.54	4.04	1.70

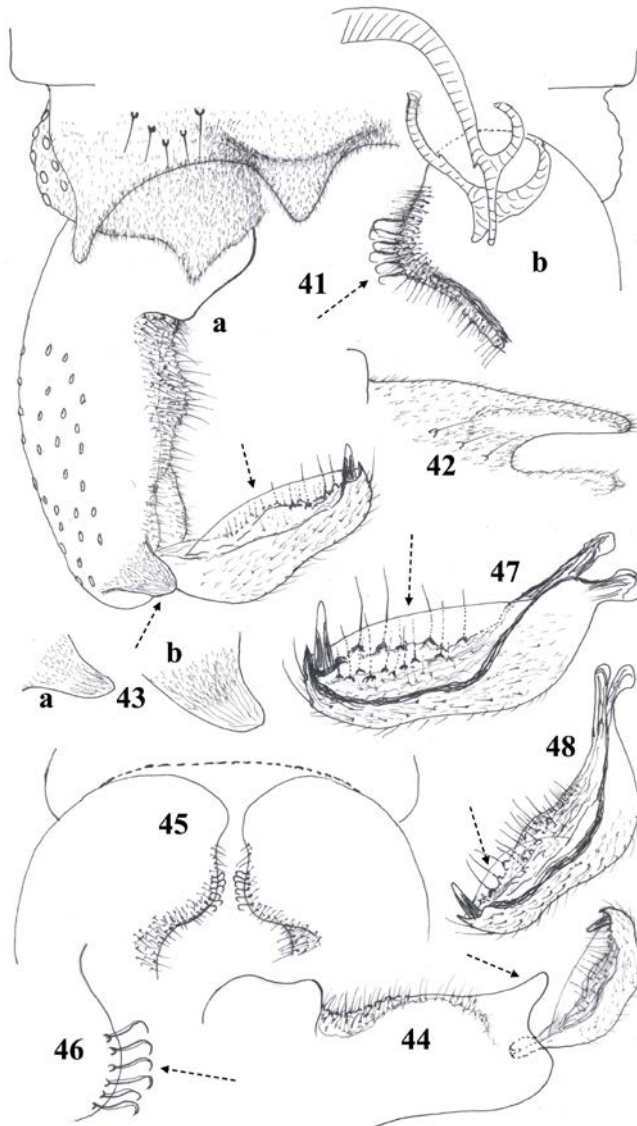
“LR = Length of tarsomere ta₁ divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and ta₁ divided by combined length of tarsomeres ta₂-ta₅; SV = Ratio of femur plus tibia to tarsomere ta₁; BR = Ratio of longest seta of ta₁ divided by minimum width of ta₁, measured one third from apex.”

Abdomen. Hypopygium in dorsal, ventral and lateral view (Figs 41-42, 43b-47). Tergite IX bearing 10 setae (5 on each side), broad with 2 lateral long pointed projections. Anal point (Figs 41-42, 49) 50 µm long, maximum width 45 µm, subtriangular and hairy, broad at base and narrowed apically. Aedeagal lobe, phallapodeme and sternapodeme as in Fig. 41b; median aedeagal lobe extended anteriorly; sternapodeme orally produced, inverted U-shaped, lateral sternapodeme weak; phallapodeme projecting upwards; outer part sickle-like, curved distally for joint with lateral sternapodeme placed caudally. Gonocoxite (Figs 41a-41b, 44-45, 53). Dorsally and laterally (Figs 41a, 44), with a plate-like superior volsella; apical area with a dorsal tubercle (40 µm long and 45 µm maximum wide) which is visible in dorsal and lateral view, broad and sub-triangular, placed over the articulation of gonostylus. Ventrally (Figs 41b, 45-46, 56), base consists of 2 lobes (Figs. 41b, 45, 56), inner one larger and bearing 5-6 characteristic curved setae (Fig. 46). Median area covered with setae, inferior volsella swollen medially, distinctly visible in dorsal view. Gonostylus (Figs 41, 47, 63) 120-125 µm long, maximum wide 50 µm; crista dorsalis transparent, consists of one large lobe occupying the entire anterior side of the gonostylus.

Female imago

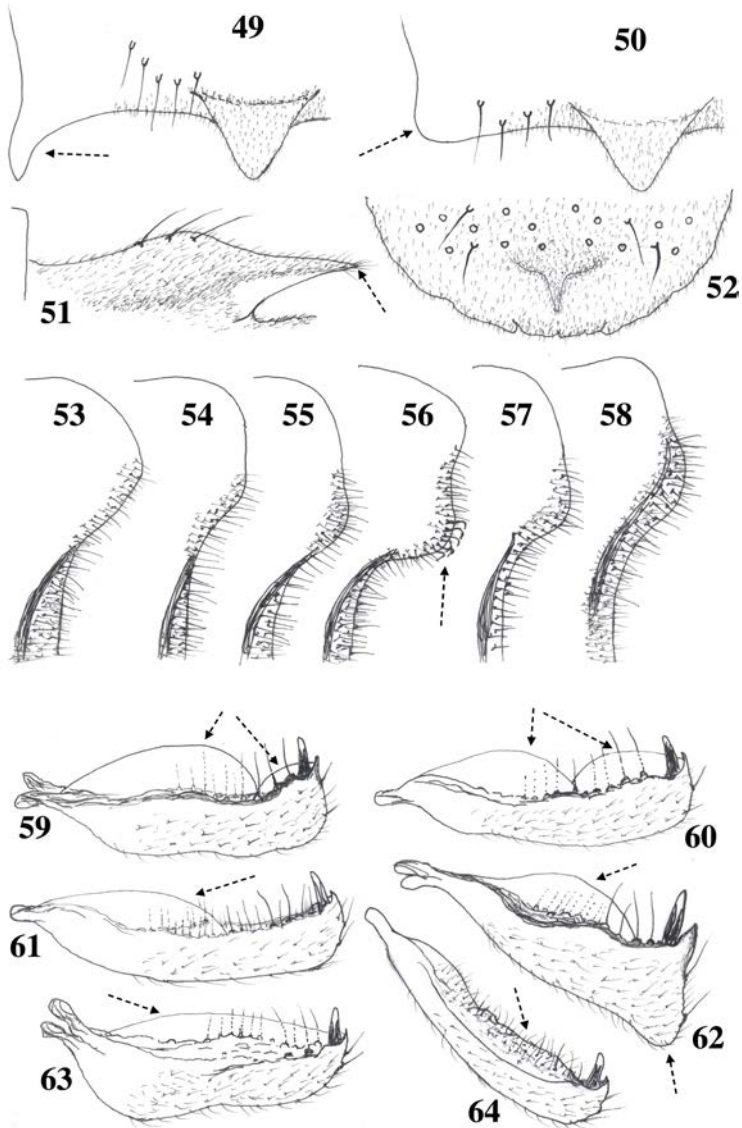
(n = 3 pharate adults; Figs 16, 65-68)

Big sized species. Total length 4.40-4.80 mm. General colouration as in the male; wing and anterior veins pale. Head (Fig. 1). Eyes sub-oval, bare; distal part broadened outwards and lacking setae. Temporals consist of 6 setae (4 outer and 2 postorbitals); distal area of the eye lacking stout setae. Palp 5-segmented, 680 µm long, length (µm) of palpomeres: 55, 75, 160, 200, 190; sensilla clavata present on distal part of fifth segment. Antenna (Fig. 16), 420 µm long, length (in µm) of segments: 57, 35, 35, 43, 50, 200; last flagellomere 200 µm long, swollen in its proximal part and slightly narrowed distally, with 2 apical setae; antennal groove present on last flagellomere; AR 0.90. Thorax. Acrostichals absent, anteprenotals 6-7, dorsocentrals 19-21, prealars 6-8, scutellum with 24-26 setae in 3-4 rows. Wing. Brachiolium with 3 setae. R with 13 setae, R₁, 7; R₂₊₃ and R₄₊₅ bare. Squama with 55-58 setae. Legs. Tarsomere 4 of PI, PII and PIII heart-shaped, bilobed apically and significantly shorter than tarsomere 5. Sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII. Genitalia in dorsal, ventral and lateral view as in Figs 65-68. Notum straight and lacking rami. Dorsomesal lobe (Figs 65-67,) distinctly swollen distally; ventrolateral lobe rectangular and elongated, apodeme lobe arc-like; sternite VIII with 10-11 setae; gonocoxite (Fig. 65b) globular with 7-9 setae; 3 seminal capsules are present, spherical and sclerotized in lateral and apical parts; tergite IX (Fig. 65c) distinctly divided in 2 semi-circular lobes, bearing 22-24 setae on each lobe; cercus (Fig. 68) circular.



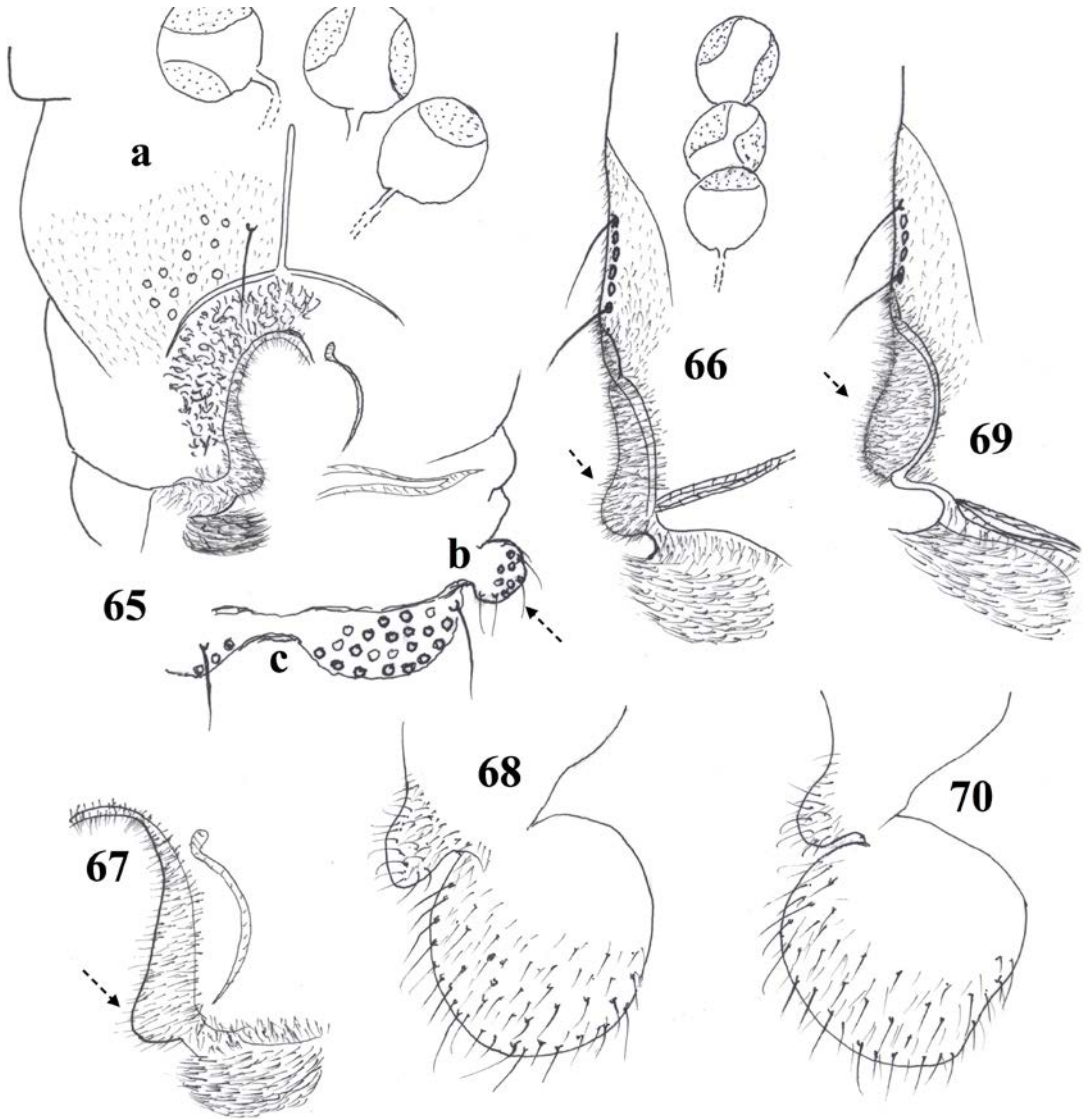
Figures 41-48. Male imagoes of *Potthastia* spp. *Potthastia giudicellii* sp. n.: hypopygium, dorsal (left, 41a) and ventral (right, 41b); anal point, lateral view (42). Dorsal tubercle of gonocoxite (43a-43b) of: *P. montium* (43a); *Potthastia giudicellii* sp. n. (43b). *Potthastia giudicellii* sp. n.: gonocoxite and gonostylus in lateral view (44); base of gonocoxite in ventral view (45) with details of curved setae (46); right gonostylus in dorsolateral view (47). *Potthastia* sp. 3: right gonostylus in dorsal view (48).

Figures 41-48. Imagos mâles de *Potthastia* spp. *Potthastia giudicellii* sp. n. : hypopyge, vue dorsale (à gauche, 41a) et ventrale (à droite, 41b) ; pointe anale en vue latérale (42). Tubercule dorsal du gonocoxite (43a-43b) de : *P. montium* (43a) ; *Potthastia giudicellii* sp. n. (43b). *Potthastia giudicellii* sp. n. : gonocoxite et gonostyle en vue latérale (44) ; base du gonocoxite en vue ventrale (45) ; détails des soies recourbées (46) ; gonostyle droit vue dorso-latérale (47). *Potthastia* sp. 3 : gonostyle droit en vue dorsale (48).



Figures 49-63. Male imagoes of *Potthastia* spp. Anal point of: *Potthastia giudicellii* sp. n. (dorsal, 49); *P. montium* (dorsal, 50); *P. gaedii* (lateral, 51); *Potthastia dominicii* sp. n. (lateral, 52). Base of gonocoxite of: *Potthastia dominicii* sp. n. (53); *P. gaedii* (54); *P. longimanus* (55); *P. giudicellii* sp. n. (56); *P. montium* (57); *P. pastoris* (58). Gonostyli of: *Potthastia dominicii* sp. n. (59); *P. gaedii* (60); *P. longimanus* (61); *P. pastoris* (62); *P. giudicellii* sp. n. (63); *P. montium* (64).

Figures 49-63. *Potthastia* spp., imagos mâles. Pointe anale de : *Potthastia giudicellii* sp. n. (vue dorsale, 49) ; *P. montium* (vue dorsale, 50) ; *P. gaedii* (vue latérale, 51) ; *Potthastia dominicii* sp. n. (vue latérale, 52). Base du gonocoxite de : *Potthastia dominicii* sp. n. (53) ; *P. gaedii* (54) ; *P. longimanus* (55) ; *P. giudicellii* sp. n. (56) ; *P. montium* (57) ; *P. pastoris* (58). Gonostyle de : *Potthastia dominicii* sp. n. (59) ; *P. gaedii* (60) ; *P. longimanus* (61) ; *P. pastoris* (62) ; *P. giudicellii* sp. n. (63) ; *P. montium* (64).



Figures 65-70. Female imagoes of *Potthastia* spp. *Potthastia giudicellii* sp. n. Genitalia: ventral and dorsal view (65a, 65b, 65c) including gonapophysis VIII, sternite VIII, seminal capsule, right gonocoxite and tergite IX; lateral view (66); dorsomesal, ventrolateral and apodeme lobes (67); cercus (68). *Potthastia dominicii* sp. n.: genitalia in lateral view (69); cercus (70).

Figures 65-70. Imagos femelles de *Potthastia* spp. *Potthastia giudicellii* sp. n. Genitalia : vues ventrale et dorsale (65a, 65b, 65c) y compris gonapophyse VIII, sternite VIII, capsule séminale, gonocoxite droit et tergite IX ; vue latérale (66) ; lobe dorsomésal et ventrolatéral et lobe de l'apodème (67) ; cerque (68). *Potthastia dominicii* sp. n. : genitalia en vue latérale (69) ; cerque (70).

Male pupal exuviae

(n = 10; Figs 24-25, 32, 39a-39b, 75, 75a)

General colouration golden brown. Frontal apotome wrinkled and rugose; cephalothorax bare. Abdomen and anal lobe golden; posterior angle of segment VIII brown. Anal lobe weakly wrinkled; apical projection dark brown, smooth medially and distally. Total length 4.30-4.50 mm.

Cephalothorax (Figs 24-25, 32). Frontal apotome (Figs 24-25) slightly domed and lacking granulation; frontal setae 120-130 μm long. Dorsocentrals (Fig. 35) all setae-like and nearly subequal; distance between Dc_1 to Dc_2 180-190 μm , Dc_2 and Dc_3 separated by 350-360 μm . Abdomen and anal segment (Figs 39a-39b, 75). Armament and distribution pattern of shagreen, rows of posterior transverse spines of abdominal segments as illustrated in Figs 39a-39b and 75. Tergite I (Fig. 39) bare; few lateral setae are forked, segment VIII with 4 lateral setae (2 medially and 2 caudolaterally); field of points and posterior transverse rows of smooth spines absent on tergites and sternites; segment VIII (Fig. 75) with 2 caudolateral setae, ventral setae forked, posterior angle acute and blackish (Figs 39, 75); apophyses present on tergites II-VI and sternites III-VI (Fig. 39); conjunctives present on tergites II-V and sternites III/VI, consist of orally projecting long smooth spines. Anal lobe (Figs 39, 75) 470-480 μm long, maximum wide 530-550 μm , sub-circular and slightly wrinkled; apical projection (Figs 75-75a) triangular, smooth and sclerotized, bare medially and distally, small sharp teeth present basally and anterolaterally at the insertion of the anal macrosetae; macrosetae 185-195 μm long, stout, needle-like and not curved at apex, apex forked in 1 specimen. Additional mensural features and morphological database are provided in Table II (p. 36).

Larva

Unknown.

Potthastia pastoris (Edwards, 1933)

Material examined

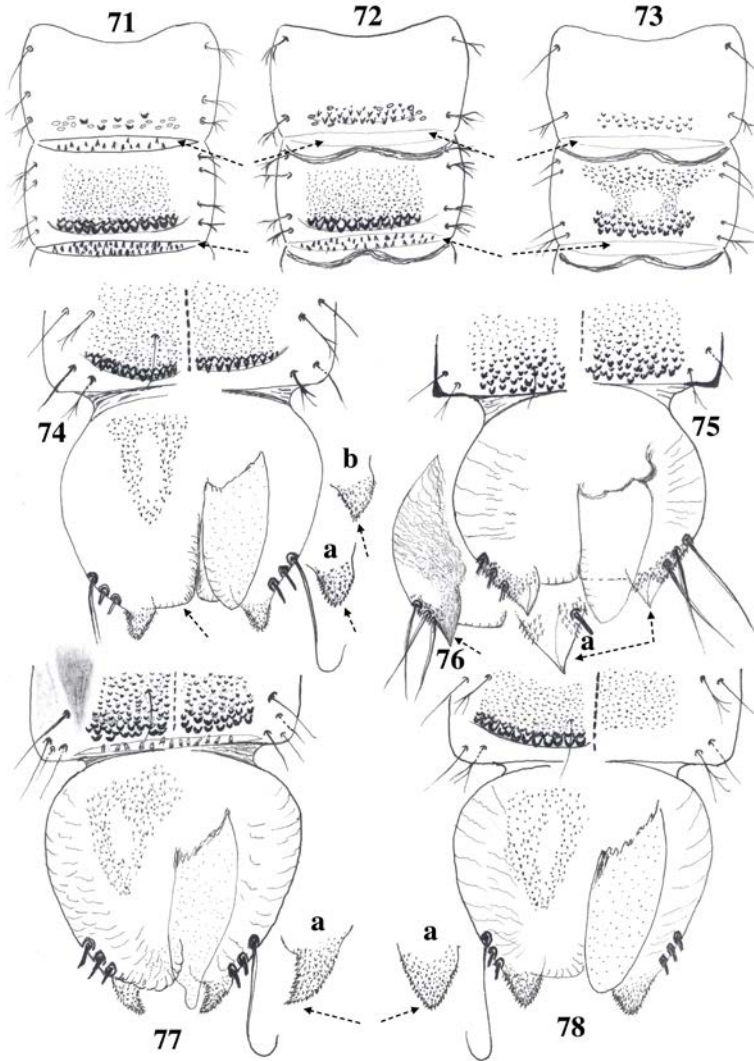
France, Corsica, Algeria, Lebanon. 2 male adults, 3 male pharate adults, pupal exuviae (7 males, 3 females).

Male adult

(n = 3; Figs 5, 58, 62, 79-83)

For additional morphological database and mensural features, see Table I (p. 35). Big sized species. Total length 4.20-4.60 mm. Wing length 3.35-3.65 mm. General colouration blackish, occasionally dark brown to blackish. Head and thorax dark brown to blackish; mesonotal stripes distinct; wing pale brown with blackish anterior veins; legs distinctly spotted, dark brown to blackish, tarsomeres 2-5 of PI, PII and PIII blackish; crista dorsalis blackish.

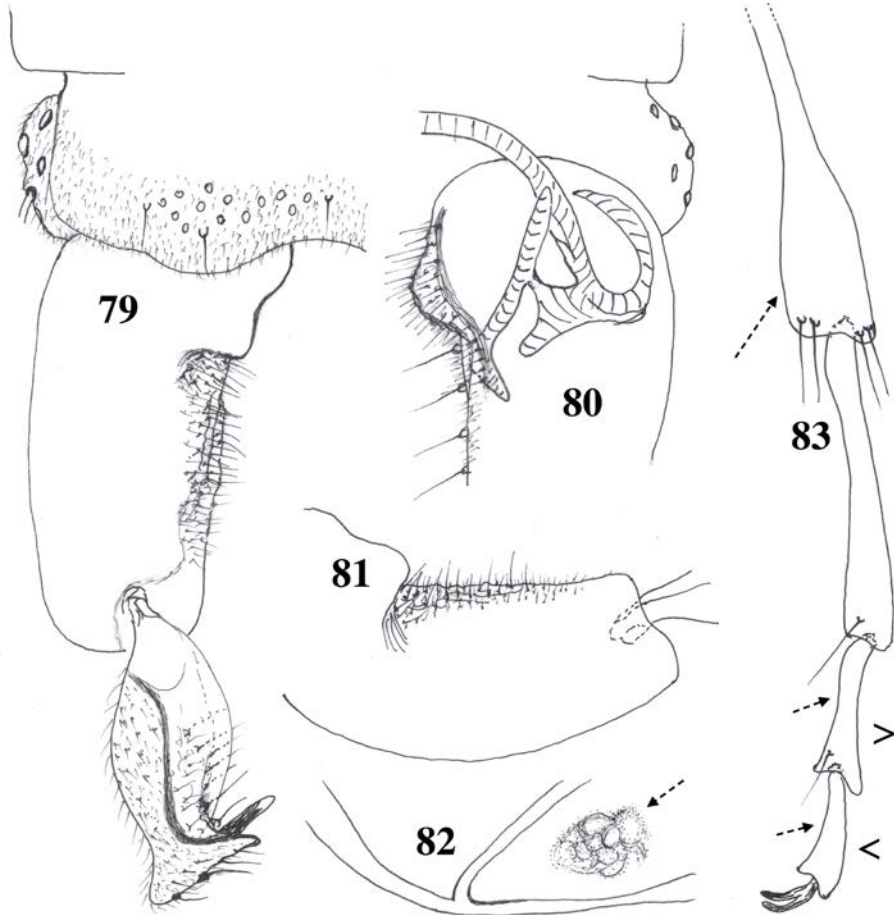
Head. Eyes and inner eye margin bare; proximal part of eye narrowed inwards, distal part slightly broadened outwards and truncate. Temporals consist of 8 setae (6 outer verticals and 2 postorbitals); distal area of the eye bearing 4 stout setae. Palp 5-segmented; first palpomeres well developed; sensilla clavata present on distal part of fifth segment. Antenna 1080-1120 μm long, 13-segmented; antennal groove beginning on segment 2 and reaching ultimate flagellomere; last flagellomere nearly linear, slightly clubbed and bearing 2 stout apical setae; segments 1-12 nearly subequal; last flagellomere 650-660 μm long. AR 1.65-1.70.



Figures 71-78. *Potthastia* spp., male pupal exuviae. Dorsal view of abdominal segments I-II/III including posterior transverse rows of spines, shagreen, conjunctives and apophyses of: *Potthastia dominicii* sp. n.

(71); *P. gaedii* (72); *P. pastoris* (73). Segment VIII and anal segment in dorsal and ventral view of: *Potthastia dominicii* sp. n. (74) with 2 aspects (74a-74b) of the apical projection; *P. giudicellii* sp. n. (75) with apical projection (75a). *P. montium*: left side of anal lobe (76). Segment VIII and anal segment in dorsal and ventral view of: *P. pastoris* (77-77a); *P. gaedii* (78-78a). a et b, apical projection of anal lobe.

Figures 71-78. *Potthastia* spp., exuvies nymphales mâles. Vue dorsale des segments abdominaux I-II/III, y compris les rangées postérieures d'épines, champs de points, conjonctives et apophyses de : *Potthastia dominicii* sp. n. (71) ; *P. gaedii* (72) ; *P. pastoris* (73). Segment VIII et segment anal en vues dorsale et ventrale de : *Potthastia dominicii* sp. n. (74) et 2 aspects de la projection apicale (74a-74b) ; *P. giudicellii* sp. n. (75) et projection apicale (75a). *P. montium* : côté gauche du lobe anal (76). Segment VIII et segment anal en vues dorsale et ventrale de : *P. pastoris* (77-77a) ; *P. gaedii* (78-78a). a et b, projection apicale du lobe anal.



Figures 79-83. Male imago of *Potthastia pastoris*. Hypopygium, dorsal (left, 79) and ventral (right, 80); gonocoxite in lateral view (81); humeral pit (82); distal part of tarsomere ta_2 and tarsomeres ta_3 - ta_5 (83).

Figures 79-83. Imago mâle de *Potthastia pastoris*. Hypopyge, vue dorsale (à gauche, 79) et ventrale (à droite, 80) ; gonocoxite en vue latérale (81) ; aire humérale (82) ; partie distale du tarsomère ta_2 et tarsomères ta_3 - ta_5 (83).

Thorax (Fig. 5). Acrostichals absent. Anteprenotal lobes separated by a V-shaped notch dorsally; anteprenotum separated from scutum by a distinct rounded notch. Lateral anteprenotals 5-6; dorsocentrals with 12-13 setae in 1-2 rows, prealars 11-12. Humeral pit (Fig. 82) consists of few large blackish granulations similar to those of the pupal exuviae. Scutellum with 26-28 setae placed in 3-4 rows. Wing. Brachiolum with 3 setae. Distribution of setae on veins: R, 7-8; R_1 , 14-15; R_{2+3} , 0; R_{4+5} , 0. Squama with 47-52 setae in 1-2 rows. Legs (tarsomeres 2-5, Fig. 83). Tarsomere ta_2 of PI, PII and PIII distinctly expanded distally; tarsomere ta_4 of PI, PII and PIII 205-210 μm long, consistently longer than tarsomere ta_5 (180-190 μm long) and moderately bilobed apically; sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII.

Abdomen. Hypopygium in dorsal ventral and lateral view (Figs 58, 62, 79-81). Tergite IX broad and extended horizontally, bilobed and bearing 36 setae. Anal point absent. Aedeagal lobe, phallapodeme and sternapodeme as in Fig. 80; aedeagal lobe swollen basally, sub-triangular and bent distally; sternapodeme orally produced, arc-shaped; phallapodeme pickaxe-like, projecting downwards with smooth apex, basal part linear for joint with sternapodeme placed caudally. Gonocoxite (Figs 79-80, 58). Dorsally and laterally (Figs 79, 81), with a plate-like superior volsella which is bearing a sinuous inner margin. Ventrally (Figs 58, 80), base consists of 1 prominent lobe covered with setae. Median area covered with fine setae, inferior volsella indistinct, consists of a rugulose area medially, distinctly visible in dorsal view. Gonostylus (Figs 62, 79) 150-155 μm long, maximum width 60 μm , minimum width 35 μm ; crista dorsalis broad and rounded anteriorly, consists of one large blackish lobe occupying nearly the entire anterior side of the gonostylus.

Male pupal exuviae

(n = 6; Figs 29, 34, 40, 73, 77-77a)

General colour blackish including the cephalothorax, anal lobe and genital sac. Frontal apotome, thorax and anal lobe wrinkled; thorax with distinct large granulations anterolaterally.

Frontal apotome (Fig. 29) slightly domed and lacking granulation; frontal setae 170-180 μm long, relatively short. Cephalothorax (Fig. 34) with dense granulation, presence of large granulations anterolaterally placed below the base of the precorneal setae; dorsocentrals (Fig. 34) setae-like; distance between Dc_1 and Dc_2 150-160 μm , Dc_2 and Dc_3 260-270 μm .

Abdomen (Figs 40, 73, 77) bearing few forked lateral setae; apophyses present on tergites and sternites II-VIII; tergite I with 1-2 rows of smooth small spines; field of smooth spines (Figs 40, 77) present on tergites II-VIII and sternites III-VIII, becoming gradually larger and more extensive towards the posterior area; field of point bands and posterior transverse rows of spines absent on tergites and sternites; conjunctives present on tergites III-VII/VIII and sternites III/VI, conjunctives on tergite VIII occasionally lacking or indistinct. Segment VIII with 4 caudolateral setae (3 dorsal and 1 ventral). Anal lobe suboval and wrinkled; apical projection (Figs 77-77a) entirely toothed, curved and pointed apically; genital sac ending with an elongated lobe; macrosetae curved apically.

Potthastia valserina Moubayed-Breil sp. n.

Male adult

(n = 1, male adult; Figs 84-91)

Material examined

France. Valserine River, a karstic tributary of the Rhône River, conductivity about 350 $\mu\text{S}/\text{cm}$, Rocher des Hirondelles, Jura Massif, altitude 600-650 m, 1 male adult, 07.06.2014, leg. Adrien Auzeil.

Big sized species. Total length 4.80 mm. Wing length 2.75 mm. General colouration blackish. Head and thorax blackish; mesonotal stripes distinct; wing pale with pale brown anterior veins; legs distinctly spotted, dark brown to blackish, distal part of ta_1 and tarsomeres 2-5 of PI, PII and PIII distinctly blackish; crista dorsalis blackish.

Head. Eyes and inner eye margin bare; proximal part of eye narrowed inwards, distal part slightly broadened outwards and truncate. Temporals consist of 8 setae including 5 outer verticals and 3 postorbitals; distal area of the eye bearing 2 stout setae. Palp 5-segmented; first

palpomere well developed; length (in μm) of segments: 50, 62, 1+60, 130, 260; sensilla clavata present on distal part of fifth segment. Antenna 1230 μm long, 13-segmented; antennal groove beginning on segment 1 and reaching ultimate flagellomere; last flagellomere nearly linear, slightly clubbed and bearing 1 stout apical seta; segments 1-12 460 μm long, nearly subequal; last flagellomere 770 μm long. AR 1.67.

Thorax (Fig. 84). Acrostichals absent. Lateral anteprenotals 14-15; dorsocentrals with 25-26 setae in 1-2 rows (mostly in 2 rows), prealars 6-7. Humeral pit (Fig. 85) consists of a small elongated area, which includes few small granulations. Scutellum (Fig. 86) with 28 setae placed laterally in 3 rows, median area bare. Wing. Brachiolium with 3 setae; anterior veins pale, distribution of setae on veins: R, 11; R₁, 8-9; R₂₊₃, 0; R₄₊₅, 0. Squama with 63-65 setae in 1-3 rows. Legs. Tarsomere 4 of PI, PII and PIII respectively 98, 95, 93 μm long, heart-shaped, bilobed apically and significantly shorter than tarsomere 5 (130, 140, 140 μm long). Sensilla chaetica present on tibia and tarsomeres 1-3 of PI, PII and PIII.

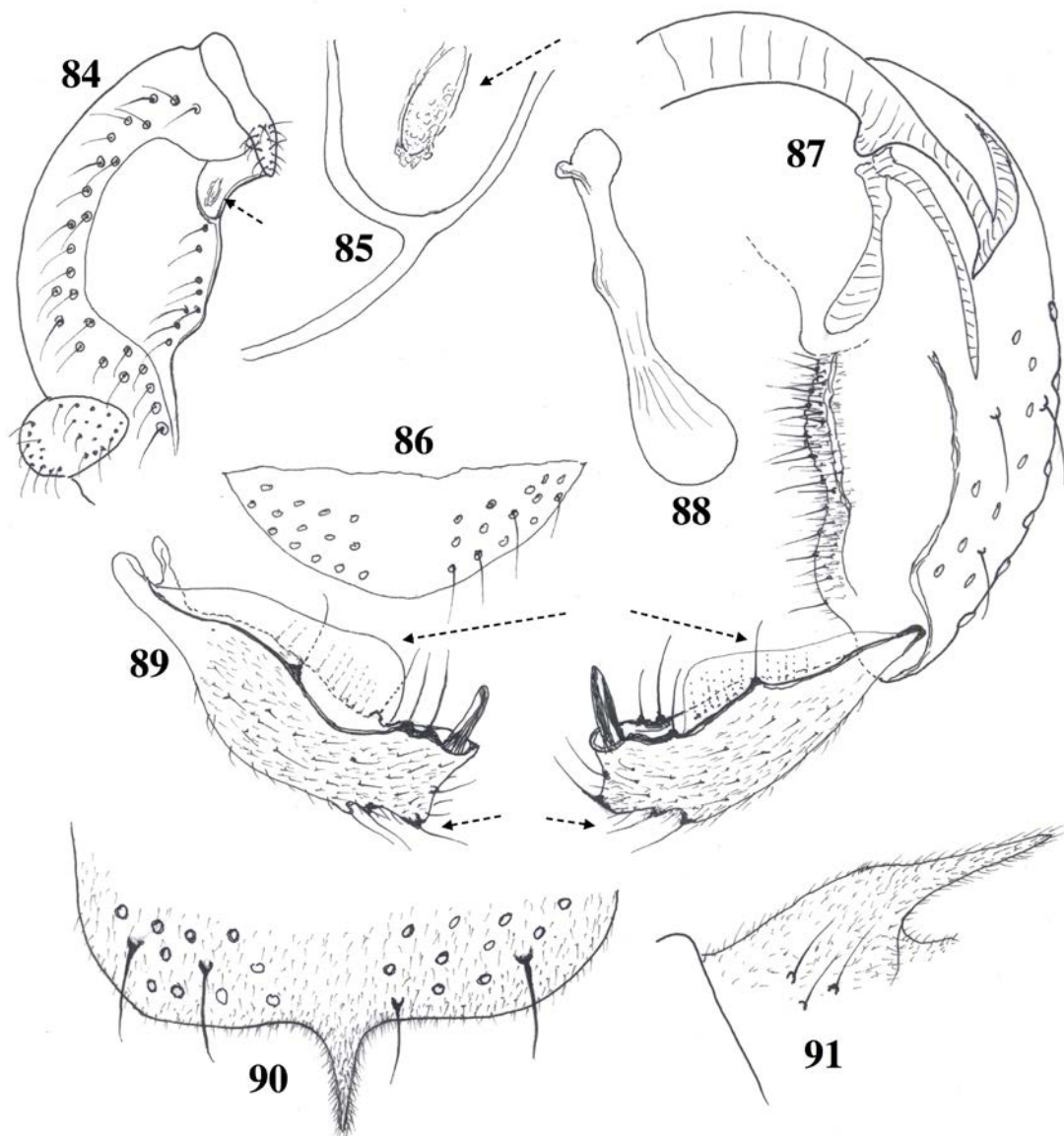
	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	1190	1305	1225	563	342	98	130	0.94	3.28	2.04	1.43
PII	1295	1280	580	412	240	95	140	0.45	4.02	4.45	1.88
PIII	1390	1410	952	505	269	93	140	0.68	3.73	2.94	2.75

“LR = Length of tarsomere ta₁ divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and ta₁ divided by combined length of tarsomeres ta₂-ta₅; SV = Ratio of femur plus tibia to tarsomere ta₁; BR = Ratio of longest seta of ta₁ divided by minimum width of ta₁, measured one third from apex.”

Abdomen. Hypopygium in dorsal and ventral view (Figs 87-91). Tergite IX (Fig. 90) broad and extended transversally, bearing 24 setae (12 on each side of the anal point. Anal point (Fig. 90, dorsal; Fig. 91, lateral) 38 μm long, elongated, narrowed with pointed apex. Sternapodeme and phallapodeme as in Fig. 87. Sternapodeme orally produced, broad and arc-shaped; phallapodeme (Fig. 88) hammer-like, inner part straight and paddle-like, outer part linear with pointed apex, basal part truncate for joint with sternapodeme expansion placed caudally. Gonocoxite (Figs 87). Dorsally with a plate-like smooth and sub-triangular superior volsella; inferior volsella distinct, consists of a large lobe covered with stout setae; inner margin distinctly swollen distally. Gonostylus (Fig. 87, dorsal view; Fig. 89, ventral view) 125 μm long, maximum wide 45 μm , projecting distally, anterior margin bearing 1 characteristic seta medially and 3 setae distally (1 dorsal and 2 ventral), posterior margin with 3 stout setae; crista dorsalis 85 μm long, 25 μm maximum width, consists of one large blackish lobe occupying $\frac{3}{4}$ of anterior side.

4. Taxonomic position

A large associated material composed of male pharate adults, male and female adults and Pe belonging to the genus *Potthastia* allowed us to provide a first revision of the known *Potthastia* species from: Corsica, continental France (Eastern and Western Pyrenees), Algeria and Lebanon. Main distinguishing characters and mensural features of the 6 currently known *Potthastia* species are illustrated in Table I for the male adults and in Table II for the Pe. Moreover, for each of the examined species some of the differentiating features provided in the literature can be supplemented or corrected based on the summarized combination of characters illustrated in Tables I-II (pp. 35-36).



Figures 84-91. Male imago of *Potthastia valserina* sp. n. Thorax (84); humeral pit (85); scutellum (86); hypopygium, dorsal and ventral (87); phallapodeme (88); right gonostylus in ventral view (89); tergite IX (90); anal point, lateral view (91).

Figures 84-91. Imago mâle de *Potthastia valserina* sp. n. Thorax (84); aire humérale (85); scutellum (86); hypopyge, vues dorsale et ventrale (87); phallapodème (88); gonostyle droit en vue ventrale (89); tergite IX (90); pointe anale en vue latérale (91).

***P. dominicii* sp. n.**

The male adult of this new species can be separated from other members of the genus and especially from its nearest species *P. gaedii* by a combination of differentiating characters.

- In the male adult. Antennal Ratio AR 2.10-2.30 (Table I), 1.60-1.70 in *P. gaedii*. Thorax: anteprenotals 9-10 (Fig. 3), 5-6 in *P. gaedii* (Fig. 4); dorsocentrals consist of 19-20 uni-biserial setae (Fig. 3), 15-17 uniserial in *P. gaedii* (Fig. 4). Anterior wing veins blackish, pale in *P. gaedii*. Tergite IX broadly bilobed laterally (Fig. 9a), semi-circular in *P. gaedii* (Fig. 52; Fig. 135.1, SERRA-TOSIO 1971; Fig. 132B, LANGTON & PINDER 1987). Apex of anal point rounded in lateral view (Fig. 10), pointed in *P. gaedii* (Fig. 51). Gonocoxite: ventral base rounded (Fig. 53), truncate in *P. gaedii* (Fig. 54); inferior volsella with 2 distinct lobes (Figs 9a, 11), indistinct in *P. gaedii* (Fig. 135.2, SERRA-TOSIO 1971; Fig. 132B, LANGTON & PINDER 1987). Gonostylus: anterior margin sinuous (Figs 12-13, 59), linear in *P. gaedii* (Fig. 60); lobes of crista dorsalis unequal (proximal one much larger), subequal in *P. gaedii*.

- In the female adult. Apical seta on last flagellomere placed pre-apically (Figs 14-14a), placed apically in *P. gaedii* (Figs 17-17a); ventrolateral lobe consistently swollen distally (Figs 18a-19), moderately swollen in *P. gaedii* (Fig. 22); apodeme lobe arc-like (Figs 18a, 20), sickle-like in *P. gaedii* (Fig. 23).

- In the pupal exuviae. Granulations and domes distinctly present on frontal apotome (Figs 24-25), absent in *P. gaedii* (Figs 30-31); frontal setae 340-380 μm long (Table II), 160-170 μm long in *P. gaedii*; Dc₁ forked (Fig. 32), setae-like in *P. gaedii* (Fig. 33); distance between Dc₁ and Dc₂ 180-190 μm , between Dc₂ and Dc₃ 410-450 μm (Fig. 32, Table II), respectively 250-260 μm and 270-280 μm in *P. gaedii* (Fig. 33, Table II); posterior transverse rows of smooth spines present on sternites III-VIII (Fig. 38), on sternites III-VII in *P. gaedii*; apophyses on tergites and sternites absent (Fig. 38), present in *P. gaedii* (Table II); wrinkles on anal lobe absent (Fig. 74), present in *P. gaedii* (Fig. 78).

***P. giudicellii* sp. n.**

The specific characters found in the male and female adult and Pe will separate this new species from other related members of the genus including its nearest one *P. montium*.

- In the male adult. Antennal Ratio AR 2.40-2.50 (Table I), 1.55-1.75 in *P. montium* (Table I). Tergite IX bearing 2 distinct lateral expansions (Figs 41a, 49), lacking lateral expansions in *P. montium* (Fig. 50); setae on tergite IX placed on anteromedian area on each side of the anal point (Figs 41a, 49), placed posterolaterally near the apical margin in *P. montium* (Fig. 50). Gonocoxite: ventral base truncate (Fig. 56), swollen distally in *P. montium* (Fig. 57); inferior volsella with a distinct median dorsal lobe (Fig. 41a), indistinct in *P. montium* (SERRA-TOSIO 197, Fig. 131.1; LANGTON & PINDER 1987, Fig. 135.D.); 5-6 curved stout setae present on inner ventral base (Figs 41b, 45-46, 56), setae are setae-like in *P. montium* Fig. 57). Gonostylus: large proximally and narrowed distally (Figs 41, 47, 63), linear and parallel-sided in *P. montium* (Fig. 64); crista dorsalis present (large lobe), absent in *P. montium*.

- In the female adult. 2 apical setae present on last flagellomere (Fig. 16), only 1 apical seta in *P. montium* (Fig. 15); ventrolateral lobe distinctly swollen distally (Figs 65a, 66-67), indistinct in *P. montium* (not figured).

- In the pupal exuviae. Frontal setae 120-130 μm long (Table II), 190-210 μm long in *P. montium*; Dc₁ setae-like (Fig. 35), forked in *P. montium* (Fig. 36); distance between Dc₁ and

Dc₂ 180-190 µm, between Dc₂ and Dc₃ 350-360 µm (Fig. 35, Table II), respectively 350-380 µm and 270-280 µm in *P. montium* (Fig. 35, Table II); conjunctives present on sternites III-VI (Fig. 39), only on sternites III-VI in *P. montium* (Table II); apophyses present on tergites II-VI and sternites III-VI (Fig. 39, Table II), present on tergites III-VII and sternites II-VI in *P. montium* (Table II); wrinkles indistinct on anal lobe (Fig. 75), consistent in *P. montium* (Fig. 76).

***P. valserina* Moubayed-Breil sp. n.**

On the basis of some specific characters found in the male adult, this new species is keyed near *P. gaedii* and *P. longimanus*. The most relevant common features noted between *Potthastia valserina* sp. n. and the two latter species include:

- phallapodeme paddle-like (Fig. 88) and anal point present (Fig. 90) as in *P. gaedii* (Figs 51-52);
- sternapodeme arc-shaped (Fig. 87), inferior volsella with 1 distinct lobe and crista dorsalis (Figs 87, 89) consisting of 1 large blackish lobe placed proximally as in *P. longimanus* (Fig. 61).

5. Key to male adults and pupal exuviae of known *Potthastia* species

Male adults

1. - Anal point absent; crista dorsalis present, consists of 1 lobe 2
 - Anal point present; crista dorsalis present..... 3
2. - Gonostylus projecting posteriorly (Figs 62, 79); crista dorsalis consists of 1 lobe reaching nearly tip of gonostylus; anterior wing veins blackish; humeral pit (Fig. 82) with large granulations; ta₂ (Fig. 83) distinctly expanded distally; ta₄ (205-210 µm long) longer than ta₅ (180-190 µm long); base of gonocoxite with a large distal lobe (Figs 58, 80); inner part of phallapodeme pickaxe-like, curved distally, ending with a finger-like apex (Fig. 80).....*P. pastoris* (Edwards, 1933)
 - Gonostylus parallel-sided (Fig. 61); crista dorsalis consists of 1 lobe reaching half of gonostylus; all wing veins pale; humeral pit lacking large granulations; ta₄ significantly shorter than ta₅; inner part of phallapodeme straight, truncate apically with a foot-like apex (Fig. 132.2, SERRA-TOSIO 1971).....*P. longimanus* Kieffer, 1922
3. - Anal point broad and sub-triangular (Figs 41a, 49-50); dorsal tubercle present on apical part of gonocoxite (Figs 41a, 43a-43b); anterior wing veins pale 4
 - Anal point elongated and narrowed to tip (Figs 9a, 10, 51-52); dorsal tubercle on gonocoxite absent; anterior wing veins blackish or pale5
4. - Gonostylus slender, parallel-sided and linear (Fig. 64); crista dorsalis absent; base of gonocoxite truncate (Fig. 57) and lacking curved inner ventral setae*P. montium* (Edwards, 1929)
 - Gonostylus broad proximally and narrowed distally (Figs 41a, 47, 63), crista dorsalis present, consists of 1 large lobe covering entirely the anterior side of gonostylus; base of gonocoxite bilobed (Figs 41b, 45-46, 56), distal lobe with 5-7 inner ventral curved setae (Figs 41b, 45-46, 56)..... *P. giudicellii* sp. n. Moubayed-Breil & Orsini, 2016
5. - Crista dorsalis consists of 2 lobes (Figs 9a, 11, 60) 6
 - Crista dorsalis consists of only 1 large lobe (Figs 87, 89); humeral pit (Fig. 85) elongated with faint granulations; anterior wing veins pale; anteprenotals 14-15 (Fig. 84); scutellum (Fig. 85) with bare median area; inner part of phallapodeme paddle-like and straight; inferior volsella distinct, large and lobe-like; anal

- point (Figs 90-91) with pointed apex; gonostylus (Figs 87, 89) projecting, bearing 4 setae on anterior margin including 1 stout seta placed medially; AR 1.67.....*P. valserina* sp. n. Moubayed-Breil, 2016
6. - Inferior volsella indistinct; tergite IX markedly semi-circular (Fig. 52); base of gonocoxite truncate (Fig. 54); crista dorsalis consists of 2 subequal lobes (Fig. 60); antepronotals 5-6 (Fig. 4); anterior wing veins pale; inner part of phallapodeme paddle-like and curved distally (Fig. 132.1, SERRA-TOSIO 1971); anal point with pointed apex (Fig. 51); AR 1.60-1.70*P. gaedii* (Meigen, 1838)
- Inferior volsella with 2 distinct lobes (Figs 9a, 11); tergite IX broadly bilobed laterally (Fig. 9a); base of gonocoxite rounded (Figs 9b, 53); crista dorsalis consists of 2 unequal lobes (Figs 12-13, 59), proximal lobe much larger than the distal one; antepronotals 9-10 (Fig. 3); anterior wing veins blackish; anal point with rounded apex (Figs 9a, 10, 52); inner part of phallapodeme (Fig. 9b) large S-like, projecting outwards distally with a rounded apex; AR 2.10-2.30*P. dominicii* Moubayed-Breil & Orsini, 2016

Pupal exuviae

1. - Anal macrosetae needle-like, not curved apically (Figs 39, 75-76); thorax without granulations (Figs 35-36); posterior transverse rows of smooth spines on tergite I absent (Fig. 39); field of point bands absent on tergites and sternites (Fig. 39-40, 73, 75, 77); anal lobe sub-circular (Figs 75-76), basal margin straight; apical projection smooth (Figs 75a-76), toothed on anterolateral area at the insertion of macrosetae2
- Anal macrosetae curved apically (Figs 39-40, 74, 77-78); thorax with dense granulations (Figs 32-34, 37); posterior rows of smooth spines present (occasionally absent) on tergite I; field of point bands present on tergites II-VIII and sternites IV-VIII; anal lobe oval (Figs 74, 77-78), basal margin straight or rounded; apical projection entirely toothed 3
2. - Dc₁ forked (Fig. 36); distance between Dc₁-Dc₂ 350-380 µm; colour blackish; conjunctives present on and sternites IV-VI; frontal apotome weakly domed (Figs 27-28); apophyses present on tergites III-VII and sternites II-VI; anal lobe strongly wrinkled (Fig. 76), apical projection blackish*P. montium*
- Dc₁ setae-like (Fig. 35); distance between Dc₁-Dc₂ 180-190 µm; colour golden brown; conjunctives present on tergites II-V and sternites III-VI; frontal apotome domed (Fig. 26); apophyses present on tergites II-VI and sternites III-VI (Fig. 39); anal lobe weakly wrinkled; apical projection brown (Fig. 75-75a).....*P. giudicellii* sp. n.
3. - Large darkened granulations present anterolaterally on thorax (Fig. 34); colour blackish; few lateral setae are forked; tergite I (Fig. 40, 73) often with 1-3 rows of small smooth spines; basal margin of anal lobe rounded (Fig. 40, 77); conjunctives present on tergites III-VII/VIII and sternites III-VI (Fig. 40a-40b); anal lobe wrinkled (Fig. 77), basal margin rounded; apical projection sub-triangular, curved apically (Figs 40, 77-77a).....*P. pastoris*
- Large darkened granulations absent on thorax; colour brown or blackish; most of the lateral setae are forked; posterior rows of smooth spines present on tergite I (Figs 38, 40, 71-73); posterior transverse rows of smooth spines present on tergites I/II-VII and sternites III-VII/VIII; conjunctives present on tergites I/II-VII and sternites III-VI (Figs 38a-38b, 40a-40b); basal margin of anal lobe straight; apical projection triangular, not curved apically (Figs 74-75, 78)4
4. - Apophyses absent; Dc₁ forked (Fig. 32); distance between Dc₁-Dc₂ 180-190 µm, Dc₂-Dc₃ 410-450 µm; colour brown; tergite I with 1 row of small smooth spines (Figs 38, 71); posterior transverse rows of smooth spines present on tergites I/II-VIII and sternites III-VIII; conjunctives present on tergites I/II-VII and sternites III-VI (Fig. 38); anal lobe not wrinkled (Fig. 74)*P. dominicii* sp. n.
- Apophyses present; Dc₁ setae-like (Fig. 33); distance between Dc₁-Dc₂ 250-260 µm, Dc₂-Dc₃ 270-280 µm; colour dark brown to blackish; tergite I with 2-3 rows of small spines (Fig. 72); posterior transverse rows of smooth spines present on tergites I-VIII and sternites III-VII; conjunctives present on tergites I/II-VII and sternites III-VI; anal lobe wrinkled (Fig. 78)*P. gaedii*

6. Ecology and geographical distribution

Larvae of all members of the genus *Potthastia* are exclusively rheophilic and commonly encountered in lotic habitats delimited by the rhithral and potamal of streams and large rivers. Localities where the larval, imaginal and pupal material of *P. dominicii* sp. n. and *P. giudicellii* sp. n. was collected consist of shaded pristine stretches and cold mountain streams including small waterfalls and riffles on stony to gravely and sandy substrata. Bryocolous and hygropetric habitats probably represent the most common aquatic areas for larval populations. Such lotic habitats, which are endangered by ecotourism and both natural and accidental flooding, deserve much greater consideration, protection and preservation. The new species are typically rheophilic and representative of helocrenes and cold stenothermic streams. They belong to the crenobiotic and crenophilous community of species as documented by LINDEGAARD (1995). Abiotic and biotic factors recorded along the rhithral and waterfalls delimited by the permanent Prezzuna and Focolara streams are:

- high value of the water conductivity (350-420 $\mu\text{S}/\text{cm}$),
- cold stenothermic water temperature (8-12 $^{\circ}\text{C}$),
- well shaded lotic habitats (waterfalls and riffles), rocks and stones densely covered by microalgae (Chlorophyceae, Xanthophyceae and especially the red algae *Hildenbrandia rivularis*), etc.

While *P. dominicii* sp. n. is likely considered as a widely distributed species occurring in the rhithral of streams and rivers delimited by the coastal Mediterranean ecosystem of both Corsica and continental France, the geographical distribution of *P. giudicellii* sp. n. is apparently restricted to pristine and well preserved streams delimited by the insular coastal ecosystem of western Corsica. However, *P. valserina* sp. n. is currently only reported from the Valserine karstic River in continental France (zone 4b as given in MOUBAYED-BREIL & ASHE 2016).

In particular, lotic habitats (helocrenes, riffles and waterfalls) extended between the upper and middle basins of Focolara and Prezzuna streams (altitude 30-650 m) where populations of *P. giudicellii* sp. n. are confined, consist of a significantly spared area from the impact of various perturbation factors including accidental flooding, ecotourism, modification of habitats, etc. Moreover, this well preserved area from the devastating impact of human activities, is entirely surrounded by three high geographical barriers (to the north, the highest peak of the Monte Cintu, 2706 m; to the south and south-east, Paglia Orba, 2525 m and Monte Rotando, 2622 m) which provide favourable ecological conditions and beneficial local protection and isolation.

Geographical distribution throughout the Mediterranean Basin for the 7 actually known *Potthastia* species is provided in figure 92. *P. giudicellii* sp. n. is restricted to the western Province of Corsica, while *P. dominicii* sp. n. is considered as a pyreneocorsican element currently known from both western Corsica and the Pyrenees.

According to MOUBAYED-BREIL & ASHE (2012, 2016) and MOUBAYED-BREIL (2016) *P. dominicii* sp. n. is believed to represent the fifth documented pyreneocorsican element of the Tyrrhenian Province where are reported the four previously chironomid taxa: *Rheocricotopus thomasi* Moubayed-Breil, 2016; Orthocladiinae, genus nov., sp. nov; *Trissocladius orsinii* Moubayed-Breil & Ashe, 2015; *Rheotanytarsus dactylophoreus* Moubayed-Breil, Ashe & Langton, 2012. In addition this latter data reinforce biogeographic affinities between western Corsica and

the eastern part of the Eastern Pyrenees. Moreover, occurrence of this commonly distributed new rheophilic species in both Corsica and the Eastern Pyrenees indicates that it is apparently more widespread in similar cold mountain springs and streams of the Tyrrhenian subregion. Therefore, this pyreneocorsican *Potthastia* species can be expected to occur in other similar geographic areas of the western Mediterranean basin, including for example similar high altitude pristine streams located in Spain and Italy.

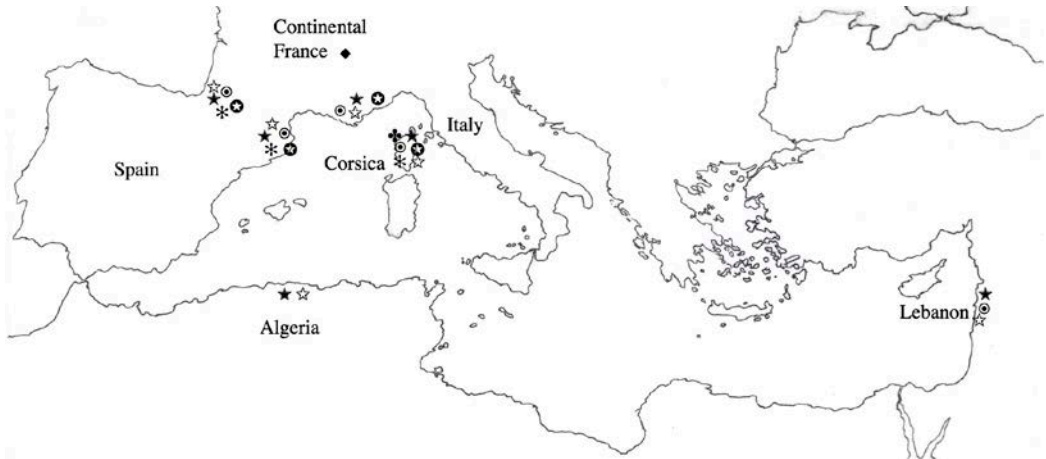


Figure 92. Geographical distribution of the 7 known *Potthastia* species in the Mediterranean basin: *P. dominicii* sp. n. (*); *P. giudicellii* sp. n. (♣); *P. gaedii* (★); *P. longimanus* (⊙); *P. montium* (⊕); *P. pastoris* (☆); *P. valserina* sp. n. (□). Other known species from Eastern Pyrenees and Corsica include: *Rheocricotopus thomasi*; *Trissocladius orsinii*; Orthoclaadiinae genus. n., sp. n.; *Rheotanytarsus dactylophoreus*.

Figure 92. Distribution géographique des 7 espèces connues de *Potthastia* dans le bassin méditerranéen : *P. dominicii* sp. n. (*); *P. giudicellii* sp. n. (♣); *P. gaedii* (★); *P. longimanus* (⊙); *P. montium* (⊕); *P. pastoris* (☆); *P. valserina* sp. n. (□). Les autres taxons connus des Pyrénées-Orientales et de Corse incluent : *Rheocricotopus thomasi*, *Trissocladius orsinii*, Orthoclaadiinae genus. n., sp. n., *Rheotanytarsus dactylophoreus*.

The aquatic invertebrate communities occurring in rivers and streams delimited by the Mediterranean coastal ecosystem are still little known and need more investigation. During the last decades most of the low wetland areas including river basins and estuarine zones are becoming degraded and strongly threatened by the impact of various human activities and perturbation factors (ecotourism planning, camping, modifications of habitats, toxic chemical pollutants, eutrophication, natural and accidental flooding).

In addition, these habitats consist of endangered hotspots of diversity similar to what is found in many coastal ecosystems around the world (MOUBAYED-BREIL 2008, MOUBAYED-BREIL et al. 2013, MOUBAYED-BREIL & ASHE 2015, MOUBAYED-BREIL & ASHE 2016). Their biogeographic significance is still underestimated and deserves therefore greater consideration, protection and preservation in the years to come. Encountered species in the same localities as *P. dominicii* sp. n., *P. giudicellii* sp. n. and *P. valserina* sp. n. include: *Boreoheptagyia legeri* (Goetghebuer,

1933); *Diamesa insignipes* Kieffer, 1908; *D. tonsa* (Haliday, 1856); *Sympothastia zavreli* Pagast, 1947; *Bryophaenocladus aestivus* (Brundin, 1947); *B. nidorum* (Edwards, 1929); *Chaetocladus melaleucus* (Meigen, 1818); *C. perennis* (Meigen, 1830); *Corynoneura gratias* Schlee, 1968; *C. lobata* Edwards, 1924; *Eukiefferiella brulini* Moubayed & Ashe, 2015; *E. minor* (Edwards, 1929); *E. tirolensis* Goetghebuer, 1938; *Heleniella ornatcollis* (Edwards, 1929); *H. serratosioi* (Ringe, 1976); *Krenosmittia camptophleps* (Edwards, 1929); *Parametriocnemus stylatus* (Spärck, 1923); *Pseudorthocladus curtistylus* (Goetghebuer, 1921); *Rheocricotopus effusus* (Walker, 1856); *R. fuscipes* (Kieffer, 1909); *R. meridionalis* Moubayed-Breil, 2016; *R. thomasi* Moubayed-Breil, 2016; *Rheotanytarsus curtistylus* (Goetghebuer, 1921); *R. pentapoda* (Kieffer, 1909); etc.

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Characters	<i>giudicellii</i>	<i>montium</i>	<i>longimanus</i>	<i>valserina</i>	<i>pastoris</i>	<i>dominicii</i>	<i>gaedii</i>
AR	2.40-2.50	1.65-1.75	1.60-1.70	1.67	1.65-1.70	2.10-2.30	1.60-1.70
Antepronotals	9-10	13-14	14-15	14-15	5	9-10	5-6
Dorsocentrals	uni-biserial	uni-biserial	uni-biserial	25-26	uni-biserial	uni-biserial	uniserial
Prealars	14	17	10	6-7	11	14	9
Ant. wing veins	pale	pale	pale	pale	blackish	blackish	pale
Legs	dark brown	dark brown	brown	spotted	blackish	spotted	spotted
Tarsomeres ta ₄ , ta ₅	ta ₄ , shorter	ta ₄ , shorter	ta ₄ , shorter	ta ₄ , shorter	ta ₄ , longer	ta ₄ , shorter	ta ₄ , shorter
AnPt: P/A	P	P	A	P	A	P	P
AnPt: Shape	large, sub-triangular	large, sub-triangular	-	elongated narrowed	-	elongated narrowed	elongated narrowed
AnPt: Apex	broad	broad	-	pointed	-	rounded	pointed
Gx: Dorsal tubercle	P, large	P, less large	A	A	A	A	A
Gx: Ventral base	bilobed	truncate	truncate	bilobed	bilobed	rounded	truncate
Gx: Apical part	bilobed	rounded	rounded	? rounded	bilobed	bilobed	rounded
Gx: Basal setae	curved apex	setae-like	setae-like	setae-like	setae-like	setae-like	setae-like
Gx: Sup. volsella	A	A	P, large	P, large	A	P, large	P, large
Gx: Inf. volsella	distinct	indistinct	1 distinct lobe	1 large lobe	indistinct	2 lobes	indistinct
Gs: General shape	narrowed	parallel-sided	elongated	projecting distally	sub-triangular	elongated	parallel-sided
Gs: Ant. margin	sinuous	linear	linear	sinuous	sinuous	sinuous	linear
Gs: Post. margin	sinuous	sinuous	linear	sinuous	sinuous	sinuous	linear
Gs: Preapical part	rounded	rounded	rounded	projecting	projecting	rounded	rounded
Gs: CrDs, P/A	P, 1 lobe	A	P, 1 lobe	P, 1 lobe	P, 1 lobe	P, 2 lobes	P, 2 lobes
Gs: CrDs, lobes	Prx, very large	A	Prx, medium	Prx, large	Prx, large	Prx, large Dst, weak	nearly sub-equal
Gs: CrDs, colour	transparent	A	blackish	blackish	blackish	blackish	blackish

Table I. Main distinguishing characters in the male adult of 7 *Potthastia* species: *P. giudicellii* sp. n., *P. montium*, *P. longimanus*, *P. valserina* sp. n., *P. pastoris*, *P. dominicii* sp. n., and *P. gaedii*.

AnPt, anal point; Gx, gonocoxite; Gs, gonostylus; CrDs, cirista dorsalis; P, present; A, absent; Ant., anterior; Inf., inferior; Post, posterior; Prx, proximal; Dst, distal; Sup., superior.

Tableau I. Principaux caractères distinctifs chez l'adulte mâle de 7 espèces de *Potthastia* : *P. giudicellii* sp. n., *P. montium*, *P. longimanus*, *P. valserina* sp. n., *P. pastoris*, *P. dominicii* sp. n., et *P. gaedii*.

AnPt, pointe anale ; Gx, gonocoxite ; Gs, gonostylus ; CrDs, cirista dorsalis ; P, présent ; A, absent ; Ant., antérieur ; Inf., inférieur ; Post., postérieur ; Prx, proximal ; Dst, distal ; Sup., supérieur.

Characters	<i>giudicellii</i>	<i>montium</i>	<i>longimanus</i>	<i>pastoris</i>	<i>dominicii</i>	<i>gaedii</i>
Colour, Pe:	brown	blackish	brown	blackish	golden	brown
Anal lobe:	brown	blackish	brown	blackish	brown	brown
Skin, thickness	thin	thin	thick	thin	thick	thick
FrAp-1	wrinkled	wrinkled	wrinkled	wrinkled	wrinkled	wrinkled
FrAp-2, domes	domed	domed	indistinct	domed	domed	domed
FrAp, Gr	A	A	A	A	Present	A
FS: length, μm	120-130	190-210	220-250	170-180	340-380	160-170
Thorax	bare	bare	wrinkled	wrinkled	wrinkled	wrinkled
Gr, thorax	bare	bare	dense	dense	dense	dense
Large Gr	A	A	A	P, dark brown	A	A
Warts, thorax	A	A	A	A	P, laterally	P, laterally
Dorsocentrals	setae-like	Dc ₁ , forked	setae-like	setae-like	Dc ₁ , forked	setae-like
Dist, Dc ₁ - Dc ₂	180-190	350-380	210-220	150-160	180-190	250-260
Dist, Dc ₂ - Dc ₃	350-360	320-340	250-260	260-270	410-450	270-280
Field of points	A	A	A	A	P	P
Field of SmSp	Tg & St, P	Tg & St, P	Tg & St, P	Tg & St, P	A	A
SmSp, Tg I	A	A	A	often	P	P
Posterior Trsv rows of SmSp	Tg, A St, A	Tg, A St, A	Tg, A St, A	Tg, A St, A	Tg, I/II-VIII St, III-VIII	Tg, I-VIII St, III-VII
Cjt, Tg	II-V	II-V	II-VII	III-VIII	I/II-VII	II/III-VII
Cjt, St	III-VI	IV-VI	III-VI	III-VI	III-VI	III-VI
Apophyses, Tg	II-VI	III-VII	II/III-VIII	II-VIII	indistinct	II-VIII
Apophyses, St	III-VI	II-VI	II-VII	II-VIII	A	II-VIII
Lateral setae	few, forked	few, forked	few, forked	few, forked	most, forked	most, forked
AnL, wrinkles	bare	wrinkled	bare	wrinkled	bare	wrinkled
AnL, Shape	circular	sub-circular	sub-oval	oval	oval	oval
AnL, margin	straight	straight	straight	rounded	straight	straight
AnL, Apical projection	few teeth	bare	toothed	toothed	toothed	toothed
MaS, apex	needle-like	needle-like	curved	curved	curved	curved

Table II. Main distinguishing characters in the pupal exuviae of 6 *Potthastia* species: *P. giudicellii* sp. n., *P. montium*, *P. longimanus*, *P. pastoris*, *P. dominicii* sp. n., and *P. gaedii*.

FrAp, frontal apotome; FS, frontal setae; Gr, granulation on thorax; Ant, anterior; Trsv, transverse; SmSp, smooth spines; Tg, tergites; St, sternites; Cjt, conjunctives; AnL, anal lobe; MaS, macrosetae; Dist, distance (in μm).

Tableau II. Principaux caractères distinctifs de l'exuvie nymphale de 6 espèces de *Potthastia* : *P. giudicellii* sp. n., *P. montium*, *P. longimanus*, *P. pastoris*, *P. dominicii* sp. n. et *P. gaedii*.

FrAp, pièce céphalique ; FS, soies frontales ; Gr, granulations ; Ant, antérieur ; Trsv, transversal ; SmSp, épines émoussées ; Tg, tergites ; St, sternites ; Cjt, conjunctives ; AnL, anal lobe ; MaS, macrosetae ; Dist, distance (en μm).