

Two new species of the genus *Empis* Linnaeus, 1758
(Diptera, Empididae, Empidinae)
from French nature reserves

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Male habitus *Empis (Xanthempis) montsegurensis* n. sp. Photo: Emmanuel Delfosse.

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KEY WORDS

Empidoidea,
Alps,
Pyrenees,
French nature reserves,
new species.

ABSTRACT

Two new species belonging to the genus *Empis* Linnaeus, 1758 and collected in France are described and illustrated: *Empis (Empis) cartusiana* n. sp. and *Empis (Xanthempis) montsegurensis* n. sp., found in the Alps in a national nature reserve (Hauts de Chartreuse) and the Pyrenees in a regional nature reserve (massif de Saint-Barthélémy), respectively.

RÉSUMÉ

Deux espèces nouvelles du genre *Empis* Linnaeus, 1758 (Diptera, Empididae, Empidinae) provenant de réserves naturelles françaises.

Deux espèces nouvelles appartenant au genre *Empis* Linnaeus, 1758 et collectées en France sont décrites et illustrées : *Empis (Empis) cartusiana* n. sp. et *Empis (Xanthempis) montsegurensis* n. sp. ont été trouvées respectivement dans les Alpes (réserve naturelle nationale des Hauts de Chartreuse) et les Pyrénées (réserve naturelle régionale du massif de Saint-Barthélémy).

MOTS CLÉS

Empidoidea,
Alps,
réserves naturelles
françaises,
espèces nouvelles.

INTRODUCTION

Since 2009 the protocol *Syrph-the-net* (Speight *et al.* 2020), which consists in analysing the diversity of the family Syrphidae Latreille, 1802 by Malaise trap sampling, is used in France by nature reserves to assess the conservation status of natural or subnatural habitats. The trapping campaigns have made the collect of a large number of invertebrates possible and some managers of nature reserves have undertaken to enhance the study of the non-syrphid taxa in order to improve their taxonomic inventory. Malaise traps have therefore been sorted for certain families and various sites, and the material sent to specialists for identification.

The family Empididae Latreille, 1804 were sent to the first author, who received about 15 000 specimens from prestigious natural sites in eastern and southern France, from the Vosges to the Pyrenees. The identification of this material will allow a first inventory for this group, focusing on nature reserves.

Some of the empidids already identified had never been recorded in France, while others represent species that are new to science. The aim of this publication is to describe two of these new species, belonging to the subfamily Empidinae Latreille, 1804, recently discovered in the two main French mountain ranges, the Alps and the Pyrenees.

MATERIAL AND METHODS

This study is based on the material collected by Malaise traps in two French nature reserves, namely the Hauts de Chartreuse and massif de Saint-Barthélemy, located in the Alps and the Pyrenees, respectively.

Specimens were dried and pinned. Male genitalia were first dissected and macerated in hot 10% KOH, positioned in glycerine and drawn using a camera lucida, and then preserved in genitalia vials attached to the specimen.

An inventory number starting with the initials ED (meaning Entomology and Diptera, respectively) was attached to each specimen deposited in MNHN and data captured in the related collection database (<https://science.mnhn.fr/institution/mnhn/collection/ed/item/search>).

Morphological terminology follows McAlpine (1981), except for the antennal structure, which follows Stuckenberg (1999). Interpretation of male genital sclerites is based on Daugeron (1997).

ABBREVIATIONS

cer	cercus;
ej ap	ejaculatory apodeme;
epn	epandrium;
hyp	hypandrium;
ph	phallus.

Repository

MNHN	Muséum national d'Histoire naturelle, Paris;
Coll. DL	Dominique Langlois private collection, Ornans.

SYSTEMATIC ACCOUNT

Family EMPIDIDAE Latreille, 1804
Subfamily EMPIDINAE Latreille, 1804

Genus *Empis* Linnaeus, 1758

Empis Linnaeus, 1758: 603.

TYPE SPECIES. — *Empis pennipes* Linnaeus, 1758: 604, by subsequent designation (Latreille 1810: 443).

Subgenus *Empis* Linnaeus, 1758

Empis (Empis) cartusiana n. sp.
(Fig. 1A–C)

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TYPE MATERIAL. — **Holotype.** France • ♂; Saint-Pierre de Chartreuse (38), Réserve naturelle nationale des Hauts de Chartreuse, Dent de Crolles; 45°19'8"N, 5°51'25"E; 1762 m a.s.l.; 22.VII.2019; J. Claude leg.; Malaise trap no. 118, subalpine meadows and moorland, nestled in a pine forest; MNHN-ED-ED10932.

Paratypes. France • 3 ♂; same data as for holotype; MNHN-ED-ED10933, MNHN-ED-ED10934, MNHN-ED-ED10935 • 4 ♀; same data as for holotype; MNHN-ED-ED11399, MNHN-ED-ED11400, MNHN-ED-ED11401, MNHN-ED-ED11402 • 6 ♂, 5 ♀; same data; Coll. DL • 1 ♂; same data; 45°19'12"N, 5°51'25"E; 1755 m a.s.l.; 17.VI.2020; Malaise trap no. 127; Coll. DL • 1 ♂; same data; 45°19'12"N, 5°51'18"E; 1776 m a.s.l.; 17.VI.2020; Malaise trap no. 128; Coll. DL • 1 ♂; Chapareillan, Mont Granier; 45°27'0"N, 5°55'33"E; 1832 m a.s.l.; 1.VII.2020; Malaise trap no. 125; Coll. DL.

ETYMOLOGY. — From the Latin word *Cartusia* meaning *Chartreuse*, in reference to the Chartreuse mountain range, an Alpine massif located in the French departments of Isère and Savoie, in which the specimens were collected (between the cities of Grenoble and Chambéry).

DIAGNOSIS. — Rather small greyish dusted species of the *Empis pennipes*-group of the subgenus *Empis* (*sensu* Chvála 2011), with white abdominal pubescence, dark halteres, an anterodorsal tuft of black hairs at the base of male cercus; phallus well visible, long, thin, curved; wing clear in male, dark in female; legs of female with pennation.

DISTRIBUTION. — France: Alps (Fig. 3).

DESCRIPTION

Male (Fig. 1A, B).

Head. Occiput dull black to dusted grey, covered with many black occipital setae, a distinct row of postoculars, postgena with yellowish fine setae. Frons reduced to small triangle above antennae. Face dull black. Antennae blackish, scape as long as pedicel, postpedicel three times scape length. Proboscis blackish, labrum about twice head height, palpus black with a few black bristly-hairs.

Thorax. Dull black with grey pruinosity. Antepnotum with row of short black setae. Proepisternum and prosternum with a few rather pale yellow setae. Postpronotum with one strong, long apical seta and a few fine, short anteriors.

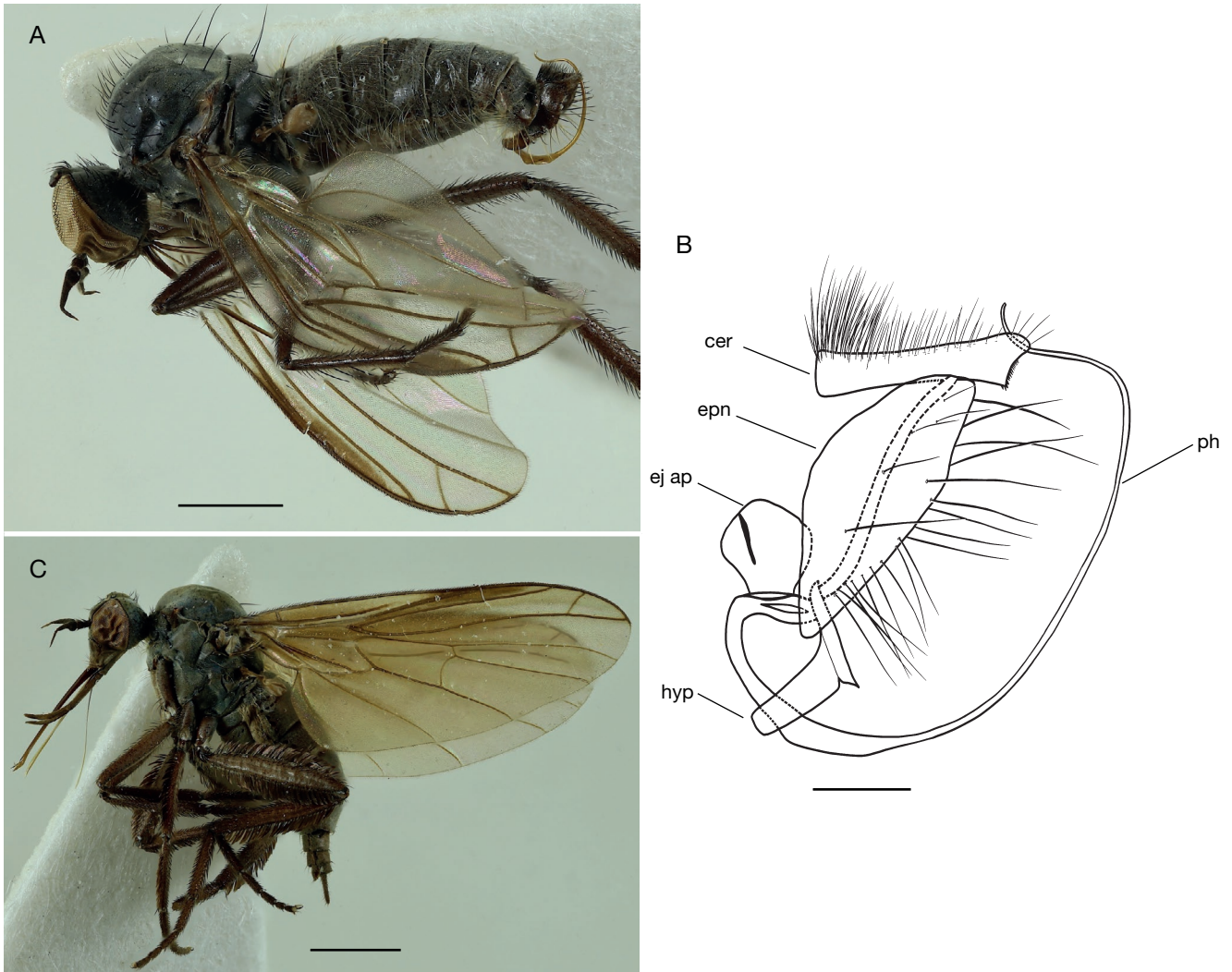


FIG. 1. — *Empis (Empis) cartusiana* n. sp.: **A**, male habitus; **B**, male hypopygium; **C**, female habitus. Abbreviations: see Material and methods. Scale bars: A, C, 1 mm; B, 0.2 mm.

Acrostichals biserial, rather short, absent in prescutellar depression; dorsocentrals irregularly biserial, a little longer than acrostichals, ending in two strong, long setae in prescutellar depression. Laterotergite with fan of mix black and yellowish setae. Scutellum with two strong, long apical setae, two thinner, shorter subapicals. Other strong, long setae as follows: three notopleurals, two pre- and one postsutural supraalars, one postalar, two distinct intraalars in the front of scutum on each side.

Legs. Dark brown blackish. Fore and mid coxae with mainly pale yellow setae, hind coxa with rather strong black setae mixed with a few pale yellow setae. Fore femur with short dorsal setae, longer fine ventrals; fore tibia with dorsal rows of distinct setae especially one posterodorsal row of rather strong, longer than tibia depth setae; first four fore tarsomeres with rather strong apical setae. Mid femur with dorsal setae shorter than femur depth, one antero- and one posteroventral rows of strong, long setae except apically; mid tibia with one antero-

and one posteroventral rows of rather strong, short setae, one strong, long dorsal seta at middle; first four mid tarsomeres with rather strong apical setae. Hind femur with many dorsal and ventral setae shorter or as long as femur depth; hind tibia with many ventral setae, shorter than tibia depth, dorsal row of strong, long setae mixed with many thinner, shorter other setae; first hind tarsomere somewhat swollen with distinct apical setae, remaining tarsomeres with rather short setae.

Wing. Length: 4.4 mm. Clear, distinct brown stigma. Sc abbreviated, A1 complete. Haltere dark.

Abdomen. Dull to dusted greyish, with whitish setae at base. First five tergites with many rather long yellowish marginal and lateral setae; sternites with yellowish setae ventrally.

Hypopygium. Dull black with black setae, cercus with anterodorsal fan of dense thin setae; epandrial lamella about 2.5 times higher than wide with strong, long setae on the

posterior margin; hypandrium reduced to simple ventral plate; phallus yellowish brown, thin, forming a long posterior loop.

Female (Fig. 1C)

Similar to male except for the usual sexual differences and the following characters: setae shorter; eyes dichoptic, all ommatidia of equal size; frons as wide as face with a few distinct setae along margin of eyes; wing darkened; legs with many pennate setae: fore femur with a few anterodorsal subpennate setae basally, fore tibia with short posterodorsal pennate setae; mid femur with long dorsal and ventral pennation, mid tibia with short dorsal pennation except at tips, short ventral pennation at base, first mid tarsomere with a few dorsal subpennate setae; hind femur with long dorsal and ventral pennation, hind tibia with rather long dorsal pennation and ventral pennation at basal half, first hind tarsomere slightly longer, less swollen with dorsal and ventral subpennate setae, more distinct dorsally.

REMARKS

In Chvála's key to the *E. pennipes* group (Chvála 2011), *E. cartusiana* n. sp. is near the pair *E. rufiventris* Meigen, 1838/*E. provencalis* Chvála, 2011, but it must be compared to the latter as both species have a mix of yellowish and black setae on the laterotergite; however the labrum of *E. cartusiana* n. sp. is distinctly shorter, the females have well-developed pennation on legs and the male genitalia are different. On the other hand *E. cartusiana* n. sp. does not correspond to any Caucasian species of the *E. pennipes* group as reviewed by Kustov & Shamshev (2014).

Subgenus *Xanthempis* Bezzi, 1909

Xanthempis Bezzi, 1909: 88.

TYPE SPECIES. — *Empis stercorea* Linnaeus, 1761: 467, by original designation.

Empis (Xanthempis) montsegurensis n. sp.
(Fig. 2)

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TYPE MATERIAL. — **Holotype.** France • ♂; France, Montségur (09211), Réserve naturelle régionale du massif de Saint-Barthélémy, Caramille; 42°49'44"N, 1°47'41"E; 1745 m a.s.l.; 26.VI.2019; L. Servièrre; Malaise trap no. 4, wet meadow, near a pine and acidophilous beech forest; MNHN-ED-ED10936.

ETYMOLOGY. — Named after Montségur, the locality where the species was collected.

DIAGNOSIS. — A species of medium size belonging to the subgenus *Xanthempis* with the occiput dusted blackish dorsally to yellowish ventrally, a dusted greyish to blackish scutum except around postpronotal lobe and postalar callus. Hypandrium bare, phallus characteristically sinuous at middle.

DISTRIBUTION. — France: Pyrenees (Fig. 3).

DESCRIPTION

Male

Head. Ocellar triangle dusted blackish with pair of rather strong setae, occiput dusted blackish dorsally, yellowish ventrally, with strong, short setae. Frons brownish with setulae along the margin of eyes. Face, gena yellowish. Labrum yellowish, twice head height, labium brownish. Palpus yellowish with a few black hairs. Scape and pedicel brownish, postpedicel blackish; scape and postpedicel long, three and six times pedicel length respectively, style very short. Eyes dichoptic, all ommatidia of equal size.

Thorax. Anteppronotum yellowish to blackish at middle, bilobed with 5-6 short spine-like setae. Postpronotum yellow with one anterior and one apical distinct setae, the latter stronger and longer. Prosternum, proepisternum yellow with 1-2 minute black hairs. Scutum dusted greyish to blackish, but yellowish around postpronotal lobe, postalar callus, notopleural area. Acrostichals absent, dorsocentrals uniserial, distinct, becoming strong, long in prescutellar depression. Strong, long following setae: one postpronotal, one presutural supraalar, one notopleural, one postalar. Scutellum dusted greyish, with one pair of strong, long apical setae. Lateral parts of thorax yellow, laterotergite with a few strong, long setae. Postscutellum blackish to yellowish laterally. Anterior and posterior spiracles yellow.

Wing. Length: 6.5 mm. Rather clear feebly tinted of brown, veins brown, well sclerotized except anal vein feebly sclerotized basally but complete; anal lobe obtuse. Haltere slightly brownish. Stigma brownish not well visible.

Abdomen. Yellow with dorsal stripe formed by brown T-shaped spots on each tergite in dorsal view, another brownish stripe on each side along margin of tergites. Thin, short yellowish hairs or black thin, short setae at margin of tergite and sternite. Posterior margins of tergites 6 and 7 with a few strong, long and black dorsal setae, posterior margins of tergite and sternite 8 with many strong, long and black setae. Tergite and sternite 8 fused.

Hypopygium. Entirely yellow. Cercus higher than wide, lengthened ventrally, with dense rather thin, short and black dorsal setae, eandrium subrectangular, pointed apically, with strong and long dorsal setae subapically and apically, hypandrium reduced, bare, phallus long, curved, characteristically sinuous at middle.

Female

Unknown.

REMARKS

E. (X.) montsegurensis n. sp. can be easily distinguished from all other species of *Xanthempis*. For the moment it is known from a single specimen collected in the Pyrenees, and in addition to *E. (X.) hypandrialis* Daugeron, 2000, *E. (X.) montivaga* Daugeron, 2000, *E. (X.) fagina*

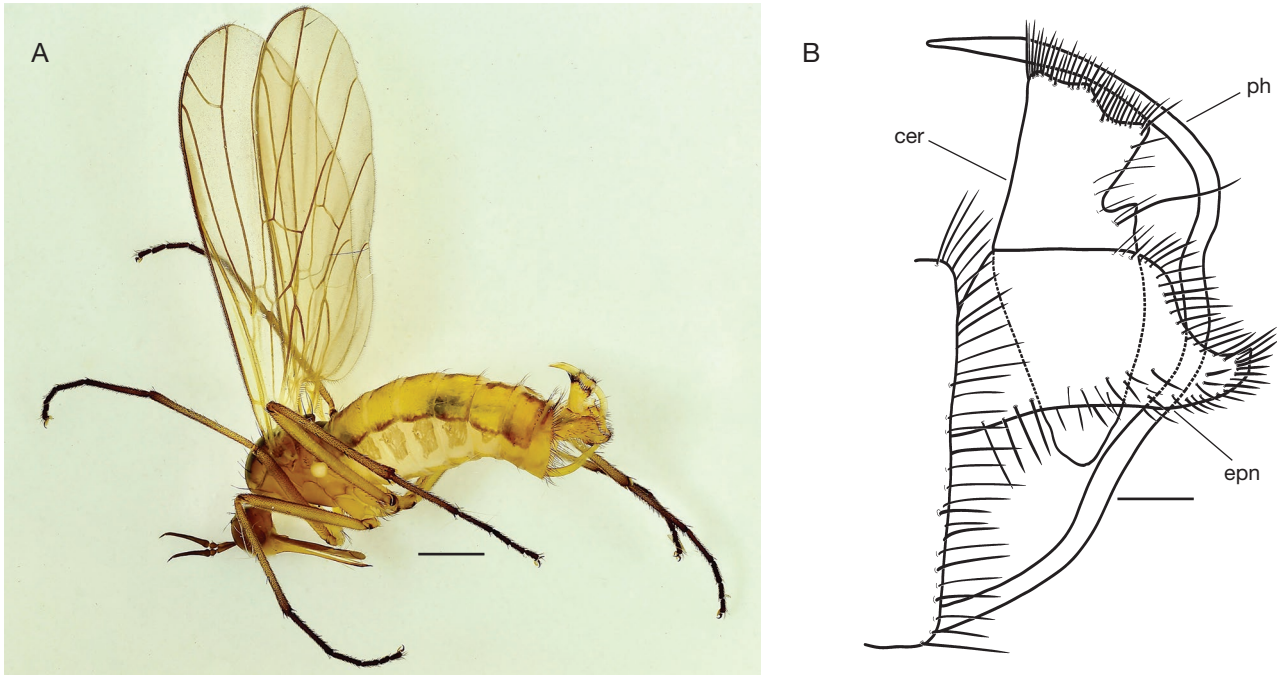


FIG. 2. — *Empis (Xanthempis) montsegurensis* n. sp.: **A**, male habitus; **B**, male hypopygium. Abbreviations: see Material and methods. Scale bars: A, 1 mm; B, 0.2 mm.

Daugeron, 2009, and *E. (X.) virgulata* Daugeron, 2009, *E. (X.) montsegurensis* n. sp. is the fifth species of *Xanthempis* only known from the Pyrenees. The key proposed

previously by Daugeron (2009) for species known from the mountain area is here modified to include the new species.

KEY TO SPECIES OF *EMPIS (XANTHEMPS)*
KNOWN FROM THE PYRENEES

1. Scutum entirely yellow 2
- Scutum with a blackish pattern 3
2. Scape and pedicel brownish, occiput with a blackish-brown spot, hypandrium with pair of short apical spines, phallus pointed at tip (Daugeron 2000: fig. 6) *E. (X.) montivaga* Daugeron, 2000
- Scape and pedicel yellowish, occiput with pair of subrectangular blackish spots (Daugeron 2009: fig. 3A), hypandrium with two pairs of short apical spines, phallus truncate at tip (Daugeron 2009: fig. 1) *E. (X.) fagina* Daugeron, 2009
3. Scutum with at least one more or less broad central black stripe between dorsocentrals, epandrial lamella subtriangular 4
- Scutum entirely blackish, epandrium subrectangular (Chvála 1994: fig. 301) 6
4. Scutum with a broad central black stripe 5
- Scutum with a single narrow central black stripe (Chvála 1994: fig. 284) *E. (X.) stercorea* Linné, 1761
5. Scutum yellow between dorsocentrals and notopleuron, hypandrium lengthened with many apical and subapical spines (Daugeron 2000: figs 2; 3) *E. (X.) hypandrialis* Daugeron, 2000
- Scutum with pair of brownish to black spots, sometimes entirely fused in a single stripe, between dorsocentrals and notopleuron (Daugeron 2009: fig. 3B), hypandrium not lengthened, bearing a single pair of subapical spines (Daugeron 2009: fig. 2) *E. (X.) virgulata* Daugeron, 2009
6. Large species (wing length > 7 mm), abdomen usually entirely yellow, without stripe, two notopleurals, phallus regularly curved *E. (X.) testacea* Fabricius, 1805
- Smaller species (wing = 6.5 mm), abdomen yellow with a well visible dorsal stripe, one notopleural, phallus somewhat sinuous at middle *E. (X.) montsegurensis* n. sp.

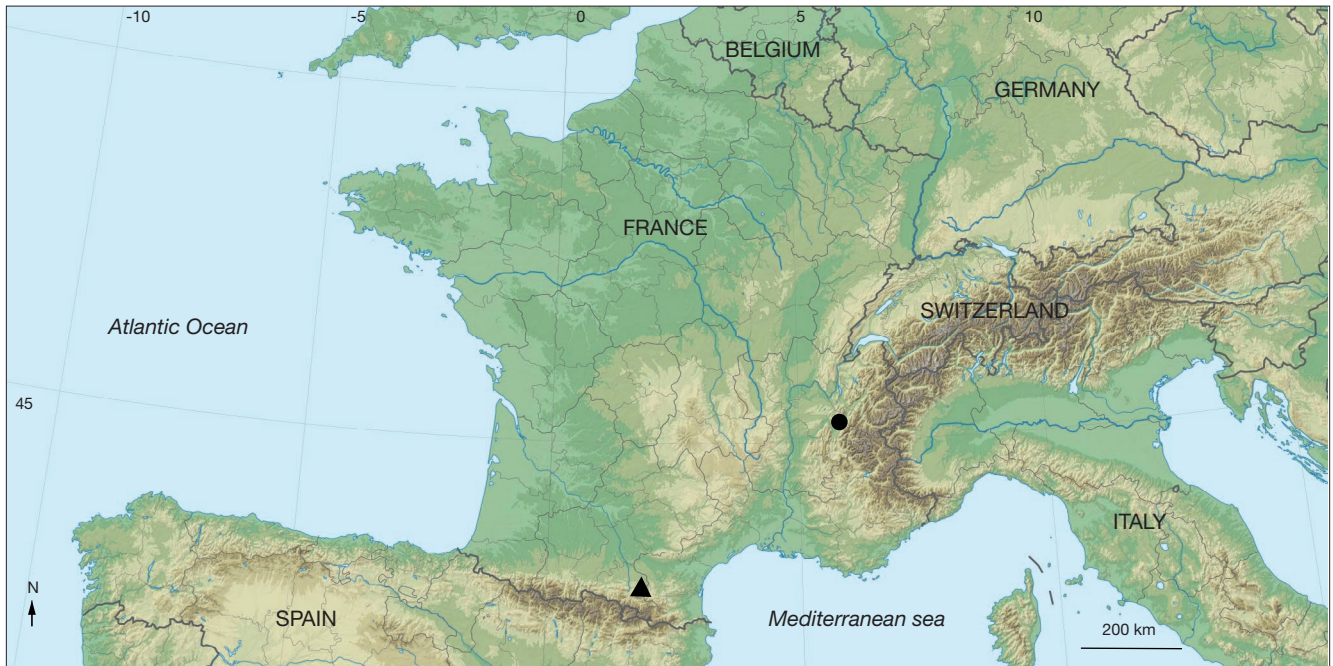


FIG. 3. — Map of France showing the distribution of *Empis (Empis) cartusiana* n. sp. (●) and *Empis (Xanthempis) montsegurensis* n. sp. (▲). Background map: Sémhur, Wikimedia Commons.

DISCUSSION

The family Empididae is still poorly documented in mainland France. Recent or ongoing works in nature reserves, national parks (Daugeron & Lefebvre 2015) and other sites (Daugeron 2009; Cocquempot & Pagé 2016; Bahid *et al.* 2017; Livory 2023) indicates an emerging dynamic for this family, especially the Empidinae which has been shown to play a key role in pollination (Lefebvre *et al.* 2014, 2018, 2019).

The description of several species of Empidinae new to science, including the two described in this paper, points to potential new discoveries in mainland France, particularly in high-altitude areas.

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The authors thank colleagues working in French nature reserves, especially Bruno Tissot who has motivated this national network to study, not only the family Syrphidae but also the non-target wildlife trapped in Malaise traps. We also thank all people who studied and/or sorted the Malaise traps: Jocelyn Claude, Romain Decoin, Catherine Genin, Candice Gagnaison in the Hauts-de-Chartreuse, Jérémy Chaigne and Laurent Servièrre in the massif de Saint-Barthélémy (09). We thank Emmanuel Delfosse (MNHN) for taking the photos of the specimens. We are also grateful to Miroslav Barták and one anonymous reviewer for their constructive comments.

REFERENCES

- BAHID F.-Z., KETTANI K. & DAUGERON C. 2017. — Two new species of the *Empis (Leptempis) rustica* group of the Mediterranean basin (Diptera: Empididae: Empidinae). *Annales de la Société Entomologique de France (N.S.)* 53: 422-427. <https://doi.org/10.1080/00379271.2017.1399085>
- BEZZI M. 1909. — Einige neue paläarktische Empis-Arten. *Deutsche Entomologische Zeitschrift* 1909: 85-103.
- CHVÁLA M. 1994. — The Empidoidea (Diptera) of Fennoscandia and Denmark. III – Genus *Empis*. *Fauna entomologica scandinavica* 29. E. J. Brill, Leiden, New York, Köln, 192 p.
- CHVÁLA M. 2011. — Revision of European species of the *Empis (s. str.) pennipes* group of species (Diptera: Empididae), with descriptions of five new species from the Mediterranean and the Caucasus. *Studia Dipterologica* 18: 173-193.
- COCQUEMPOT C. & PAGÉ G. 2016. — Présence de *Rhamphomyia (Pararhamphomyia) marginata* (F., 1787) en Indre-et-Loire (France) (Diptera Empididae). *L'Entomologiste* 72 (4): 209-214.
- DAUGERON C. 1997. — Découverte du sous-genre *Xanthempis* Bezzi en Afrique du nord et description de 3 espèces nouvelles (Diptera: Empididae). *Annales de la Société entomologique de France* 33 (N.S.): 155-164. <https://doi.org/10.1080/21686351.1997.12277746>
- DAUGERON C. 2000. — The subgenus *Xanthempis*: new species and taxonomical data (Diptera: Empididae). *Annales de la Société Entomologique de France (N.S.)* 36: 371-388.
- DAUGERON C. 2009. — Two new species of *Xanthempis* Bezzi (Diptera, Empididae, Empidinae) endemic to the Pyrenees. *Zootaxa* 2087 (1): 59-64. <https://doi.org/10.11646/zootaxa.2087.1.4>
- DAUGERON C. & LEFEBVRE V. 2015. — Descriptions of two new species of Empidinae Schiner, 1862 (Diptera: Empididae) from the Mercantour National Park, France. *Zoosystema* 37 (4): 605-609. <https://doi.org/10.5252/z2015n4a6>

- KUSTOV S. Y. & SHAMSHEV I. V. 2014. — A review of dance-flies of the *Empis* (s. str.) *pennipes* group of species (Diptera: Empididae) from the Caucasus, with descriptions of five new species. *Caucasian Entomological Bulletin* 10 (1): 170-184. <https://doi.org/10.23885/1814-3326-2014-10-1-170-184>
- LATREILLE P. A. 1810. — *Considérations générales sur l'ordre naturelle des animaux composant les classes des Crustacées, des Arachnides et des Insectes; avec un tableau méthodique de leurs genres, disposés en famille*. Paris, F. Schoell: 1-444. <https://doi.org/10.5962/bhl.title.34917>
- LEFEBVRE V., FONTAINE C., VILLEMANT C. & DAUGERON C. 2014. — Are empidine dance flies major flower visitors in alpine environments? A case study in the Alps, France. *Biology Letters* 10 (11): 20140742. <https://doi.org/10.1098/rsbl.2014.0742>
- LEFEBVRE V., FONTAINE C., VILLEMANT C. & DAUGERON C. 2018. — Altitudinal, temporal and trophic partitioning of flower-visitors in Alpine communities. *Scientific Report* 8: 4706. <https://doi.org/10.1038/s41598-018-23210-y>
- LEFEBVRE V., DAUGERON C., VILLEMANT C. & FONTAINE C. 2019. — Empidine dance flies pollinate the woodland geranium as effectively as bees. *Biology Letters* 15 (7): 20190230. <https://doi.org/10.1098/rsbl.2019.0230>
- LINNAEUS C. 1758. — *Systema Naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Ed. 10. Stockholm, 824 p.
- LIVORY A. 2023. — Les empididés de la Manche I : présentation et liste provisoire des espèces (Diptera Empididae). *L'Argiope* 120: 3-10.
- MCALPINE J. F. 1981. — Morphology and terminology – Adults [Chapter] 2, in MCALPINE J. F., PETERSON B. V., SHEWELL G. E., TESKEY H. J., VOCKEROTH J. R. & WOOD D. M. (eds), *Manual of Nearctic Diptera, Volume 1*. Agriculture Canada Monograph 27: 9-63.
- SPEIGHT M. C. D., CASTELLA E. & SARTHOU J.-P. 2020. — StN 2020 in SPEIGHT M. C. D., CASTELLA E., SARTHOU J.-P. & VANAPPELGHEM C. (eds), *Syrph the Net on CD, Issue 12*. Syrph the Net Publications, Dublin.
- STUCKENBERG B. R. 1999. — Antennal evolution in the Brachycera (Diptera), with a reassessment of terminology relating to the flagellum. *Studia Dipterologica* 6: 33-48.

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