

Redescription of the male of *Pelecorhynchus vulpes* (Macquart) and first description of the male terminalia (Diptera: Pelecorhynchidae)

Christian R. González¹

¹ Universidad Metropolitana de Ciencias de la Educación (UMCE), Facultad de Ciencias Básicas, Instituto de Entomología (IE). Santiago, Chile. ORCID: [0000-0003-2582-6071](https://orcid.org/0000-0003-2582-6071). E-mail: christian.gonzalez@umce.cl

Abstract. Macquart (1850) provided the original description of *Pelecorhynchus vulpes* (= *Pangonia vulpes*) based on a holotype male from Chile. His description is brief and lacks many morphological details. Therefore, herein we redescribe, in far greater detail, the holotype male of *Pelecorhynchus vulpes* (Macquart) and describe and illustrate, for the first time, the morphology of the male terminalia.

Keywords. Andean region; Chile; Morphology; Taxonomy.

INTRODUCTION

Macquart (1850) described the genus *Pelecorhynchus* on the basis of the Australian species *P. maculipennis* Macquart. However, later studies synonymized this species with *P. personatus* (Walker), which Walker (1848) originally described from Australia without reference to any species being known from the New World. Later, Bigot (1857) erected the genus *Coenura*, which includes the species of Chilean distribution. *Coenura* and *Pelecorhynchus* are both genera of which were placed in the subfamily Pelecorhynchinae of Tabanidae (Enderlein, 1925). Later, Mackerras & Fuller (1942) elevated the group to family rank and considered *Coenura* as a junior synonym of *Pelecorhynchus* on the basis of morphological similarities of adults. Recently, González *et al.* (2023) restored *Coenura* Bigot, 1857 to generic status to include part of the southern South American fauna comprised of *C. biguttata* Philippi, *C. elegans* Philippi, *C. hualqui* (Llanos & González), *C. longicauda* Bigot, *C. toltensis* (Llanos & González), and *C. xanthopleura* Philippi. The monophyly of this group is supported by molecular and morphological data and is consistent with a strictly Chilean distribution (González *et al.*, 2023). Chilean species maintained within *Pelecorhynchus*, includes *P. vulpes* (Macquart), *P. kroeberi* (Lindner) and *P. penai* Pechuman. Chilean species of *Pelecorhynchus* form a clade that includes the type species *P. personatus* (González *et al.*, 2023).

Pelecorhynchus flies currently are known to occur in southeastern Australia, including Tasmania (Daniels, 1989), as well as in the central and southern regions of Chile (Llanos *et al.*, 2015; González & Elgueta, 2020). These flies feed on nectar and frequently are associated with flowers, especially during spring.

Pelecorhynchus vulpes (Macquart, 1850) was described on the basis of a male holotype collected in Chile. In his original description, Macquart referred the specimens to “Chili”, collected by “M. Gay” (= Claude Gay). Indeed, Claude Gay is known to have collected for long periods of time in Chile (1828-1832, 1834-1842), extensively and in many provinces. Considering the known distribution of *P. vulpes*, the holotype was probably collected during Gay’s expedition to the provinces of Valdivia and Chiloé in October 1834 (Papavero, 1971).

Pelecorhynchus vulpes is a rarely collected species that is poorly represented in collections in Chile and abroad. It probably has a short flight period, and its populations may have been depleted as a result of the significant anthropogenic activity in its area of distribution. The development of land for agriculture and indiscriminate logging with replacement of native species by fast-growing monocultural plantations are the most frequent disturbances that have caused severe fragmentation of the Chilean landscape (Echeverría *et al.*, 2007). The scarcity of this species and others in southern ecosystems also could be

Pap. Avulsos Zool., 2024; v.64: e202464032
<https://doi.org/10.11606/1807-0205/2024.64.032>
<https://www.revistas.usp.br/paz>
<https://www.scielo.br/paz>

Edited by: Carlos José Einicker Lamas

Received: 19/12/2023

Accepted: 05/07/2024

Published: 09/08/2024

ISSN On-Line: 1807-0205
ISSN Printed: 0031-1049
ISNI: 0000-0004-0384-1825



explained by phenomena related to climate change that has affected their areas of distribution, decreasing their abundance or causing local extinction (Parmesan, 2006; Robinet & Roques, 2010), changes in their phenology, and increased or decreased synchronization between insects and their food plants in response to climate warming (Forrest, 2016).

The availability of a male specimen collected in 2022 in Región de Los Ríos, Valdivia Province, and photographs of the holotype deposited at the Muséum National d'Histoire Naturelle, Paris, France, allowed us to redescribe the male and to describe the male terminalia, which may provide important diagnostic characteristics for the characterization and differentiation of species.

MATERIAL AND METHODS

The morphological terminology herein follows Sinclair *et al.* (1994), Carmo & Santos (2011) and Cumming & Wood (2017). Terminalia were macerated in a 10% KOH solution at 50°C for one hour to dissolve the soft tissue, neutralized with acetic acid, rinsed in distilled water, and then dissected in 80% ethanol. Terminalia were mounted on glass slides in Canadian balsam for examination. Digital photographs were obtained by use of a DS-Fi2 camera mounted on a Nikon SMZ 1500 trinocular stereo-

microscope. The depth of the field was enhanced by use of Nikon ACT-2U software to stack multiple images.

RESULTS

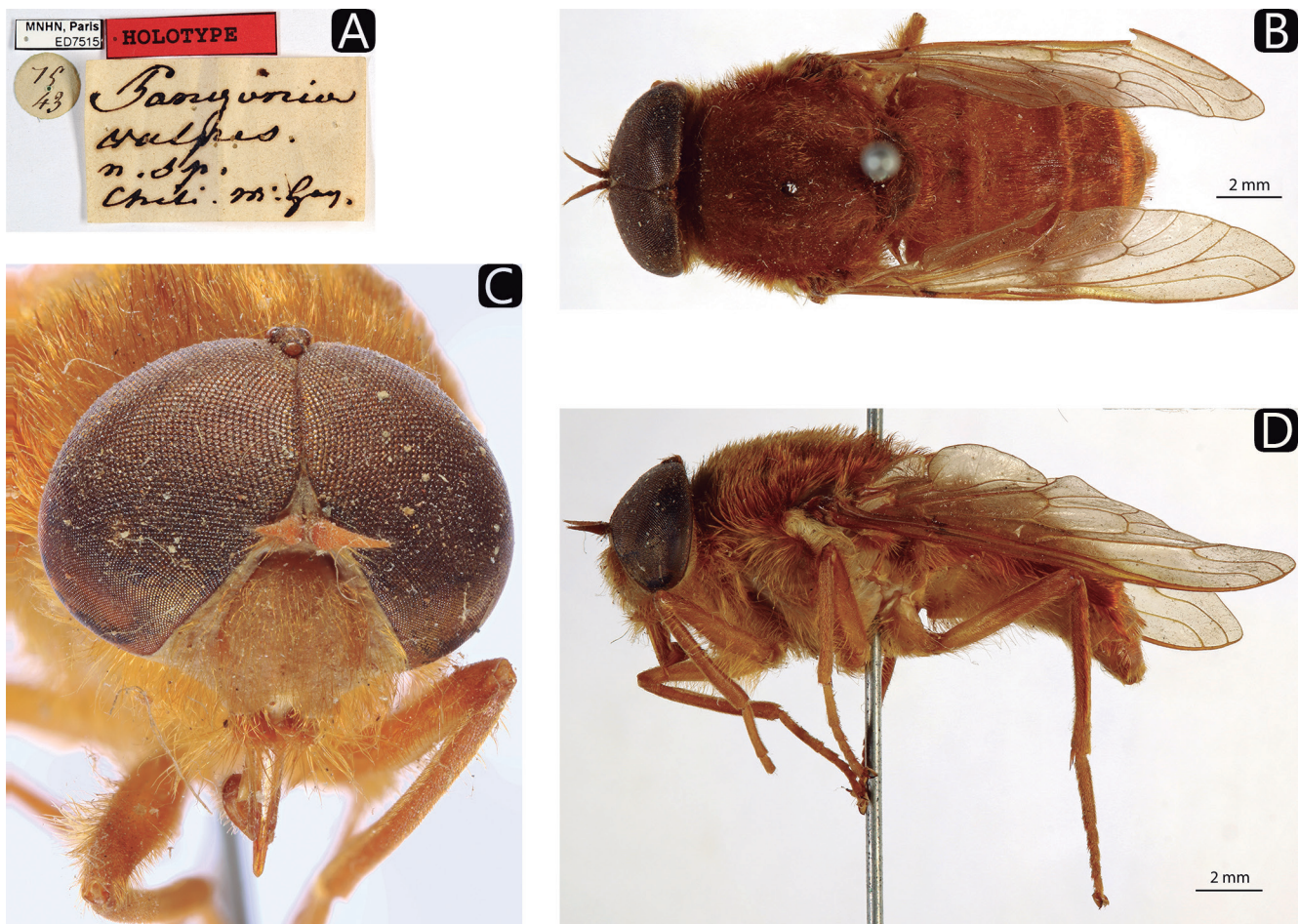
Pelecorhynchus vulpes (Macquart) (Figs. 1-3)

Pangonia vulpes Macquart, 1850: 327-328.

Pelecorhynchus aurantiacus Ricardo, 1900: 103 (description of female), pl. i, fig. 2; Ricardo, 1910: 403 (in key), 409 (comments).

Pelecorhynchus vulpes (Macquart). Surcouf, 1921: 222 (in key); *Coenura vulpes* (Macquart), Enderlein, 1925: 262 (list); Kröber, 1930a: 152 (in key), 152-153 (redescription of female); Kröber, 1930b: 114 (in key), 114-115 (redescription of female).

Material examined: Holotype specimen MNHN-ED-ED7515 (<http://coldb.mnhn.fr/catalognumber/mnhn/ed/ed7515>). Chile 1 male, M. Gay coll. (by photography) (Fig. 1A). Región de La Araucanía: Malleco Province: 1 male Nahuelbuta, 12.XII.1977, J. Jiménez coll. Región de Los Ríos: Valdivia Province: 1 male Isla Teja, 12.XII.2022, L.A. García coll. (all deposited in the insect collection of the Instituto de Entomología, Universidad Metropolitana, Chile).



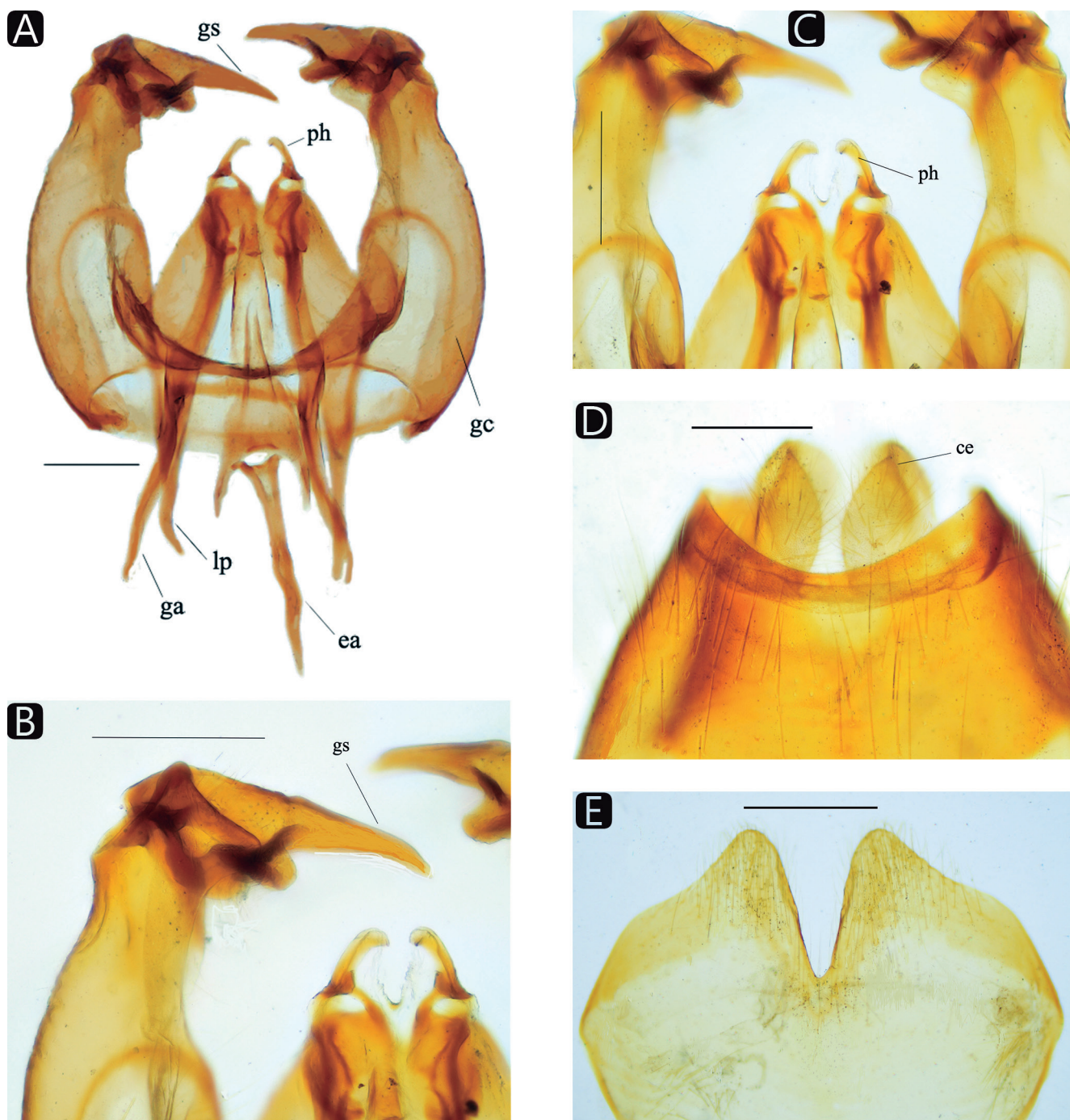
Figures 1A-D. *Pelecorhynchus vulpes* (Macquart, 1850), male holotype [MNHN] MNHN-ED-ED7515. ©Muséum National d'Histoire Naturelle Paris (France), Collection Insects – Diptera (ED), Collection Macquart, Pierre Justin Marie. (A) Labels. (B) Dorsal view. (C) Head in frontal view. (D) Lateral view.

Diagnosis: Body color orange-rufous (Fig. 1B). Eyes bare. Ocellar triangle with sparse, short setulae on the vertex (Fig. 1C). First flagellomere rounded laterally, gradually tapered (Fig. 1D). Maxillary palp spatulate with abundant long orange-rufous setulae. Scutum orange-rufous bearing abundant short orange-rufous setulae (Fig. 1B). Pleura pruinose brown with long orange-rufous setulae; anepimeron with long white setulae (Fig. 1D). Legs orange-rufous. Wings hyaline (Fig. 1B). Abdomen orange-rufous dorsally, with concolorous setulae on all tergites (Fig. 1B). Gonostylus subtriangular, lateral lobe straight, pointed

(Fig. 2B). Parameral sheet hooks short, upturned, shorter than medial lobe of gonostylus (Fig. 2C).

Redescription (Holotype m)

Male: Length 18.5 mm, wing length 16.5 mm. Body color orange-rufous (Fig. 1B). **Head.** Head wider than thorax. Eyes brownish, bare, all facets of equal size (Fig. 1C). Ocellar triangle and ocelli developed. Vertex pruinose brown with short brown setulae (Fig. 1C). Face inflated, convex, brown, with orange-rufous setulae (Fig. 1D). An-



Figures 2A-E. Male terminalia of *Pelecorhynchus vulpes* (Macquart, 1850), specimen from Isla Teja, 12.XII.2022, L.A. García coll. (A) Gonocoxite, dorsal view (scale bar = 1.0 mm) (ea = ejaculatory apodeme; ga = gonocoxal apodeme; gc = gonocoxite; gs = gonostylus; lp = lateral ejaculatory process; ph = parameral sheet hooks). (B) Gonostylus (scale bar = 0.1 mm) (gs = gonostylus). (C) Parameral sheets and ejaculatory apodeme (scale bar = 1.0 mm) (ph = parameral sheet hooks). (D) Hypoproct and cerci, dorsal view (scale bar = 1.0 mm) (ce = cerci). (E) Epandrium (scale bar = 1.0 mm).

tenal scape brown with abundant long brown setulae; scape 2X length of pedicel, subquadrate; pedicel brown, bearing shorter setulae. First flagellomere orange, rounded laterally, gradually tapered, with eight flagellomeres (Fig. 1D). Maxillary palpus pruinose orange-rufous, one-third of head height; first segment rounded, with long orange-rufous setulae; second segment 3X length of first, spatulate, with abundant long orange-rufous setulae. Proboscis brown with yellow-black setulae; labellum large, fleshy, one-half head height (Fig. 1D). **Thorax.** Scutum orange-rufous, bearing abundant long orange-rufous setulae (Fig. 1B). Postpronotal lobes concolorous. Scutellum orange-rufous with long orange-rufous setulae on distal margin (Fig. 1B). Pleura pruinose brown with long orange-rufous setulae (Fig. 1D); anepisternum with long orange-rufous setulae; katepisternum and katatergite with long orange-rufous setulae; anepimeron with long white setulae. Legs orange-rufous, coxae with long orange-rufous setulae, femora with long orange-rufous setulae; tibiae concolorous and more setulose than femora, setulae orange-rufous; remaining leg segments with short orange-rufous setulae (Fig. 1D). Wing hyaline (Fig. 1D); Sc and R₁ well separated at wing margin; R_{2,3} and R₄ parallel; curvature R₄ at base forming an angle less than 90°; R₅ and M₁ parallel; M₁ and M₂ straight, slightly divergent; M₃ and M₄ slightly divergent; CuA and CuP convergent, distal part of CuP straight; costal cell orange; subcostal cell hyaline; r_{2,3} hyaline; discal cell hyaline; cua closed. Basicosta with mi-

crotrichia. Halter reddish. Squamae concolorous with wing base. Upper calypteres yellowish, lower calypteres lighter in color. **Abdomen.** Suboval, orange-rufous, tergites 2-7 with orange-rufous setulae dorsally, longest on posterior margins (Fig. 1B). Sternites with shorter orange-rufous setulae. **Terminalia.** Gonocoxite developed, narrow, curved, apically rounded, with setulae (length = 1.37 mm, maximum width = 1.83 mm) (Fig. 2A); gonocoxal apodeme extending well beyond anterior margin of hypandrium (length = 0.9 mm), lateral ejaculatory process shorter (length = 0.75 mm) (Fig. 2A). Gonostylus subtriangular, lateral lobe straight, pointed (length = 0.15 mm) (Fig. 2B); medial lobe rounded. In dorsal view, aedeagus short and narrow, shorter than length of gonocoxite; ejaculatory apodeme elongated (length = 1.1 mm) (Fig. 2C); parameral sheet hooks short, heavily chitinized, upturned, and spaced between them, shorter than medial lobe of gonostylus (length = 0.15 mm, maximum width = 3.0 mm) (Fig. 2C); spines of hooks of parameral sheets absent. Cerci attached directly to epandrium, one-segmented and prominent, lobate, apically rounded, with abundant small setulae (length = 2.1 mm, maximum width = 2.3 mm) (Fig. 2D). Hypoproct about as long as wide, much longer than more dorsally situated cerci; posterior margin with a broad, shallow, V-shaped emargination (length = 2.0 mm, maximum width = 2.2 mm) (Fig. 2D). Epandrium large, rectangular, strongly arched, with very long lateral setae (Fig. 2E).

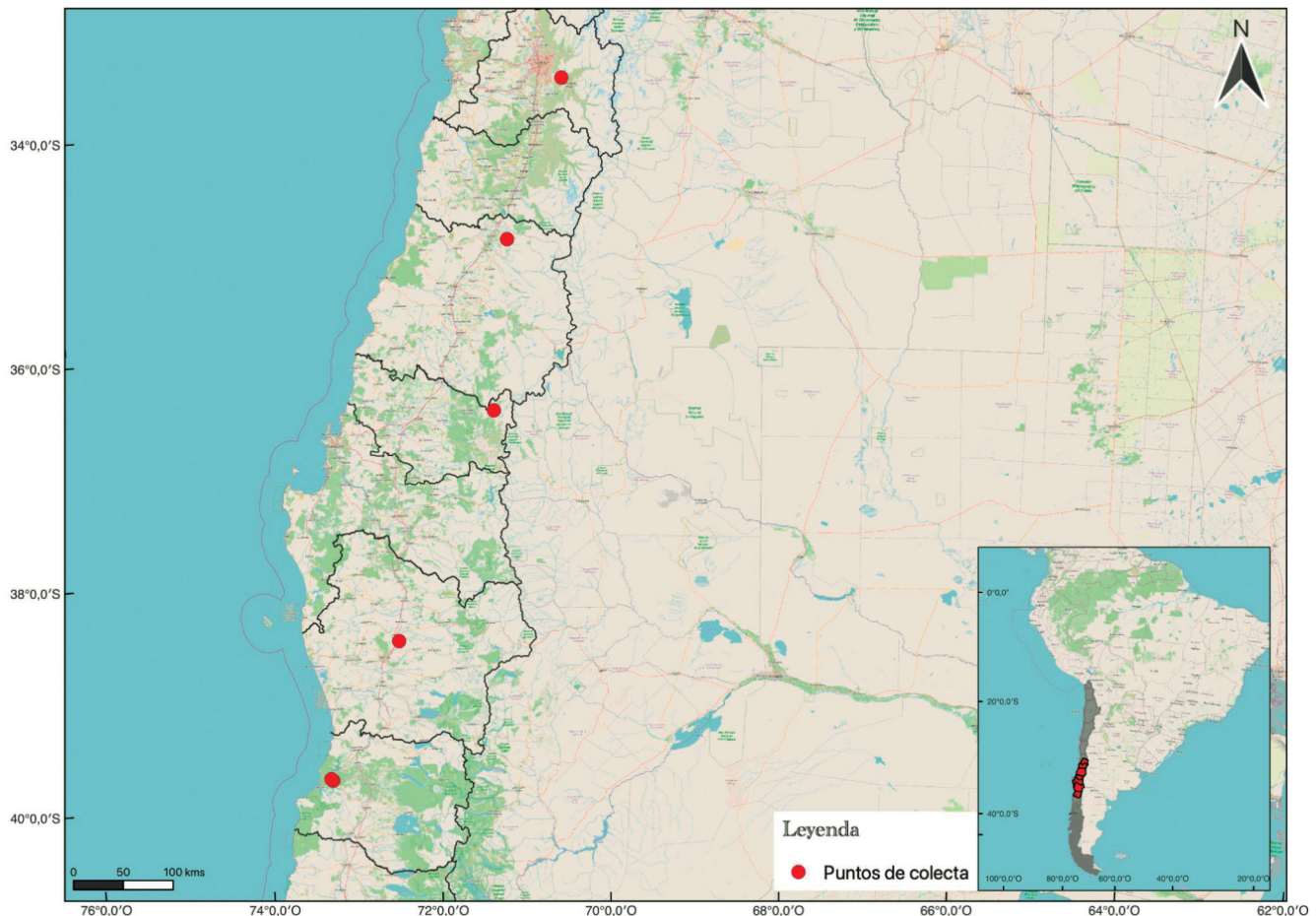


Figure 3. Geographic distribution of *Pelecorhynchus vulpes* (Macquart, 1850).

Remarks: The male terminalia of *P. vulpes* shows similarities to some Australian species, such as *P. albolineatus* Hardy, *P. fascipennis* Mackerras & Fuller, *P. kippsi* Mackerras & Fuller, and *P. nigripennis* Ricardo, particularly in the shape of the gonostylus (pointed at apex and abruptly expanded at base) and in the development and orientation of the hooks of the aedeagus (Mackerras & Fuller, 1942, Nagatomi, 1984). The genitalia of *P. vulpes* does not exhibit any morphological similarity with the other species of Chilean distribution, which are currently included in the genus *Coenura* (González *et al.*, 2023).

Geographic distribution: Chile (Región Metropolitana de Santiago to Región de Los Ríos) (Fig. 3).

CONFLICT OF INTEREST: Author declares there are no conflicts of interest.

FUNDING INFORMATION: This project did not use any external financial support.

ACKNOWLEDGEMENTS: We thank William L. Murphy, Research Collaborator with the Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA, for reviewing the manuscript and for help in editing the English version.

REFERENCES

- Bigot, J.M.F. 1857. Diptères nouveaux provenant du Chili. *Annales de la Société Entomologique de France, Série 3*, 5: 277-308, pls. 6-7.
- Carmo, D.D.D. & Santos, C.M.D. 2011. Morfologia comparada das terminálias masculina e feminina dos Rhagionidae (Diptera, Tabanomorpha) Neotropicais. *Papéis Avulsos de Zoologia*, 51(30): 465-479. <https://doi.org/10.1590/S0031-10492011003000001>.
- Cumming, J.M. & Wood, D.M. 2017. 3. Adult morphology and terminology. In: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.). *Manual of Afrotropical Diptera. Vol. 1. Introductory chapters and keys to Diptera families*. Pretoria, South African National Biodiversity Institute. p. 89-133. (Suricata 4)
- Daniels, G. 1989. 27. Family Pelecorhynchidae. In: Evenhuis, N.L. (Ed.). *Catalog of the Diptera of the Australasian and Oceanian regions. Bishop Museum Special Publication*, 86: 275-276.
- Echeverría, C.; Newton, A.C.; Lara, A.; Rey-Benayas, J.M. & Coomes, D.A. 2007. Impact of forest fragmentation on species composition and structure in temperate landscape of southern Chile. *Global Ecology and Biogeography*, 16(4): 426-439. <https://doi.org/10.1111/j.1466-8238.2007.00311.x>.
- Enderlein, G. 1925. Studien an blutsaugenden Insekten I. Grundlagen eines neuen Systems der Tabaniden. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 11: 253-409.
- Forrest, J.R. 2016. Complex responses of insect phenology to climate change. *Current opinion in insect science*, 17: 49-54. <https://doi.org/10.1016/j.cois.2016.07.002>.
- González, C.R. & Elgueta, M. 2020. A catalog of the Pelecorhynchidae (Diptera: Tabanomorpha) from Chile. *Zootaxa*, 4809(1): 156-164. <https://doi.org/10.11646/zootaxa.4809.1.9>.
- González, C.R.; Saldarriaga-Córdoba, M.; Aguilera, O. & Miranda-Esquivel, D.R. 2023. *Coenura* Bigot as a valid genus: A molecular and morphological phylogenetic analysis of *Pelecorhynchus* Macquart *sensu lato* (Diptera: Pelecorhynchidae). *Zootaxa*, 5383(3): 297-324. <https://doi.org/10.11646/zootaxa.5383.3.2>.
- Kröber, O. 1930a. Die Pelecorhynchinae und Melpiinae Südamerikas (Dipteren, Tabanidae). *Mitteilungen aus dem Zoologische Museum in Hamburg*, 44: 149-196, 33 figs.
- Kröber, O. 1930b. Tabanidae. In: *Diptera of Patagonia and South Chile. Part V. Fascicle 2*. British Museum (Natural History), London, pp. 106-161.
- Llanos, L.; González, C.R. & Saldarriaga, M. 2015. Revision of the New World species of the genus *Pelecorhynchus* Macquart, 1850 (Diptera: Pelecorhynchidae). *Zootaxa*, 3955(2): 188-210. <https://doi.org/10.11646/zootaxa.3955.2.2>.
- Mackerras, I.M. & Fuller, M.E. 1942. The genus *Pelecorhynchus* (Diptera: Tabanoidea). *Proceedings of the Linnean Society of New South Wales*, 67: 9-76, pl. I.
- Macquart, P.-J.-M. 1850. Diptères exotiques nouveaux ou peu connus. 4.e supplément. *Mémoires de la Société Royale des Sciences, de l'Agriculture et des Arts, de Lille*, 1849: 309-479, pls. 1-14.
- Nagatomi, A. 1984. Male genitalia of the lower Brachycera (Diptera). *Beiträge zur Entomologie*, 34: 99-157.
- Papavero, N. 1971. *Essays on the history of Neotropical Dipterology, with special reference to collectors (1750-1905)*. São Paulo, Museu de Zoologia da Universidade de São Paulo, v. 1, 216p. <https://doi.org/10.5962/bhl.title.101715>.
- Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. *Annual Review of Ecology, Evolution and Systematics*, 37: 637-669. <https://doi.org/10.1146/annurev.ecolsys.37.091305.110100>.
- Ricardo, G. 1900. Notes on the Pangoninae of the family Tabanidae in the British Museum collection. *The Annals and Magazine of Natural History, Series 7*, 5: 97-121. <https://doi.org/10.1080/00222930008678247>.
- Ricardo, G. 1910. A revision of the genus *Pelecorhynchus* of the family Tabanidae. *The Annals and Magazine of Natural History, Series 8*, 5: 402-409. <https://doi.org/10.1080/00222931008692794>.
- Robinet, C. & Roques, A. 2010. Direct impacts of recent climate warming on insect populations. *Integrative Zoology*, 5(2): 132-142. <https://doi.org/10.1111/j.1749-4877.2010.00196.x>.
- Sinclair, B.J.; Cumming, J.M. & Wood, D.M. 1994. Homology and phylogenetic implications of male genitalia in Diptera – Lower Brachycera. *Entomologica Scandinavica*, 24: 407-432. <https://doi.org/10.1163/187631293X00190>.
- Surcouf, J. 1921. Revision du genre *Pelecorhynchus* Macquart. (Diptères piqueurs de la famille des Tabanidae). *Bulletin du Muséum National d'Histoire Naturelle Paris*, 1921: 221-224.
- Walker, F. 1848. *List of the specimens of dipterous insects in the collection of the British Museum*. London, British Museum. v. 1, 229p.