

Short note

<https://doi.org/10.26496/bjz.2023.112>

## ***Leptocheirus pilosus* Zaddach, 1844 (Crustacea: Amphipoda: Corophiidae) expands its range to Belgium**

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**Keywords.** *Leptocheirus pilosus*, brackish water, Scheldt, Canal Ghent-Terneuzen, Belgium.

VAN DEN NEUCKER T., BOITO L., SOORS J., DEWOLF J., MERTENS J., VAN PELT D., VAN DAMME S. & SCHOELYNCK J. (2023). *Leptocheirus pilosus* Zaddach, 1844 (Crustacea: amphipoda: Corophiidae) expands its range to Belgium. *Belgian Journal of Zoology* 153: 125–133. <https://doi.org/10.26496/bjz.2023.112>

*Leptocheirus pilosus* is a small amphipod with an adult size that rarely exceeds 4 mm. The dorsal side of living individuals is reddish brown, caused by dark branched pigment cells, whereas ventrally the colour is much paler. The colour fades in preserved specimens, but the branched pigment cells remain visible. Another notable characteristic of *L. pilosus* is the presence of long feathery setae on the second gnathopod. On the anterior face of the basal joint of the second gnathopod there are two rows of long setae and single rows of similar setae are projecting upwards and inwards from the horizontal meral and carpal joints [1,2]. *Leptocheirus pilosus* is a brackish water species, predominantly found within the oligohaline and mesohaline salinity range [1,3–6]. Records exist from waterbodies with strongly fluctuating salinities between 0 and 35 ppt [7,8], but the species does not occur in purely freshwater environments [9,10]. *Leptocheirus pilosus* is recorded at water depths ranging from 0.4 to 9 m [4,6]. It is a tubicolous species (i.e., species living in self-constructed tubes). The tubes are flat, blister-like capsules constructed with mucus, detritus, and sediment particles. These are fixed to clean, smooth surfaces, such as the upper side of rocks and algae thalli [1]. *Leptocheirus pilosus* is a selective deposit feeder. Detritus particles that can serve as food items are grasped with the antennae. Suspended detritus particles can be intercepted with the sieve setae on the second gnathopod. The life-history patterns of *L. pilosus* are understudied, but ovigerous females are known to occur from April till September and carry on average 11 eggs [1]. The native distribution of *L. pilosus* is scattered along the European coasts from the Baltic Sea to the Mediterranean and Black Sea. The species is native to Finland, Sweden, Estonia, Poland, Germany, the British Isles, Ireland, the Netherlands, France, Spain, Portugal, Italy, Greece, Türkiye, Libya and Tunisia [1–8,10–21]. Here, we present an overview of the first Belgian records of *L. pilosus*.

In Belgium, *L. pilosus* was found for the first time on the 17<sup>th</sup> of September 2020 in the river Scheldt, near Galgeschoor (Antwerp) (Fig. 1; Table 1). Two specimens were found in a box corer sample taken 3.2 m below the mean low water mark. Galgeschoor is situated in the mesohaline zone of the river Scheldt. Salinity was 16.5 ppt at the time of sampling (Table 2) and varied between 1.8 and 16.8 ppt in 2020 [22]. Sampling was carried out by the Research Institute for Nature and Forest (INBO) and is part of an ongoing project aimed at monitoring the ecosystem of the Scheldt estuary.

In April, May and June 2021, a total of 361 specimens of *L. pilosus* were found in macroinvertebrate samples collected in three harbour docks of the Port of Antwerp (Fig. 1; Table 1). On the 14<sup>th</sup> of April 2021, a single specimen of *L. pilosus* was caught using a hand-held net in the Doel Dock near an artificial foreshore consisting of gabions with rip-rap (i.e., metal mesh baskets with rocks). The hand-net sampling was carried out with a 500 µm mesh net, following the methodology described in GABRIELS *et al.* [23]. The maximum sampling depth at the artificial foreshore was about 1.2 m. On the 15<sup>th</sup> of April 2021, 166 and 185 specimens of *L. pilosus*, respectively, were found in the Hout Dock (Figs 2–3), in samples retrieved by scraping the concrete quay walls and submerged nylon ropes with a spatula. Seven additional specimens were found in artificial substrate samples from the same dock on the 31<sup>st</sup> of May 2021. On the 1<sup>st</sup> and 2<sup>nd</sup> of June 2021, single specimens of *L. pilosus* were detected in artificial substrate samples from the Kanaal Dock and from the Doel Dock. The artificial substrate used in the Port of Antwerp consisted of stone bricks in 400 × 300 × 150 mm metal cages attached to the quay walls or attached to ropes approximately 3 m below the water surface for six weeks [24]. The harbour docks of the Port of Antwerp are connected to the mesohaline zone of the river Scheldt. However, salinity differed significantly between the harbour docks (Table 2) with a salinity of 1.5 ppt in the Hout Dock and 6.4 ppt in the Doel Dock at the time of sampling in April 2021. Measurements of salinity throughout the year were not available for these two docks. In the Kanaal Dock near the Lillo bridge, salinity measured

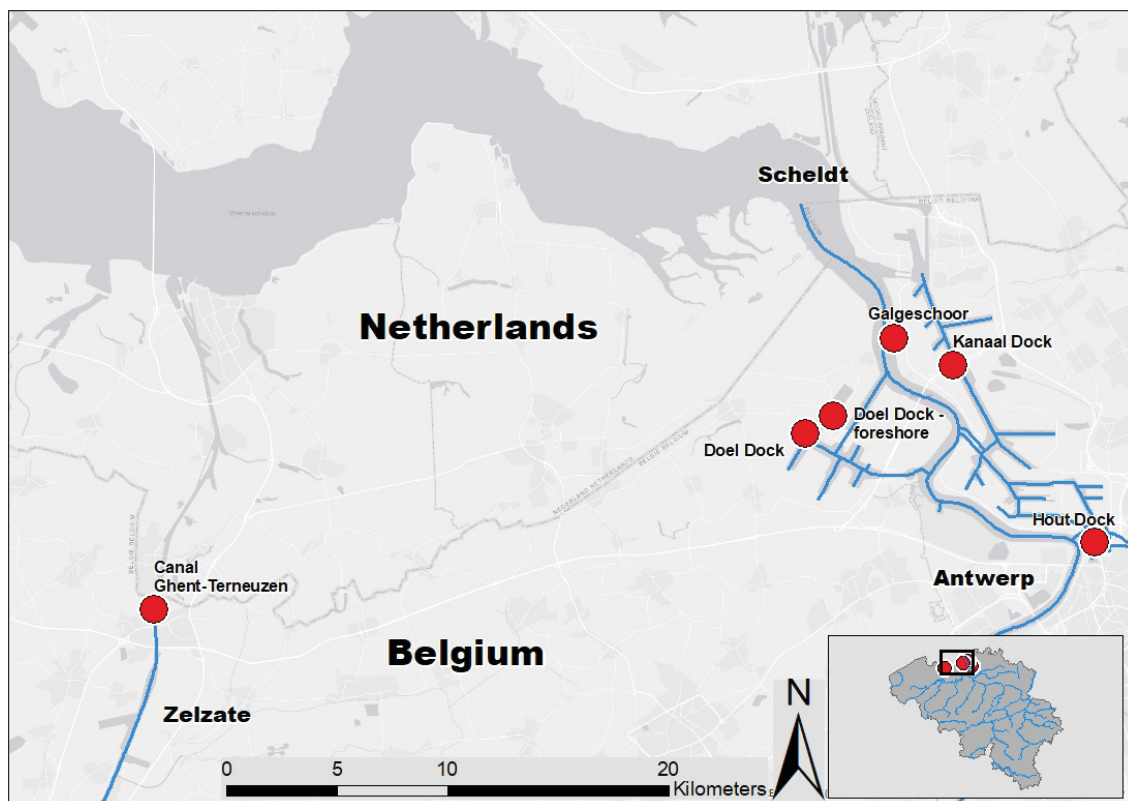


Figure 1 – Recorded distribution of *Leptocheirus pilosus* in Belgium up to the 16<sup>th</sup> of September 2021.

TABLE 1

The number of *Leptocheirus pilosus* specimens and the three most abundant associated taxa at the sampling locations. The sampling date, method and depth are also given.

Locality	Coordinates	Sampling date	Sampling method	Sampling depth (m)	# <i>L. pilosus</i>	Most abundant associated taxa
Antwerp, Galgeschoor, river Scheldt	51°19',0" N; 4°16'45,1" E	17 September 2020	box corer	3.2	2	<i>Potamocorbula amurensis</i> (Schrenck, 1862)
						<i>Heteromastus filiformis</i> (Claparède, 1864)
Antwerp, Doel Dock, artificial foreshore	51°17'15,0" N; 4°14'25,01" E	14 April 2021	kick-net	< 1.2	1	<i>Boccardiella tigricea</i> (Feronnière, 1898)
						<i>Hediste diversicolor</i> (O.F. Müller, 1776)
						<i>Sinelobus vanhareni</i> Bamber, 2014, <i>Heleobia charnana</i> (d'Orbigny, 1841)
Antwerp, Hout Dock	51°14'10,8" N; 4°24'34,1" E	15 April 2021	scrape sample (nylon ropes)	± 3	185	<i>Mytilopsis leucophaea</i> (Conrad, 1831)
						<i>Hediste diversicolor</i> (O.F. Müller, 1776)
						<i>Apocorophium lacustre</i> (Vanhöffen, 1911) <i>Sinelobus vanhareni</i> Bamber, 2014
Antwerp, Hout Dock	51°14'10,8" N; 4°24'34,1" E	15 April 2021	scrape sample (concrete quay wall)	± 3	166	<i>Mytilopsis leucophaea</i> (Conrad, 1831)
						<i>Hediste diversicolor</i> (O.F. Müller, 1776)
						<i>Gammarus tigrinus</i> Sexton, 1939
Antwerp, Hout Dock	51°14'10,8" N; 4°24'34,1" E	31 May 2021	artificial substrate (bricks)	± 3	7	<i>Palaeomon macrodactylus</i> Rathbun, 1902
						<i>Chironomidae</i> (larvae)
						<i>Heleobia charnana</i> (d'Orbigny, 1841)
Antwerp, Kanaal Dock, Lillo bridge	51°18'29,8" N; 4°19'3,9" E	1 June 2021	artificial substrate (bricks)	± 3	1	<i>Chironomidae</i> (larvae)
						<i>Gammarus salinus</i> Spooner, 1947
						<i>Ficopomatus enigmaticus</i> (Fauvel, 1923)
Antwerp, Doel Dock	51°16'49,9" N; 4°13'18,3" E	2 June 2021	artificial substrate (bricks)	± 3	1	<i>Gammarus salinus</i> Spooner, 1947
						<i>Alitta succinea</i> (Leuckart, 1847)
						<i>Gammarus tigrinus</i> Sexton, 1939
Zelzate, Canal Ghent-Terneuzen	51°12'28,3" N; 3°48'2,4" E	16 September 2021	artificial substrate (broken bricks)	± 6	500	<i>Heleobia charnana</i> (d'Orbigny, 1841)
						<i>Palaeomon macrodactylus</i> Rathbun, 1902

TABLE 2

Key water parameters of the Belgian localities where *Leptocheirus pilosus* was recorded.

Locality	Sampling date	Water temperature (°C)	pH	Dissolved oxygen (mg L <sup>-1</sup> )	Oxygen saturation (%)	Conductivity (µS cm <sup>-1</sup> )	Salinity (ppt)
Antwerp, Galgeschoor, river Scheldt	7 September 2020	20.2	7.9	7.5	82.0	27000	16.5
Antwerp, Doel Dock, artificial foreshore	20 April 2021	10.9	8.3	13.6	123.0	10990	6.2
Antwerp, Hout Dock	20 April 2021	11.4	8.3	11.4	104.3	2860	1.5
Antwerp, Kanaal Dock, Lillo bridge	19 April 2021	10.8	8.0	10.3	95.0	8040	5.0
Antwerp, Doel Dock	20 April 2021	10.6	8.7	18.3	164.4	11120	6.4
Antwerp, Kanaal Dock, Lillo bridge	19 May 2021	14.3	8.2	10.9	111.0	9610	6.1
Zelzate, Canal Ghent-Terneuzen	16 September 2021	20.2	7.9	6.0	80.3	7710	4.3



Figure 2 – A preserved specimen of *Leptocheirus pilosus* from the Hout Dock (Antwerp, Belgium).

5.0 ppt in April 2021 and 6.1 ppt in May 2021 and fluctuated between 4.6 and 8.9 ppt in 2021 [22] (Table 2). The sampling campaigns in the Port of Antwerp were part of a macroinvertebrate diversity study carried out by the University of Antwerp (UA) [24]. All specimens collected in the harbour docks of the Port of Antwerp are stored in the collection of the ECOSPHERE Research Group of the UA.

On the 16<sup>th</sup> of September 2021, 500 *L. pilosus* were found in an artificial substrate sample from the Canal Ghent-Terneuzen, Zelzate (Fig. 1; Table 1). The artificial substrate of this location was composed of 40 to 80 mm pieces of brick in a plastic mesh bag, with a total volume of approximately 5 L [23]. The substrate was placed on the bottom of the Canal, at a depth of about 6 m, and retrieved after 41 days. The Canal Ghent-Terneuzen connects the Ghent harbour with the polyhaline zone of the Scheldt estuary, but the sampling locality in Zelzate can be considered oligohaline. Salinity was 4.3 ppt when the artificial substrate was retrieved (Table 2) but fluctuated between 1.3 and 4.5 ppt in 2021 [22]. Sampling in the Canal Ghent-Terneuzen was part of a long-term water quality monitoring program carried out by the Flemish Environment Agency (VMM). All *L. pilosus* specimens from the Canal Ghent-Terneuzen are stored in the collection of the Royal Belgian Institute of Natural Sciences (collection number 34293).

No earlier Belgian records of *L. pilosus* prior to those reported here could be found. While it is possible that *L. pilosus* may have been overlooked in previous research, it was not mentioned in the extensive non-native species checklists compiled by KERCKHOF *et al.* [25] and BOETS *et al.* [26], nor does it occur in the list of Belgian marine amphipods of CATTRIJSE *et al.* [27]. Moreover, *L. pilosus* was not mentioned in studies of (hyper)benthic macroinvertebrate communities carried out in the Belgian part of



Figure 3 – A close-up of the long feathery setae on the second gnathopod of a preserved specimen of *Leptocheirus pilosus* from the Hout Dock (Antwerp, Belgium), which are an important diagnostic feature of the species [1,2].

the Scheldt estuary [28–30] and in recent macroinvertebrate surveys performed in the Antwerp harbour docks [31–33]. Consequently, it is reasonable to assume that *L. pilosus* is a fairly recent addition to the Belgian fauna, although its status as a (neo)native or non-native species remains unclear. It is unknown whether its recent range expansion results from natural dispersal or whether it reached Belgian waters via shipping activities or man-made corridors such as canals and culverts. The possibility that *L. pilosus* reached the Scheldt estuary without human intervention cannot be excluded, since these amphipods are efficient swimmers [1] and can survive at least temporarily in marine saline conditions [7,8]. Moreover, the species is considered native to neighbouring countries France and the Netherlands [10,21] and it was recently found in Bath, near the Dutch-Belgian border [10], close to the Port of Antwerp. The species depends on hard substrates for the construction of the blister-like tubes which it inhabits [1]. Hard substrates in the main stem of the river Scheldt consist of man-made structures, rip-rap and shells of predominantly fossil and non-native molluscs, while the river bottom mainly consists of soft sediments [34]. In the Port of Antwerp and in the Canal Ghent-Terneuzen, artificial hard substrates such as concrete quay walls and rip-rap are widely available and provide suitable habitats for *L. pilosus*. This may explain why *L. pilosus* was most abundant in samples from the Antwerp harbour docks and the Canal Ghent-Terneuzen. The most abundant associated taxa (Table 1) differed between sampling locations and methods. Nonetheless, several associated taxa found in our study are also part of macroinvertebrate communities with *L. pilosus* in other countries, including *Ficopomatus enigmaticus*, *Sinelobus vanhaareni*, *Apocorophium lacustre*, *Gammarus salinus* and *G. tigrinus* [5–7,20]. Dense *Ficopomatus enigmaticus* reefs in the Antwerp harbour docks [24], as well as shell clusters of non-native bivalves such as the long established *Mytilopsis leucophaeata* and the recently introduced *Ischadium recurvum* [35] could provide additional suitable substrate for *L. pilosus* in the Port of Antwerp. It is possible that the improving water quality in the Scheldt estuary [36,37] could further facilitate the colonization of hard substrates by *L. pilosus* within the optimal salinity range.

High abundances of *L. pilosus* in scrape samples from the Antwerp harbour and in artificial substrate samples from the Canal Ghent-Terneuzen, as well as its presence in the river Scheldt, suggest that the species could already be firmly established in Belgium. The species may become an important part of the food web in oligohaline and mesohaline waters with hard substrate. Additional sampling campaigns in the harbour docks of the Port of Antwerp and in canals and rivers with brackish water are needed to monitor its range expansion and potential ecological effects.

### Acknowledgements

Benthos sampling carried out by the INBO and the crew of the Henry De Vos research vessel was funded by the Vlaamse Waterweg nv (MONEOS; INBOPROJ-502). The research carried out by the UA in the Port of Antwerp was funded by Havenbedrijf Antwerpen-Brugge (project: Ecologisch Potentieel in de dokken van de Antwerpse haven) and the Bijzonder Onderzoeksfonds of the University of Antwerp (Project no. 44158). Robrecht Debbaut (UA) made the distribution map.

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*Manuscript received: 28 March 2023*

*Manuscript accepted: 10 October 2023*

*Published on: 27 October 2023*

*Branch editor: Marleen De Troch*