

A new *Stenothoe* species (Crustacea: Amphipoda: Stenothoidae) living on *Boloceropsis platei* (Anthozoa: Actiniaria) from Chilean Patagonia

T. Krapp-Schickel¹ · V. Häussermann² · W. Vader³

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Abstract This paper describes a new species of *Stenothoe* (Amphipoda, Stenothoidae), *S. boloceropsis* sp. nov., collected among the tentacles of the sea anemone *Boloceropsis platei* Mc Murrich, 1904, found on sublittoral sand of Quellon, Chiloe Island, Chile.

Keywords New *Stenothoe* species · Sea anemone *Boloceropsis platei* Mc Murrich, 1904 · Northern Patagonian Zone · Chile · Shallow water

Abbreviations

A1, 2 Antennae 1, 2
art Article
Cx Coxa

Ep 1–3 Epimeral plates 1–3
Gn 1,2 Gnathopods 1, 2
Md Mandible
Mx 1, 2 Maxillae 1, 2
Mxp Maxilliped
P 3–7 Peraeopods 3–7
T Telson
U 1–3 Uropods 1–3

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In this paper, the following terms are applied (see also Krapp-Schickel 2011: 1–2): tooth: non-articulated pointed ectodermal structure; spine: stout, articulated structure (synonymous with “robust seta”); seta: slender, flexible articulated structure. VH: Vreni Häussermann; GF: Günter Försterra.

✉ T. Krapp-Schickel
traudl.krapp@uni-bonn.de

V. Häussermann
v.haussermann@gmail.com

W. Vader
wim.vader@uit.no

- ¹ Zoologisches Forschungsmuseum Alexander Koenig, Adenauerallee 160, 53113 Bonn, Germany
- ² Facultad de Recursos Naturales, Escuela de Ciencias del Mar, Universidad Católica de Valparaíso, Avda. Brasil 2950, Valparaíso, Chile
- ³ Tromsø Museum, University of Tromsø, 9037 Tromsø, Norway

Introduction

Associations between amphipods and sea anemones are probably not all that rare, but few have been recorded previously. In Chile, they have earlier been described from the widely distributed sea anemone *Antholoba achates* (Krapp-Schickel and Vader 2009) which is also known for its associations with other crustaceans and molluscs (Häussermann and Försterra 2009). Specimens of a small amphipod species have been observed by Häussermann and Försterra on the two very similar species *Boloceropsis platei* Mc Murrich, 1904 and *Bolocera occidua* McMurrich, 1893 between Renihue Fjord (~43°S) and Madre de Dios Archipelago (~50°S). Anemones were collected by hand while scuba diving, scratching the pedal disc carefully off the substratum with the finger nail. The present specimens have been collected from a specimen of *Boloceropsis platei* from Quellon, Chiloe Island, in 1998. The specimens turned out to belong to a new species of *Stenothoe* (Amphipoda: Stenothoidae), a genus hitherto known mainly from boreal to temperate waters all over the world. The new species is described here.

Materials and methods

Between 1998 and early 2014, VH and GF observed, collected, examined and preserved nearly 2,000 specimens of shallow water (to 40 m depth) sea anemones at nearly 300 sites along the Chilean coast from Arica ($\sim 15^\circ\text{S}$) to Navarino Island, and the Beagle Channel (55°S). At 54 of these sites in Chilean Patagonia, they found sea anemones of the species *Boloceropsis platei*/*Bolocera* sp. They collected six specimens of a small amphipod which were living between the tentacles of *Boloceropsis platei*; they also documented amphipods at 16 additional sites from *B. platei* and *Bolocera occidua* (Fig. 1). The amphipods were fixed in 10 % formalin and later preserved in 70 % ethanol. Slides were prepared under a Reichert dissecting microscope with glycerine and/or Faure's medium. Pencil drawings were done using a Wild M5 microscope with camera lucida; the transfer or "inking" was done using the program Adobe Illustrator. The studied amphipod material is deposited at the Crustacean Collection of the Museo de Zoología de la Universidad de Concepción (MZUC-UCCC), Chile, and the Museum of Verona (Italy, MVRCr).

Systematics

Family Stenothoidae Boeck, 1871

Stenothoe boloceropsis sp. nov. Figures 1, 2, 3, 4 and 5.

Holotype ov. Female 2.5 mm; among the tentacles of the sea anemone *Boloceropsis platei* Mc Murrich, 1904 collected from sandy bottom at Quellon, Chiloe Island, Chile ($43^\circ 10'\text{S}$; $73^\circ 29'\text{W}$), 23 m depth, 7.2.–8.2. 1998; VH and GF coll.; slide deposited at the Museo civ. Storia nat., Verona (Italy): MVRCr 7719.

Additional material Female 2 mm, same locality, slide inv. nr. MZUC-UCCC 43682. 4 spec. 2–2.5 mm in alcohol, stored at the Verona Museum.

Diagnosis Antennae reaching one-third of body length. Gn 1 propodus slender, without palmar corner, $l:w = 3$; Gn 2 propodus somewhat longer than Gn 1 propodus, but twice as wide, hind margin rounded, palm defined by strong spines. P 6, 7 basis oval, regularly rounded, posterior margin not much widened. Telson spinose.

Description

Bodylength 2–2.5 mm

Head Eyes round. Antennae subequal, A1 peduncle art 1 = art 2 + art 3. Mouthparts: Mx 1 palp with 2 arts, inner plate small; Mx 2 plates in tandem position, inner plate

much shorter than outer one. Md body long and slender, molar absent.

Peraeon Cx 1 rectangular; basis anteriorly beset with several long spines; merus not reaching end of triangular carpus, both posteriorly with many spines; propodus slender, narrow, $l:w = 3$, without defined palm, on anterior and posterior margin spines.

Cx 2 oval, three times as long as Cx 1. Gn 2 basis with spines on anterior margin; merus not reaching end of triangular carpus, both arts with spines on posterior margin; propodus twice as wide but scarcely longer than Gn 1 propodus, regularly rounded, palm defined by a group of strong spines. Peraeopods: Cx 3 rectangular; P 3 much smaller than P 4; merus P 3 somewhat thicker than propodus and carpus and anteriorly somewhat lengthened; basis on anterior margin spinose. Cx 4 triangular, longer than Cx 3 and about double width; P 4 basis and merus about same width, merus longer than P 3 merus. Dactyli P 3, P 4 reaching about half length of propodus. P 5 very similar P 3. P 6, 7 similar to each other; basis hind margin regularly rounded, posterodistal corner lengthened; merus scarcely widened, but clearly posterodistally acutely lengthened, reaching half length of carpus.

Pleon Ep 1 posteriorly acutely ending; Ep 2, 3 posteriorly with corner of about 120° ; all margins smooth. U 1 spinose peduncle longer than subequal rami; U 2 rami clearly different in length; U 3 peduncle < ramus, ramus art 1 subequal art 2, beset with spines. Telson triangular, laminar, with spines. No sexual dimorphism known as yet.

Etymology After the sea anemone *Boloceropsis platei* Mc Murrich, 1904, on which this species is living. Used as noun in apposition.

Discussion From the Pacific Ocean, only six *Stenothoe* species are known: *S. estacola* Barnard, 1962, *S. frecanda* Barnard, 1962, *S. garpoorea* Krapp-Schickel, 2009, *S. haleloke* Barnard, 1970 (syn. *S. qingtaoensis* Ren, 1992), *S. kaia* Myers, 1985 and *S. verrucosa* Krapp-Schickel, 2009. The species *S. frecanda*, *S. kaia* and *S. verrucosa* show an enlarged rectangular Gn 2 propodus in male (propodus $l:w =$ about 3); in the male Gn 2 propodus of *S. estacula* and *S. garpoorea*, there is a well-defined palmar corner of about 90° , and Gn 1 propodus is about twice as long as wide. The material of *S. qingtaoensis* Ren, 1992 from Jiaozhou Bay in East China (12 females, 3 males, length up to 3 mm) is most probably a synonym of the single female of 2 mm of *S. haleloke* Barnard, 1970 from Hawaii and is morphologically very similar to the present new species. It lacks also sexual dimorphism, the antennae are subequal and about one-third length of the body, the eyes are well developed and round, Gn 2 propodus is widened and the



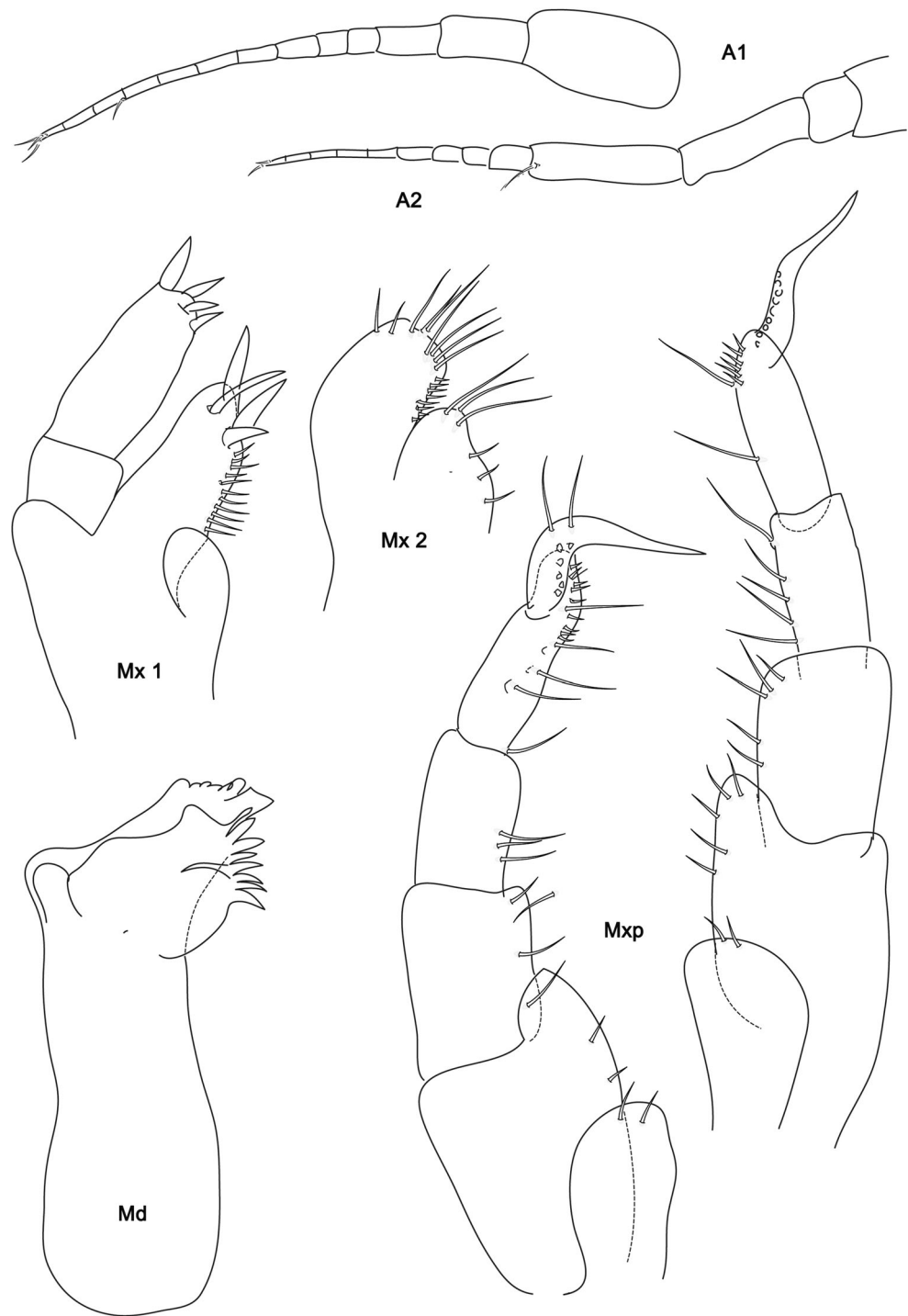
Fig. 1 *Boloceroptis platei* with associated stenothoid. Source ©Vreni Häussermann, all rights reserved

hind margin rounded, and bases of P 6, 7 are widened but posteriorly not much rounded. But the differences are Gn 1 propodus similar in shape to Gn 2 propodus with well-defined palmar corner in *S. haleloke* versus dissimilar, much narrower and lacking palmar corner in the present species; Gn 2 carpus and merus distoposteriorly acutely ending, versus with round corners especially in carpus of the new species; U 2 rami subequal versus clearly unequal

in the present species. *S. haleloke* is reported from littoral algae and not in association with other animals.

It could well be that this species lives in similar conditions as *Stenothoe brevicornis* G.O.Sars, 1883, which is well known from the Atlantic as obligate associate of the sea anemone *Actinostola callosa* Verrill, 1882 (Vader and Krapp-Schickel, 1996). Also no sexual dimorphism is

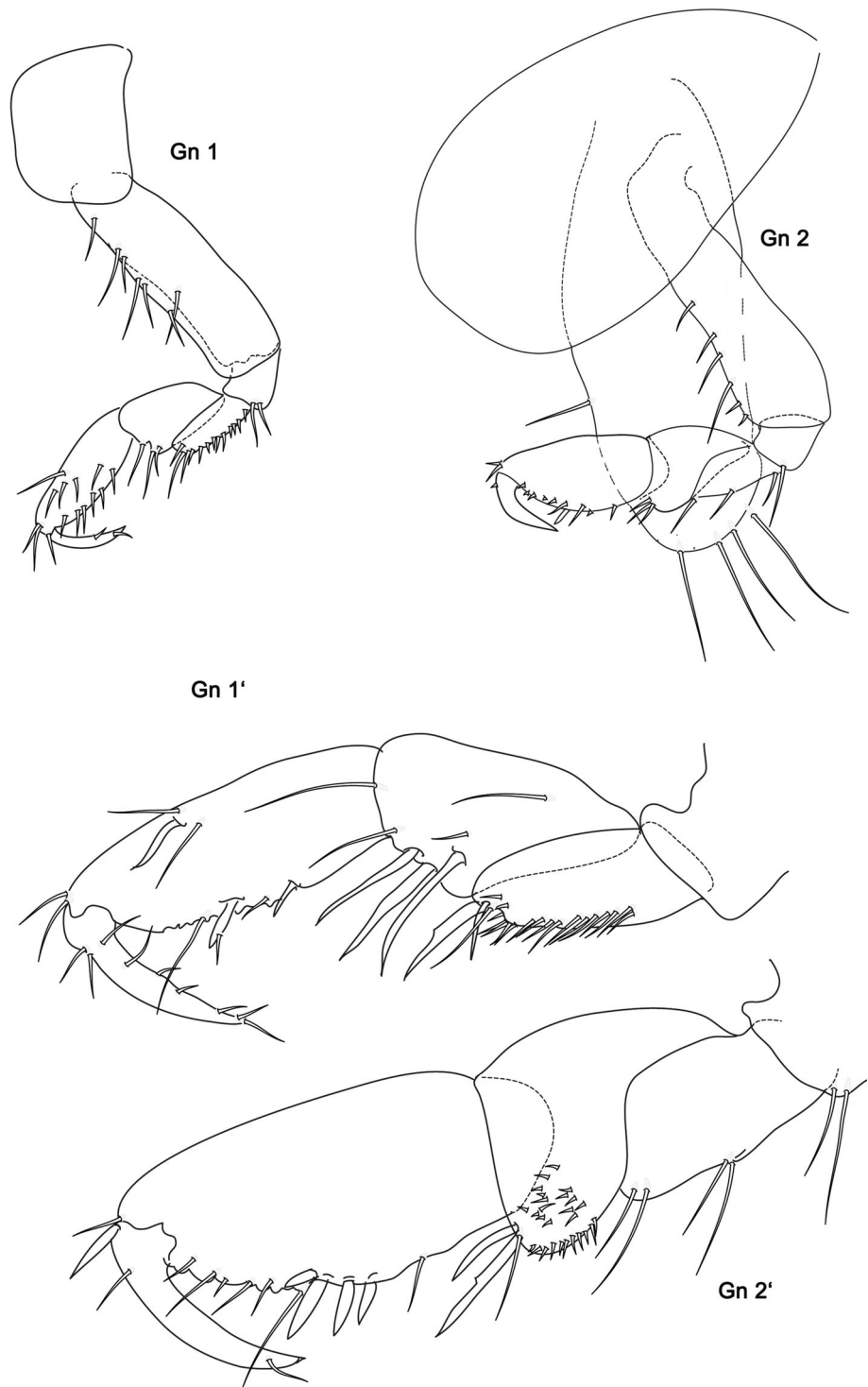
Fig. 2 *Stenothoe boloceropsis* n.sp.: A1, 2 = antenna 1, 2; Mx 1, 2 = maxilla 1, 2; Md = mandible; Mxp = maxilliped



observed, the antennae are subequal in length and about one-third of the body length, the eyes are well developed and round, also P 6, 7 bases are similarly moderately widened with not much rounded hind margins. But in *S. brevicornis*, the telson is naked, U 3 peduncle is longer than ramus and again U 2 has subequal rami, vs. a spinose telson, U 3 peduncle shorter than ramus and U 2 rami dissimilar in the present species. Among the at present 53

known *Stenothoe* species, the majority has a Gn 1 propodus about twice as long as wide, and many of them show a clear palmar corner. Only the following species have a Gn 1 propodus longer than twice the width: *S. divae* Bellan-Santini, 2005 from the Mid-Atlantic Ridge in about 800 m depth, *S. coutieri* Chevreux, 1935 from bathyal of the Açores, *S. eduardi* Krapp-Schickel, 1976 from the Mediterranean, *S. sivertseni* Stephensen, 1949 from Tristan

Fig. 3 *Stenothoe boloceropsis* n.sp.: Gn 1, 2 resp. Gn 1', 2' = gnathopods 1, 2 in same enlargement

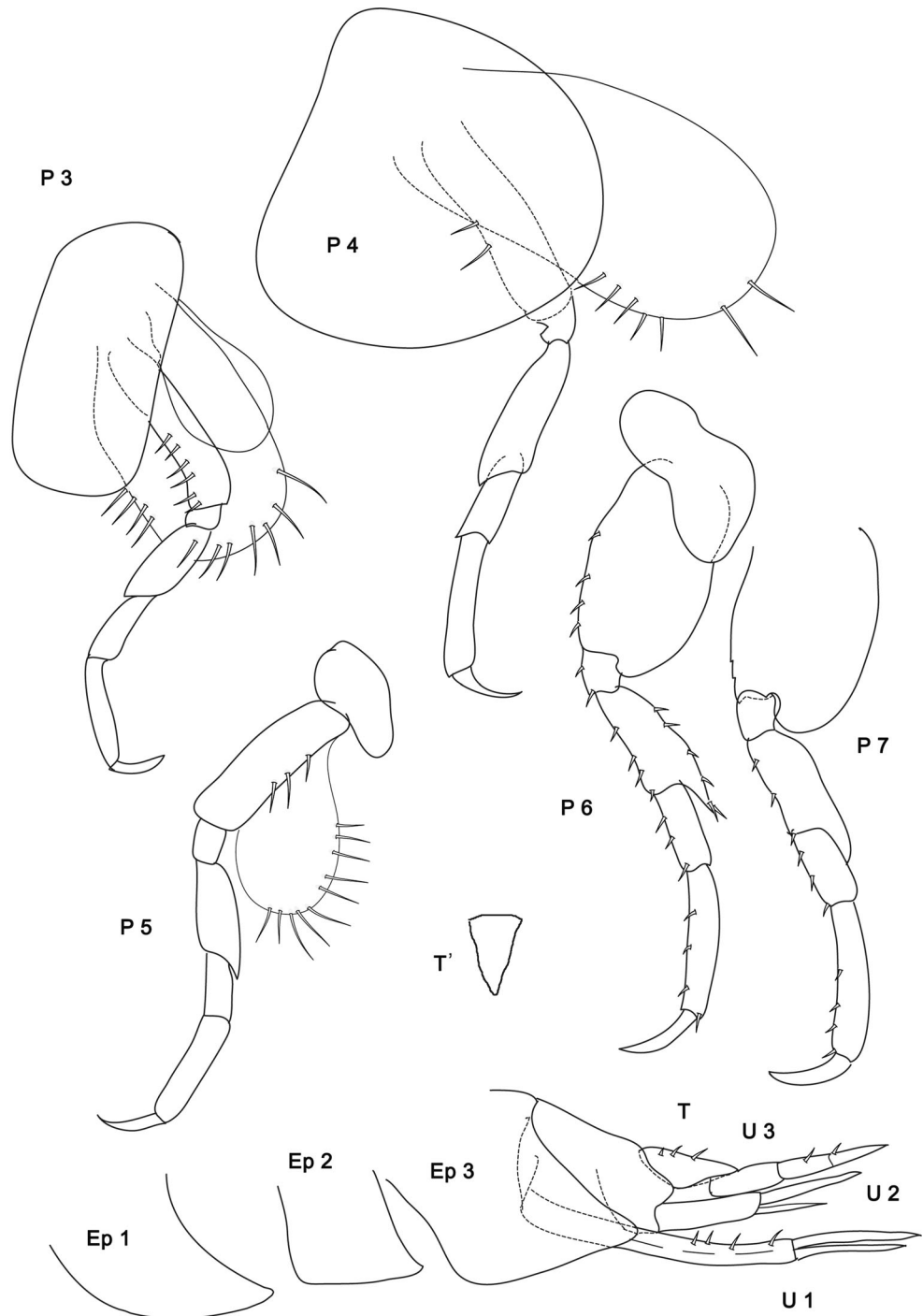


da Cunha, *S. macrophthalma* Stephensen, 1931 from the bathyal of the N-Atlantic and *S. megacheir* (Boeck, 1871) from Norway. Except *S. coutieri* all these species show strong sexual dimorphism, while in *S. coutieri* only a single male is known, where Gn 1 propodus shows a clear palmar corner.

Biology of stenothoids associated with sea anemones

Associations between amphipods and sea anemones are probably quite common in nature, but for a long time they were largely overlooked. They were reviewed by Vader (1983); an updated review is in preparation by Vader and

Fig. 4 *Stenothoe boloceropsis*
n.sp.: P 3–7 = pereopods 3–7;
Ep 1–3 = epimeral plates 1–3;
U 1–3 = uropods 1–3;
T = telson, T' telson from
dorsal



Tandberg. In all known cases, stenothoid associates live on the column and tentacles of the sea anemone host; in recent years, quite a number of these associations have become known. The best studied case is that of *Stenothoe brevicornis* Sars, 1883, an obligate symbiont of the sea anemone *Actinostola callosa* (Verrill) in N. Norway and eastern Canada (Vader and Krapp-Schickel 1996, Fenwick and Steele 1983); the species has recently also been found on

Liponema multicornis (Verrill, 1880) in the Gulf of Maine (Auster et al. 2011). The amphipods are found on the outside of the sea anemones (the collecting methods made detailed observations impossible, and the amphipods did not survive well in the laboratory), with usually up to ten specimens per host and a maximum of 44. In the larger hosts, from 65 to 86 % of the sea anemones harboured amphipods. All size classes of amphipod are represented,

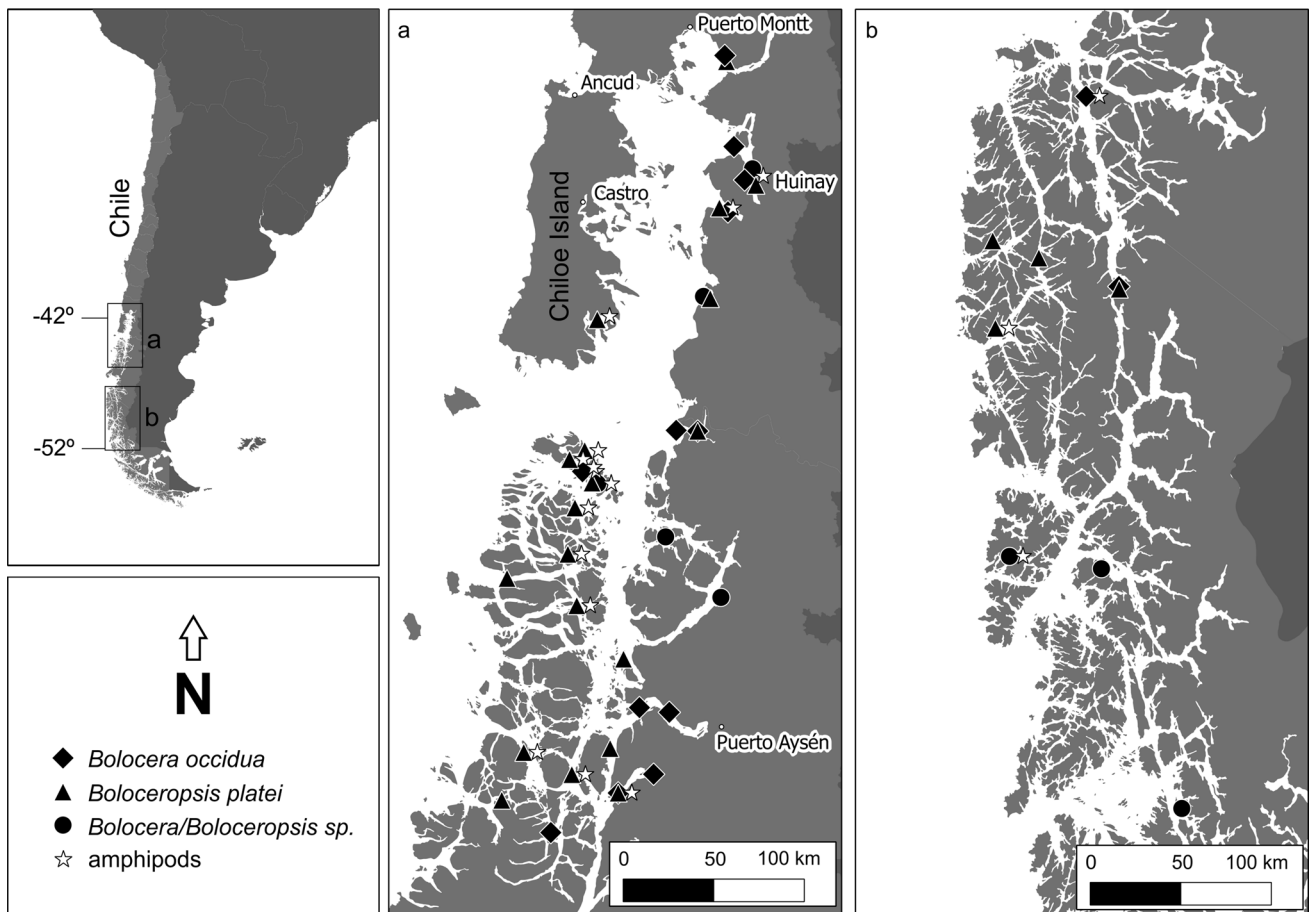


Fig. 5 Distribution map of *Boloceros platei* and *Bolocera occidua* with and without stenothoid amphipods

also ovigerous females; the species appears to be iteroparous. Surprisingly, a study of stomach contents showed that *Stenothoe brevicornis* in fact feeds to a considerable amount on host tissue (Moore et al. 1994). No biological data have as yet been collected for *S. boloceros*, but it seems to have a way of life quite similar to *S. brevicornis*.

Natural history of the host, the sea anemone Boloceros platei

The actiniid sea anemone *Boloceros platei* can be found in Chilean Patagonia between Lenca, Seno de Reloncavi, Northern Patagonian Zone (41,6720°S; 72,6561°W) and Isla Camelo, Central Patagonian Zone (49,19°S; 75,394°W) between 8 and 40 m depth (most common between 20 and 30 m depth). Species identified as *Bolocera/Boloceros* sp. were found at 54 of the more than 300 sampling sites; of these, *Boloceros platei* was found at 33 sites. Of the 54 sites, amphipods were observed at 17 sites. Amphipods were most common in the Guaitecas and Chonos Archipelagos (approximately 43–46°S). Specimens of the species *Boloceros platei* are characterized

by its white or light pink generally uniform colour (some specimens have a dark ring around the mouth opening), its large size (alive up to 6 cm pedal disc diameter), the numerous long, non-retractile tentacles (alive up to 13 cm) and the small offspring sitting in large groups around many specimens. Specimens of this species live on exposed rock, boulders, gravel or sandy bottom. In the latter case, several small stones have been found attached to the pedal disc. Generally, there are few specimens in an area, but we have also found sites with dozens of specimens at regular distances (between 0.5 and 4 m). The specimens are always sitting in an upright position. Little information is available on the biology of this species. A hermit crab with shell (~1.5 cm diameter) has been observed in its gastrocoel. Following Sebens and Paine (1979), embryos can be present in the gastrocoel. This has never been observed in the present study. A small detached specimen was observed making slow rhythmic movements with the tentacles which could be used to move around. When being preserved, specimens rarely throw off tentacles. The very similar species, *Bolocera occidua*, can be found between Lenca, Seno de Reloncavi, Northern Patagonian Zone

(41,672033333°S; 72,6561°W) and Angostura Inglesa, Canal

Messier, Central Patagonian Zone (48,974722222°S; 74,421361111°W), from 25 m down to 233 m (Häussermann 2006). It was found at 20 of the more than 300 sampling sites. Its colour varies between white, pink and dark brown. Its tentacles are also non-retractile, but thrown off readily when disturbed. The relationship between body size and tentacle length also differs, and in adult animals, the body of *B. occidua* is smaller in relationship to its tentacles (however, with subadult specimens, this is different). The morphology and histology (including cnidae) of the two species are so similar that no character for clear distinction has been found yet. The phenotypes can generally be distinguished in situ (especially the dark brown one).

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