Zootaxa 3285: 1–120 (2012)
www.mapress.com/zootaxa/

Monograph

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

ZOOTAXA

3285

Snailfishes (Family Liparidae) of the Ross Sea, Antarctica, and Closely Adjacent Waters

DAVID L. STEIN
Department of Fisheries and Wildlife
Oregon State University
104 Nash Hall
Corvallis, Oregon 97331 USA
e-mail: david.stein@oregonstate.edu

Magnolia Press
Auckland, New Zealand

Accepted by R. Pethiyagoda: 07 Nov. 2011; published: 30 Apr. 2012

DAVID L. STEIN
Snailfishes (Family Liparidae) of the Ross Sea, Antarctica, and Closely Adjacent Waters
(*Zootaxa* 3285)

120 pp.; 30 cm.

30 Apr. 2012

ISBN 978-1-86977-869-9 (paperback)

ISBN 978-1-86977-870-5 (Online edition)

FIRST PUBLISHED IN 2012 BY

Magnolia Press

P.O. Box 41-383

Auckland 1346

New Zealand

e-mail: zootaxa@mapress.com

http://www.mapress.com/zootaxa/

ISSN 1175-5326 (Print edition)

ISSN 1175-5334 (Online edition)

Table of contents

Abstract

Snailfishes (Family Liparidae) of the Ross Sea are reviewed, keys are provided to their identification, and the utility of several taxonomic characters, including the pectoral fin and girdle and length and shape of the abdominal cavity, is discussed. New and previously unstudied specimens show that there are more than 34 Ross Sea liparid species in three genera; 18 of them are new to science and are described below. Ross Sea snailfishes include at least six *Careproctus*, 27 *Paraliparis*, and one *Genioliparis* species. The new species are *Paraliparis alius* from off Iselin Seamount at 1225–1332 m, *P. amerismos* from off Hillary Canyon (near Pennell Bank) at 1149–1358 m, *P. camilarus* from the northwest edge of Mawson Bank at 1431–1658 m, *P. ekaporus* from off Mawson Bank at 1431–1658 m, *P. epacrognathus* from off Mawson Bank at 1431–1658 m, *P. haploporus* from off Mawson Bank at 1954–1990 m, *P. longicaecus* from the NW edge of Mawson Bank at 1431–1658 m, *P. macropterus* from off Iselin and Mawson Banks at 1133–1990 m, *P. magnoculus* from off Iselin and Scott Canyon at 950–1368 m, *P. mentikoilon* from off Mawson Bank at 1954–1990 m, *P. nigrolineatus* from off Mawson Bank at 1954–1990 m, *P. nullansa* from off Mawson Bank at 1954–1990 m , *P. orbitalis* from off Cape Adare at 1110–1210 m, *P. parviradialis* from off Mawson Bank at 1954–1990 m, *P. plicatus* from off Mawson Bank at 1431–1990

m, *P. posteroporus* from off Mawson Bank at 1400–1600 m, *P. tangaroa* from Iselin Seamount at 966–1153 m, and *P. voroninorum* from off Mawson Bank at 1954–1990 m. In addition, one unknown *Paraliparis* is partially described but not named owing to its poor condition. Range extensions for *P. neelovi* and *P. stehmanni* are reported, and two more individuals of *P. andriashevi*, previously known from two specimens, were collected. Other species included are *Careproctus ampliceps*, *C. catherinae*, *C. inflexidens*, *C. polarsterni*, *C. pseudoprofundicola*, *C. vladibeckeri*, *Genioliparis kafanovi*, *Paraliparis antarcticus*, *P. devriesi*, *P. fuscolingua*, *P. macrocephalus*, *P. rossi*, and *P. terraenovae*. History and characteristics of the Ross Sea that probably led to isolation and speciation are described and discussed. The new discoveries increase the number of known Southern Hemisphere snailfish species to about 200.

Key words: Pisces, Liparidae, snailfish, Antarctic, Ross Sea, new species

Introduction

Snailfishes (Family Liparidae) are probably the most speciose family of Antarctic fishes (Eastman 2005), although they are a secondary, not primary, Antarctic family (sensu Andriashev, 1977a; Andriashev & Stein 1998). They did not originate in the region but colonized it after successfully invading the deep sea (Andriashev 1990a, 1991a). Antarctic waters are thus a known center of liparid species diversity (Andriashev & Stein, 1998; Andriashev, 2003) at and below nominally mid-slope depths of 1500 m, but snailfish biomass and numerical abundance is low (Andriashev & Stein, 1998). Andriashev (2003) summarized knowledge of Southern Ocean snailfishes, reviewing 105 species in eight genera, but he did not include recent captures and descriptions of 30 Australian species. Subsequently, more species have been described from the Southern Ocean (Chernova & Duhamel, 2003; Stein, 2005, 2006; Chernova, 2006; Balushkin & Voskoboinikova, 2008). Including known and probably new but as yet undescribed species (Stein, in prep.), the present total of liparid species from the Southern Hemisphere is about 200, and of those, about 150 occur in Subantarctic and Antarctic waters.

It is common for multiple new liparid species to be discovered in a previously unexplored or underexplored region in apparently small populations (Southeast Australia, Stein et al. 2001; northeast Pacific Aleutian Islands, Orr & Busby 2006, Orr & Maslenikov 2007; and others) or as great range extensions for the family (northwest Australia, Stein et al. 2001, Galapagos Islands, Stein & Chernova 2002; Hawaiian Islands, Stein work in progress). In recent decades, the Southern Hemisphere and the Antarctic have been productive regions for the discovery and study of liparids, and have proven to be an important center of diversity for the family. Therefore, the new discoveries reported here are not unusual.

Within the Antarctic, fishes of deeper waters are not very well known (Eastman & Hubold 1999). In the Ross Sea, most previous scientific sampling has been shallower than 1000 m (Eastman & Hubold 1999, Eastman 2005, J. Eastman, pers. comm., 20 Sept. 2010). The New Zealand R/V *Tangaroa* IPY-CAML expedition of 2008 was planned to sample "large scale gradients of depth and latitude" "across the shelf, slope, seamount and abyss environments" of the Ross Sea (Hanchet et al., 2008). From 7 February to 14 March, 2008, as part of the International Polar Year (IPY; 2007–2008), R/V *Tangaroa* sampled the Ross Sea extensively, as well as around the Admiralty and Scott seamounts (Hanchet et al., 2008). The cruise was a joint effort of the New Zealand government, the International Polar Year (IPY) program, and the Census of Antarctic Marine Life (CAML). Ross Sea samples were taken as far south as 76º49.56′ S, and as far east as 179º57.6′ W, then, as encroaching sea ice forced the vessel north, in a northerly transect to 66º49.15′ S. Samples were taken with a wide variety of gear, variously deployed 282 times at depths from 200–3500 m.

Fishes were collected in both midwater and bottom trawls, but all the snailfishes were collected by the latter. A total of 53 bottom collections were made, using beam trawls (13), Brenke sled (5), epibenthic sled (11), and rough bottom trawls (24) at depths ranging from 281–3,490 m. Of these, six tows collected a total of 26 liparids, all *Paraliparis*; all but one from 774 m or deeper, and all but five taken at two stations (IPY-CAML/TAN 144, IPY-CAML/TAN 167). Many of these were photographed while fresh, and those photos are included here. Samples were often from areas and depths that were previously not well known. The *Tangaroa* specimens included 17 species, 13 of them new.

The recent commercial fishery for toothfish (*Dissostichus mawsoni* and *D. eleginoides*) and the New Zealand Ministry of Fisheries (MFish) observer program associated with it resulted in specimens of rare or undescribed liparids from mid- and lower slope depths, often in poor condition owing to their capture by mechanized longline

and automatic line strippers. These collections provided an additional 22 *Paraliparis* specimens from the Ross Sea, some having been caught before, but most after, the *Tangaroa* cruise. Of these 22, 18 were collected by New Zealand MFish Scientific Observers on board New Zealand flagged longline fishing vessels. They were either taken directly as by-catch on the long line hooks or recovered from toothfish stomach contents. These include 11 species, seven of them new.

Thus, the 48 identifiable Ross Sea specimens in the collection of the National Museum of New Zealand Te Papa Tongarewa (NMNZ) represent more than 27 species of *Paraliparis*, 18 of them new and described here (Table 1). Known Ross Sea liparid species now total 34: six *Careproctus*, 27 *Paraliparis*, and 1 *Genioliparis*, collected at stations throughout the region (Fig. 1). Because the NMNZ materials include so many new taxa, representing a majority of the liparid species in the region, this paper reviews the entire snailfish fauna.

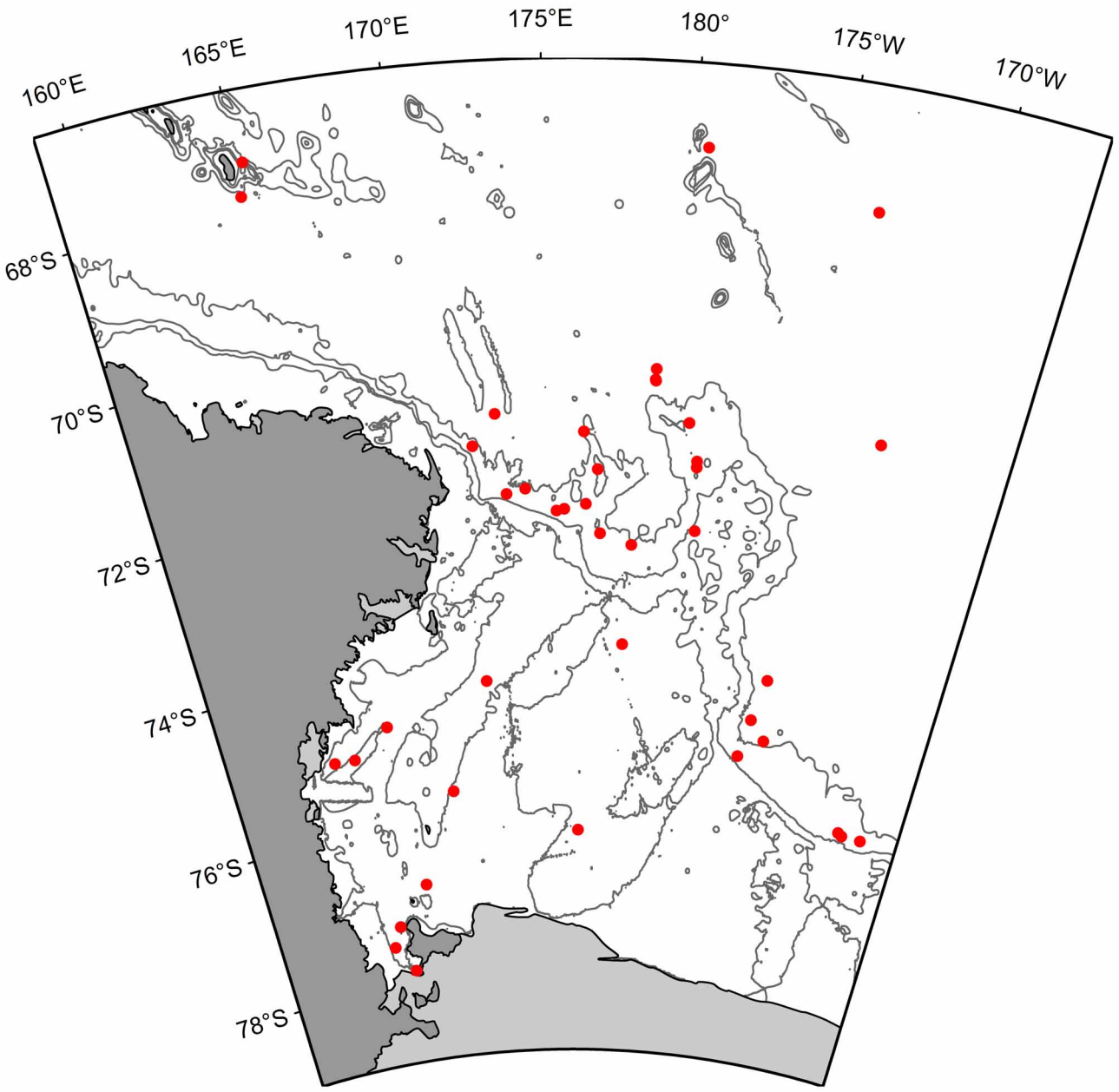

FIGURE 1. Map of the Ross Sea, showing all collection localities.

TABLE 1. Liparid species of the Ross Sea, showing authors, distributions, and depths of occurrence.

Species	Authority	Distribution	Depth (m)
Careproctus ampliceps	Andriashev & Stein 1998	Northern Ross Sea	2608–3514
Careproctus catherinae	Andriashev & Stein 1998	Northern Ross Sea	1382–2154
Careproctus inflexidens	Andriashev & Stein 1998	Northeastern Ross Sea	2049–2089
Careproctus polarsterni	Duhamel 1992	Circumantarctic	495–830
Careproctus pseudoprofundicola	Andriashev & Stein 1998	Northeastern Ross Sea	2049–2089
Careproctus vladibeckeri	Andriashev & Stein 1998	Circumantarctic	2273–2941
Genioliparis kafanovi	Balushkin & Voskoboinikova 2008	Ross Sea	Bathypelagic?
Paraliparis alius	new species	SW of Iselin Seamount	1225–1332
Paraliparis amerismos	new species	Hillary Canyon, near Pennell Bank	1149–1358
Paraliparis andriashevi	Stein & Tompkins 1989	Iselin Seamount, NW Mawson Bank	1260–2306
Paraliparis antarcticus	Regan 1914	Circumantarctic	100– ca 800
Paraliparis camilarus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis devriesi	Andriashev 1980	SW Ross Sea near McMurdo	500– ca 900
Paraliparis ekaporus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis epacrognathus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis fuscolingua	Stein & Tompkins 1989	Off Cape Adare	2273
Paraliparis haploporus	new species	NW edge of Mawson Bank	1954–1990
Paraliparis longicaecus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis macrocephalus	Chernova & Eastman 2001	Drygalski Trough	1181–1191
Paraliparis macropterus	new species	NW Mawson Bank; NW Iselin Bank	1133–1990
Paraliparis magnoculus	new species	Scott Canyon, SE Iselin Bank	950–1413
Paraliparis mentikoilon	new species	NW edge of Mawson Bank	1954–1990
Paraliparis neelovi	Andriashev 1982	Circumantarctic	1070–2000
Paraliparis nigrolineatus	new species	NW edge of Mawson Bank	1954–1990
Paraliparis nullansa	new species	NW edge of Mawson Bank	1954–1990
Paraliparis orbitalis	new species	Off Cape Adare	1110–1210
Paraliparis parviradialis	new species	NW edge of Mawson Bank	1954–1990
Paraliparis plicatus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis posteroporus	new species	NW edge of Mawson Bank	1431–1658
Paraliparis rossi	Chernova & Eastman 2001	SW of Mawson Bank	465–466
Paraliparis stehmanni	Andriashev 1986	Circumantarctic	1431–2600
Paraliparis tangaroa	new species	Iselin Seamount	966–1153
Paraliparis terraenovae	Regan 1916	Circumantarctic	5–850
Paraliparis voroninorum	new species	NW edge of Mawson Bank	1954–1990
Paraliparis sp.	undescribed new species	Scott Canyon	1106–1117

Material and methods

For definitions of characters, measurements, and counts of *Careproctus* and *Paraliparis* species, I follow the methods and terminology described by Andriashev (2003), Andriashev & Stein (1998), Stein et al. (2001), and Stein (2006). Abdominal vertebrae are those not supporting anal fin rays, caudal vertebrae are those supporting them. Additional characters include distance from mandible to end of body cavity, pectoral symphysis to end of body cavity, and distance between lower pectoral fin lobes. Body cavity end is defined as the posteriormost point of the cavity itself (if cut open) or the posteriormost point of the peritoneum if viewed through the body wall. For the purpose of measurement, the pectoral symphysis is the posteriormost edge of the girdle on or nearest the ventral midline of the body. Distance between pectoral fin lower lobes is between the bases of the lowest ray on each side (those closest to the ventral midline of the body). In addition, to avoid confusion when making caudal fin ray counts, caudal fin ray number consists of both principal and auxiliary rays (Andriashev 2003:9) although they are listed separately in the counts. Cephalic pores are shown in figures when extant; many pores may be shown in some figures, but if any are missing owing to damage, pore formulas are not given.

Specimens were radiographed to obtain counts of medial skeletal elements, and where possible, right side pectoral girdles were dissected and cleared and stained by the method of Taylor (1967a, b) to show their skeletal elements. Sensory pores, their details, and teeth were stained temporarily by the method of Saruwatari et al. (1997), and often permanently by direct application of Alizarin Red S. Where possible, sex of specimens was determined and stage of maturity established visually. Museum abbreviations follow Sabaj Perez (2010).

Ratios are given as percent SL or HL followed (in parentheses) by data for the paratype(s) where there are two or more specimens in the type series except where otherwise noted. Andriashev (2003) presented head length percentages only as whole numbers. Not all measurements were made for all specimens or species; omission means measurements were species or genus specific (e.g., disk dimensions or position), not normally taken (postorbital length, etc), or unobtainable because of damage or distortion. Expanded diagnoses (e.g., abbreviated descriptions) are provided for described taxa. These short descriptions should be used with care, and specimens so identified should be checked against the full descriptions.

Distribution maps show only Ross Sea captures. Distributions outside the Ross Sea are not shown.

A general cautionary note is appropriate for liparid identification. Because snailfishes are fragile, soft-bodied, poorly ossified, easily skinned, and often have large amounts of gelatinous subdermal extracellular matrix, or SECM (Eastman et al., 1994), capture and preservation frequently result in significant damage to specimens, if only through shrinkage and damage from handling. Therefore, fresh individuals rarely look like preserved ones. To show this and as an aid in identification, this paper includes color photographs of fresh specimens and drawings of the same individuals when possible. Trying to identify fresh material by comparing it to drawings of preserved specimens may be misleading and confusing (see below figures including both). Materials used in this study (except where noted otherwise) are deposited at The National Museum of New Zealand Te Papa Tongarewa, in Wellington.

Pectoral fin structure

Structure of the pectoral fin endochondral plate and its associated bones (chiefly number, arrangement, and shape of radials and presence of fenestrae) have been used as important characters since Andriashev (1977b) discussed and subsequently used them to distinguish among species, some of which can hardly be identified without their examination. Andriashev (1986:170–176; 2003:10–14, 427–438) provided thorough discussions of proposed evolutionary stages in the development of the pectoral girdle and radials, and also discussed the significance of anomalous radial arrangements and the presence of the lobed pectoral fin and rudimentary notch rays. Although in his discussion of pectoral girdle structure and variability of radial number, Andriashev (2003:289–292) refers to examining multiple specimens of some species, he did not provide detailed descriptions or analyses of observed variability. In this paper, I distinguish three kinds of radial anomalies: variability in number, shape, and position. These are not mutually exclusive; one pectoral girdle could display all three types. Andriashev (2003 and earlier papers) apparently defined rudimentary rays to be those less than 1–2 mm long, i.e. reduced to bases only. I know of no thorough study of morphological variability of pectoral girdle structure within any species.

Antarctic species of *Paraliparis* seem to have an unusually high intraspecific variability in radial number. At least eight species, all from the Southern Ocean and all but one in *Paraliparis*, have variable numbers of radials and this variability does not seem to be related to number of radials. These species are *P. antarcticus* Regan 1914a (in Andriashev 2003:233–234), *P. australis* Gilchrist 1902 (in Andriashev 2003:291), *P. charcoti* Duhamel 1992, *P. hureaui* Matallanas 1999, *P. kocki* Chernova 2006, *P. mawsoni* Andriashev 1986, *P. stehmanni* Andriashev 1986 (see description below), and *C. vladibeckeri* Andriashev & Stein 1998. In *P. kocki* (see below) there can be 3, 4 or 5 radials. Why or how this occurs, what it represents, and whether it occurs in Northern Hemisphere species are unknown. It should be noted that within the liparids, more derived genera and species (such as *Paraliparis*) are often defined by structural loss (fewer pectoral and caudal fin rays and pectoral radials, less developed and weaker skeletons) and the observed variability may be related to this loss, in which case, species of *Liparis* should show less variability. Andriashev (2003:291) considered that such intraspecific variability is anomalous and "a result of disturbance of the normal process of embryogenesis."

The shape and position of one or more radials may be unusual. *Paraliparis charcoti* and *P. hureaui* have anomalous radials that are unique in the family (see Matallanas, 1999). The holotype of the former has five radials, with R3 and R4 forming part of the endochondral plate edge. The holotype of the latter has four radials, the lower two of which are D-shaped with the stem (the straight edge) forming part of the posterior edge of the endochondral plate, and two fenestrae (foramina), the larger of which is anterior to the radials. Although Matallanas (*ibid.*) considered these characters to be of specific importance, Andriashev (2003:250, 289) considered them anomalous and therefore not useful for defining taxa. Three species described here (*P. camilarus* n. sp., *P. epacrognathus* n. sp., *P. voroninorum* n. sp.), have radials with shape or position anomalies. The specimen of *P. camilarus* has R3 with a distinct teardrop-shaped hole, apparently a notch that is malformed; *P. epacrognathus* has R3 present as a small radial with a large lunate cutout in its dorsal edge, making it almost "C-shaped"; and *P. voroninorum* has a small "extra" radial (R2) squeezed between, and anterior to, two apparently normal round radials. Whether these are actually anomalies, whether they are species-specific, or whether they represent "normal" intraspecific variability is unknown and can only be answered by examination of further specimens. If such variations are the result of embryonic development, perhaps the low temperatures occurring in the region (down to –1.9 C in McMurdo Sound; Eastman & Clarke, 1998) prolong development and thereby increase the probability of such occurrences. In either case, the question remains why such variability is so common in the Antarctic, particularly in the Ross Sea. Possibly it is common elsewhere but has not been noticed.

When Andriashev published his 2003 review of Southern Ocean snailfishes, he was aware of only one Southern Ocean species of *Paraliparis* (*P. stehmanni*) with notched pectoral radials. Subsequently Chernova (2006) described *P. kocki* on the basis of three individuals, all with different numbers of radials, notches, and fenestrae. The holotype (ZMH 9078) has four radials, R1, 2, and 3 notched; the male paratype (ZMH 9569) has 3(2+0+1) radials, R1 with a slit, R2 slit and notched; the female (ZMH 9569) has 5(4+1) radials, R1, 2, and 3 notched, R4 small, R5 normal. The scapula and coracoid are similar in all three individuals. This species has enough other characters (teeth, head length, etc) that define it (other than pectoral girdle structure) to allow concluding that it can be misleading to use the number of radials and structure of the pectoral girdle as the sole reasons to distinguish among species. The collection described here includes eight species with notched or slit radials in various combinations (*P. camilarus*, *P. ekaporus* n. sp., *P. epacrognathus*, *P. longicaecus* n. sp., *P. mentikoilon* n. sp., *P. nullansa* n. sp., *P. posteroporus* n. sp., *P.stehmanni*). One of these, *P. camilarus*, has an apparently unique occurrence of a notched R4, and its only two fenestrae are not between radials. The significance of such variability is unknown; some intraspecific variation in notch presence or absence is probably normal. Andriashev (2003) discussed it in some of the species descriptions in his 2003 review (cf. *P. antarcticus*, p. 234).

Characteristics of the scapula and coracoid may also be useful. Scapular characters include whether it is "double headed" e.g., shaped like a double bladed axe, the larger head being the scapular blade and the other head being the helve (depends upon presence, absence, development, and shape of the helve) or whether the helve is absent; coracoid characters include the presence or absence of a helve, its length if present, whether it has strengthening plates or lateral ribs (cf. Andriashev 2003:10–12), a slit, fenestrae, and if there is a ventral hemicircular notch at the proximal (basal) end of the helve. In *C. polarsterni* Duhamel 1992, *P. nullansa*, *P. voroninorum*, and *P. andriashevi*, the scapula has no helve, but is roughly hemicircular and attached to the cleithrum by its anterior edge. In *P. andriashevi* and *P. fuscolingua* Stein & Tompkins 1989, the coracoid has no helve, and its anterior end is terminated by a more or less acute angle. Again, intraspecific variability of these characters is unknown.

Few known *Paraliparis* species lack a scapular helve. All of them appear to be from the Ross Sea: *P. andriashevi* Stein & Tompkins 1989, *P. ekaporus*, *P. nullansa*, and *P. voroninorum*. The first two species have 4 radials, the former with 1+1+1+1, the latter with 3+1. The third has 4 (3+1) radials but could be abnormal and therefore might have 3 (2+0+1). The last has 3 (2+0+1) radials. This could be a unique adaptation within *Paraliparis*, and could represent (following Andriashev's 2003 radial reduction hypothesis) a trend from *P. andriashevi* to *P. ekaporus* etc, although the latter's single chin pore suggests it does not. At least five Southern Ocean *Careproctus* also lack scapular helves: *C. continentalis* Andriashev & Prirodina 1990, *C. guillemi* Matallanas 1998, *C. inflexidens*, *C. parini*, and *C. polarsterni*, suggesting that this character has occurred more than once, but the few available specimens allow only speculation.

Notch ray development has been frequently used as a taxonomic character. Notch rays are considered to be the shorter rays in the middle of the fin, frequently distinctly separated at their bases by a wider distance from the more closely spaced upper and lower lobe rays; the upper or lower notch rays sometimes appear externally as part of the lobe to which they are closest. As a result, their definition can be somewhat arbitrary. Notch rays can be fully developed or rudimentary (incompletely developed). Presence or absence of rudimentary rays (usually in the notch between the upper and lower lobes, but occasionally the lowest ray as in *P. gracilis* Norman 1930 and *P. operculosus* Andriashev 1986) have been used frequently to distinguish between similar species (Andriashev 2003 and others).

The species considered here show all stages of ray development: base only (discernible only by dissection), unsegmented rays of various lengths and development including a short filamentous stub, a longer filamentous rudiment, and weakly developed (unsegmented and unfused) but bilaterally symmetrical rays. Specimens of some species (for instance, *P. parviradialis* n. sp. and *P. posteroporus*) have both rudimentary and fully developed rays in the pectoral fin notch. The relationship of these stages or combinations in any species to size, age, or growth is unknown, although the specimens (with rudimentary rays) described below are clearly adults. In this work, I consider rudimentary pectoral fin notch rays as those that are incompletely developed; that is, at least unsegmented, whether short or long.

Finally, there is considerable interspecific variation in the distance between the lower pectoral lobes; many species have the two lobes closely attached so there little or no space between the two, but others have a wide space separating them. For instance, this distance in *P. epacrognathus* is 11.3% HL, 1.9% SL, but in *P. plicatus* n. sp. it is 28.0% HL and 4.5% SL. The variability in width of this space can be useful in distinguishing among species, and furthermore it is not as easily damaged as many other characters such as cephalic pores.

Because of the known variations, it is wise to be aware of the potential for confusion when depending on this suite of characters. I have used the characters of the girdle as conservatively as I could, especially considering the frequency of apparent anomalies; notwithstanding, I have used them to define species where they add useful distinctions between species. In accordance with the comments above, it is possible that when more specimens become available and allow clarification of intraspecific and interspecific variability and definition of anomalous character states, pectoral girdle character states in some of the taxa herein will need to be revised.

Abdominal cavity shape as a taxonomic character

Abdominal cavity shape and length may differ distinctly between species, but this difficult to quantify character has apparently not been used previously. It may vary in shape (amount of curvature of the dorsal margin), and relative depth and length. For instance, in *Paraliparis devriesi* Andriashev 1980 it is short, rounded, and its deepest point is at about the dorsal end of the gill flap (Andriashev 2003: Fig. 135); in *P. andriashevi*, it is noticeably shorter and its dorsal margin is almost straight (Stein and Tompkins 1989); and in *P. neelovi* Andriashev 1982a it is much longer (Andriashev 2003:331).

Eye and orbit diameters

Eye size has long been used as a character to help identification of liparids. However, the eye is frequently damaged during collection, rendering its measurement problematic or impossible. Even if not damaged, it is often diffi-

cult to determine where the edges of the eye are. The orbit is a better character because it is less easily damaged and provides hard (or relatively hard) surfaces between which to measure. The diameter of the pupil has also been used (Andriashev, 2003), but it seems more likely to be variable and also more easily damaged than the eye or orbit diameter and will not be used here. Because eye size has been so broadly used for other species, I use both eye and orbit diameter here.

Abbreviations

Measurements
TL Total length
SL Standard length

Counts

D	dorsal fin rays
A	anal fin rays
P	pectoral fin rays
C	caudal fin rays
V	vertebrae (abdominal + caudal centra including hypural plate)
R1-R4	pectoral fin girdle radials, numbered from dorsal to ventral
gr	gill rakers (if two numbers, outer + inner. If a single number, outer only)
pc	pyloric caeca

Ratios

aAf	anus to anal fin origin
bd	body depth
cp	chin pore interspace, measured between inner edges of pores
da	posterior edge of disk to center of anus
disk	disk length
E	eye horizontal diameter
go	gill opening length
HD	head depth
HL	head length
HW	head width
io	interorbital width
lj	lower jaw length
LLD	distance between the lowest rays of each lower pectoral fin lobe
LPL	lower pectoral fin lobe length
ma	mandible to anus
mabd	mandible to posterior end of abdominal cavity
md	mandible to disk
orbit	horizontal orbital width
pabd	posterior edge of pectoral symphysis to end of abdominal cavity
pcl	pyloric caeca length, measured from tip of caecum to base on pylorus
preA	preanal fin length
preD	predorsal fin length
sn	snout; anteriormost point of head excluding lower jaw to anterior margin of orbit
sna	snout to anus
uj	upper jaw length
UPL	upper pectoral fin lobe length

Key to Genera of Ross Sea snailfishes

1a. Disk present . . . . . *Careproctus*
1b. Disk absent 2
2a. Snout usually with large papillae, mouth gape very large, teeth long, sharp depressible canines in bands. . . . . *Genioliparis*
2b. Snout papillae absent, teeth not as above . . . . . *Paraliparis*

Key to Ross Sea *Careproctus*

1a. Vertebrae more than 50 2
1b. Vertebrae fewer than 50 5
2a. Vertebrae more than 60, HL 16% SL, D 60 . . . . . *C. inflexidens* Andriashev & Stein
2b. Vertebrae 50–60, HL greater than 20% SL, D 52 or fewer 3
3a. P rays fewer than 23, pyloric caeca absent, ma ~16% SL, aAf ~17% SL . . . . . *C. pseudoprofundicola* Andriashev & Stein
3b. P rays more than 24, pyloric caeca present, ma greater than 20% SL, aAf 15% SL or less 4
4a. Pyloric caeca 4–6, preA less than 39% SL, radials 3 (2+0+1) . . . . . *C. polarsterni* Duhamel
4b. Pyloric caeca 10–12, preA greater than 43% SL, radials 2 (1+0+0+1) . . . . . *C. vladibeckeri* Andriashev & Stein
5a. P rays 25 (14–15+3–4+7), radials 2 (1+0+0+1), disk 20% HL . . . . . *C. ampliceps* Andriashev & Stein
5b. P rays 37–38 (28–29+9), radials 4 (3+1), disk 40–43% HL . . . . . *C. catherinae* Andriashev & Stein

Systematics

Careproctus Krøyer 1862

Careproctus Krøyer 1862:253. Type species *Liparis reinhardti* Krøyer 1862 by monotypy.

Diagnosis (modified from Andriashev, 2003:33). Ventral disk present, in some species very small. One pair of nostrils. Pseudobranchs absent. Pleural ribs present on posterior abdominal vertebrae, sometimes reduced. Hypural complex variably fused, sometimes a slit present in hypural plate. Temporal sensory canal with one or two suprabranchial pores, coronal pore absent. Teeth trilobed to simple, usually arranged in many rows forming bands. Pectoral girdle with two to four radials that may be notched or unnotched; interradial fenestrae present or absent. Principal caudal fin rays 4–10, auxiliary rays not more than four. Pyloric caeca 3–16, rarely absent. Abdominal vertebrae 8–12, total vertebrae 35–64. More than 50 Southern Ocean species known from littoral depths (rarely) to greater than 5500 m, usually bathyal and abyssal.

The following descriptions of *Careproctus* species are modified from Andriashev & Stein 1998 and Andriashev 2003.

Careproctus ampliceps Andriashev & Stein 1998
Figs. 2, 3

Careproctus ampliceps Andriashev & Stein 1998:9, Fig. 5; Andriashev 2003:76, Figs. 34, 35.

Holotype. LACM 11418–2, female, 102 mm TL, 91 mm SL, 67°33′ S, 179°34′ W, USNS *Eltanin*, Stn. 1948, 3 Feb 1967, 3495–3514 m.

Material examined. Holotype. LACM 11350–1, male, 91 mm TL, 83 mm SL, 68°05′ S, 173°44′ W, *USNS Eltanin*, Stn. 1866, 12 Jan 1967, 2608–3176 m.

Expanded diagnosis. Counts. V 47 (12+35), D 40, A 34, C 9 (4/5), P 25 (14–15+3–4+7), radials 2 (1+0+0+1), gr 10, pc 10, pores 2–6–7–1. Ratios. HL 34.1, HW 17.6, sn ~10, E 5.3, orbit 10.1, uj 14.7, go 12.4, md 19.2, disk 7.7, da 4.6, bd 28.6, preD 36.8, preA 41.8, ma 31.3, aAf 15.1, UPL 23.1, LPL 26.3, pcl <5% SL. In % HL: sn 29.5, E 18.4, orbit 30.7, go 36.5, disk 20.3, da 13.5, aAf 15.1, md 58.3, UPL 68.

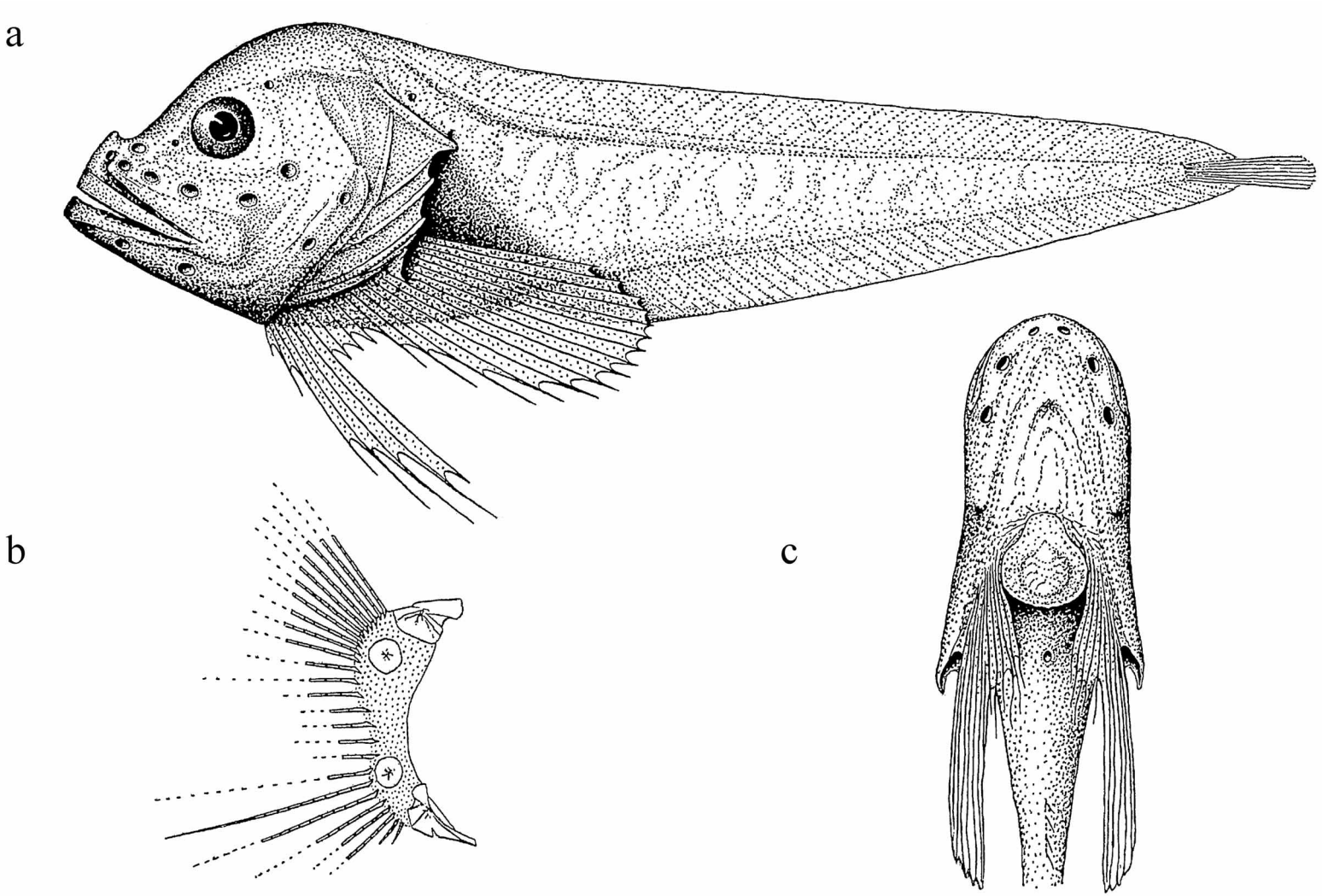

FIGURE 2. *Careproctus ampliceps* Andriashev & Stein 1998. Holotype, LACM 11418–2, 91 mm SL. From Andriashev & Stein, 1998: Fig. 5; a. lateral view; b. pectoral girdle, ZIN N 674; c. ventral view.

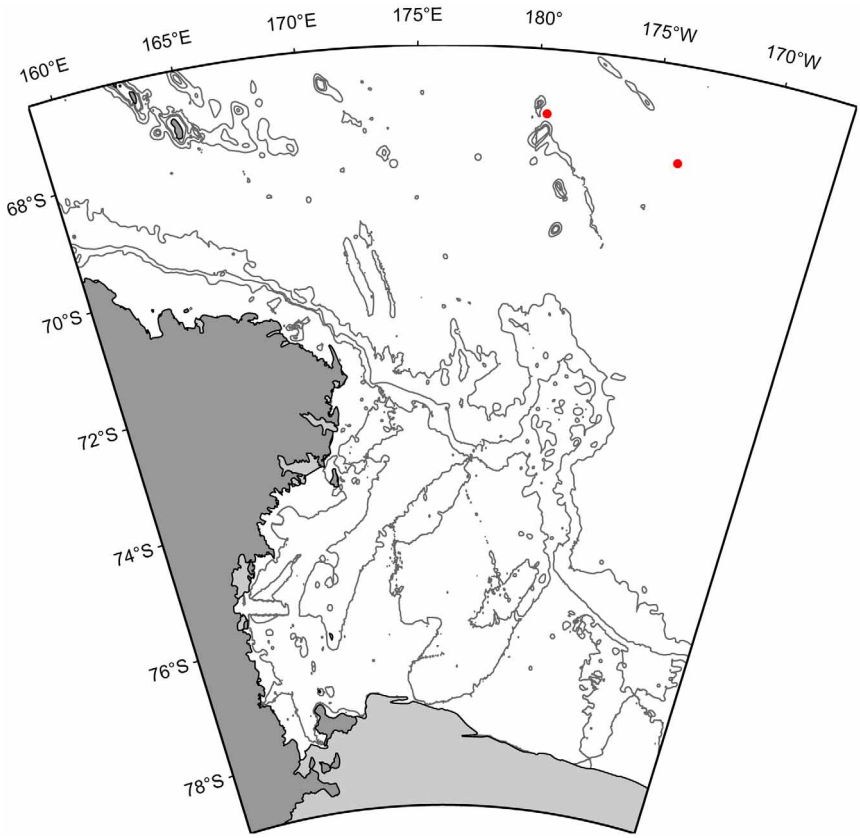

FIGURE 3. Distribution of *Careproctus ampliceps.*

Head large, deep, compressed laterally. Nostril small, less than half diameter of upper nasal pore. Mouth terminal, large, slightly oblique. Upper jaw reaching to below posterior half of eye. Teeth small, simple, conical, forming narrow bands in both jaws; symphyseal gaps narrow. Cephalic pores large, oval, symphyseal pore pair slightly smaller than others in the series, well separated from each other by a distance about equal to one pore diameter. Gill opening nearly vertical, long, extending down in front of 8–9 pectoral fin rays and supported ventrally by 3–4 branchiostegal rays entering its margin. Pectoral fin upper lobe reaching well behind anal fin origin; fin deeply notched, rudimentary rays absent, lower lobe longer than upper, but not reaching to below tip of upper lobe. Radials 2 (1+0+0+1), round, unnotched. Scapular helve short, strong; coracoid long, supported by triangular lamellar plates, basal notch absent. Disk cupped, small, about 1/5 HL. Pleural ribs absent; hypural plate single, unslit. Tiny prickles present on skin as single needles, visible at 25x magnification. Peritoneum brown-black; body, orobranchial cavity, stomach, and pyloric caeca pale.

Distribution. Northern Ross Sea at 2608–3514 m.

Comparisons. Most similar to *C. improvisus* Andriashev & Stein 1998 from South Georgia, but differs in the longer gill opening (in front of 8–9 rays vs completely above pectoral), longer head (34 vs 27% SL), larger mouth (maxilla reaching to below posterior margin of eye vs not reaching to below eye) and smaller disk (8 vs 11% SL). Also similar to *C. acifer* Andriashev & Stein 1998 from the abyssal Scotia Sea, differing in gill opening length (2 vs 7% SL) extending in front of 8–9 rays (vs above pectoral), longer head (34 vs 26% SL) and longer predorsal length (37 vs 29% SL).

Careproctus catherinae Andriashev & Stein 1998

Figs. 4, 5

Careproctus catherinae Andriashev & Stein 1998:11, Fig. 6; Andriashev 2003:44, Figs. 15, 16.

Holotype. LACM 11398–2, male, 216 mm TL, 189 mm SL, 75°07′ S, 175°51′ W, USNS *Eltanin*, Stn. 1925, 27 Jan 1967, 1382–1405 m.

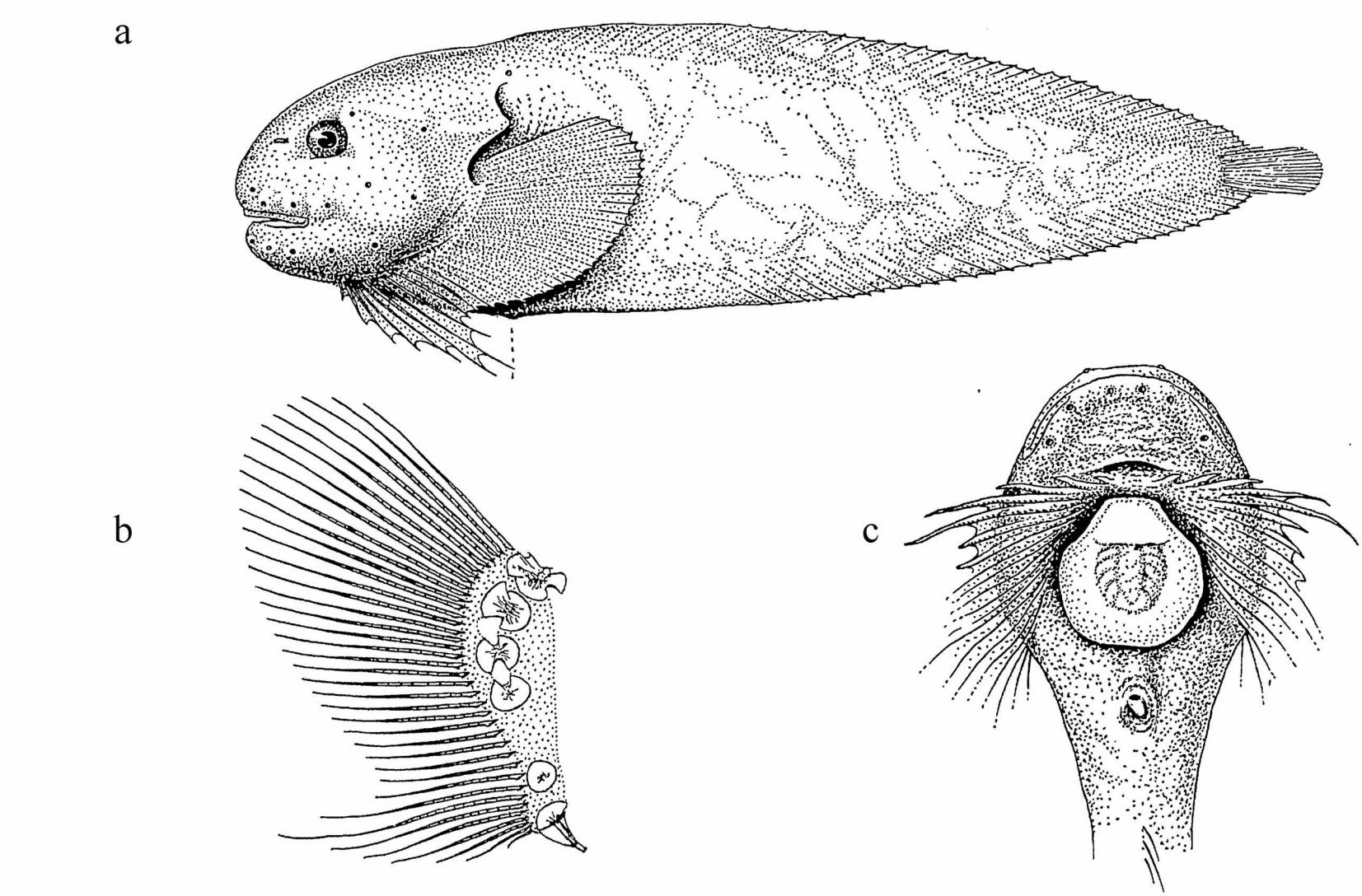

FIGURE 4. *Careproctus catherinae* Andriashev & Stein 1998. Holotype, LACM 11398–2, 189 mm SL. From Andriashev & Stein, 1998: Fig. 6; a. lateral view, b. pectoral girdle, ZIN N 668; c. ventral view.

Material examined. Holotype. Paratype, ZISP 50835 (formerly LACM 11399–4), female, 192 mm TL, 176 mm SL, 74°53′ S, 174°42′ W, *USNS Eltanin*, Stn. 1926, 22 Jan 1967, 2148–2154 m.

Expanded diagnosis. Counts. V 46–47 (11+35–36), D 43, A 34, C 14 (2+5/7), P 37–38 (28–29+9), radials 4 (3+1), gr 9, pc 12, pores 2–6–7–1. Ratios. HL 30.7–32.4, HW 24.6–26.0, sn 8.4–8.6, E 4.6–5.2, orbit 8.2–8.7, uj 14.4–15.4, go 11.2–11.6, md 11.5–11.8, disk 13.1, da 4.1–4.3, bd 26.2–29.4, preD ~31, preA 44.9–49.7, ma 26.7–28.1, aAf 12.8–13.4, UPL 17.6–19.0, LPL 16.9–17.9. In % HL: HW 76.6–81.2, sn 25.7–28.1, E 15.2–15.9, orbit 27.0–27.2, io 37.9–38.5, go 34.5–37.9, disk 40.3–42.8, UPL 55.2–62.1, LPL 49.0–62.8.

Head large, its width slightly less than its depth. Dorsal contour of head evenly rounded to snout. Mouth large, terminal, horizontal, upper jaw extending to below middle or rear of eye. Teeth mostly simple, conical, recurved and sharp, innermost with small shoulders or lobes, forming wide bands. Symphyseal gaps absent. Disk large, flat, about 2/5 HL. Gill opening extending ventrally in front of 5–6 pectoral fin rays, gill flap small, near dorsal end of opening. Upper pectoral lobe not quite reaching anal fin origin; notch distinct but not deep, its ray spacing gradually increasing ventrally, rudimentary rays absent; lower lobe nearly as long as upper lobe, its ventralmost ray below anterior margin of eye. Radials R1, R2, R3 deeply notched; scapular helve short and wide, coracoid helve long, narrow, basal notch absent. Two pair of well-developed pleural ribs. Preanal fin length a little less than half SL. Hypural plate divided, a distinct parhypural suture present. Pyloric caeca 12, in two groups of 7 and 5. In life, body pink to lavender; in alcohol, body, orobranchial cavity, peritoneum, and stomach pale.

Distribution. Known from the northern Ross Sea at 1382–2154 m.

Comparisons. Similar to *C. smirnovi* Andriashev 1991b from the Falkland Islands at 1500–1580 m, but differs distinctly in having a shorter gill opening (in front of 5–6 rays, 34–38% HL vs 14–17 rays, 47–50% HL), much larger disk (40–43 vs 30–33% HL), unpigmented peritoneum (vs pale brown) and other characters. Also similar to *C. parini* Andriashev & Prirodina 1990 from the South Shetland Islands at 750–860 m, but it differs in tooth shape (simple, conical, recurved vs trilobed), pectoral ray count (37–38 vs 33–35), shorter distance from disk to anus (~13 vs 25–32% HL), and peritoneum color (pale vs brown).

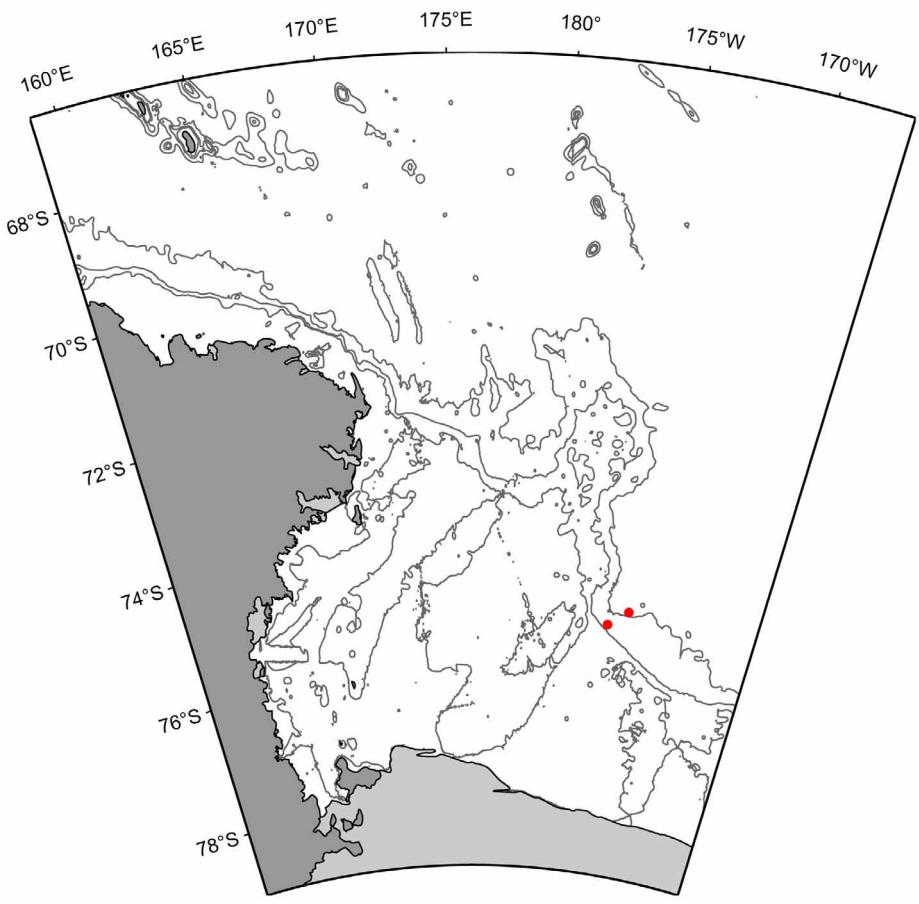

FIGURE 5. Distribution of *Careproctus catherinae.*

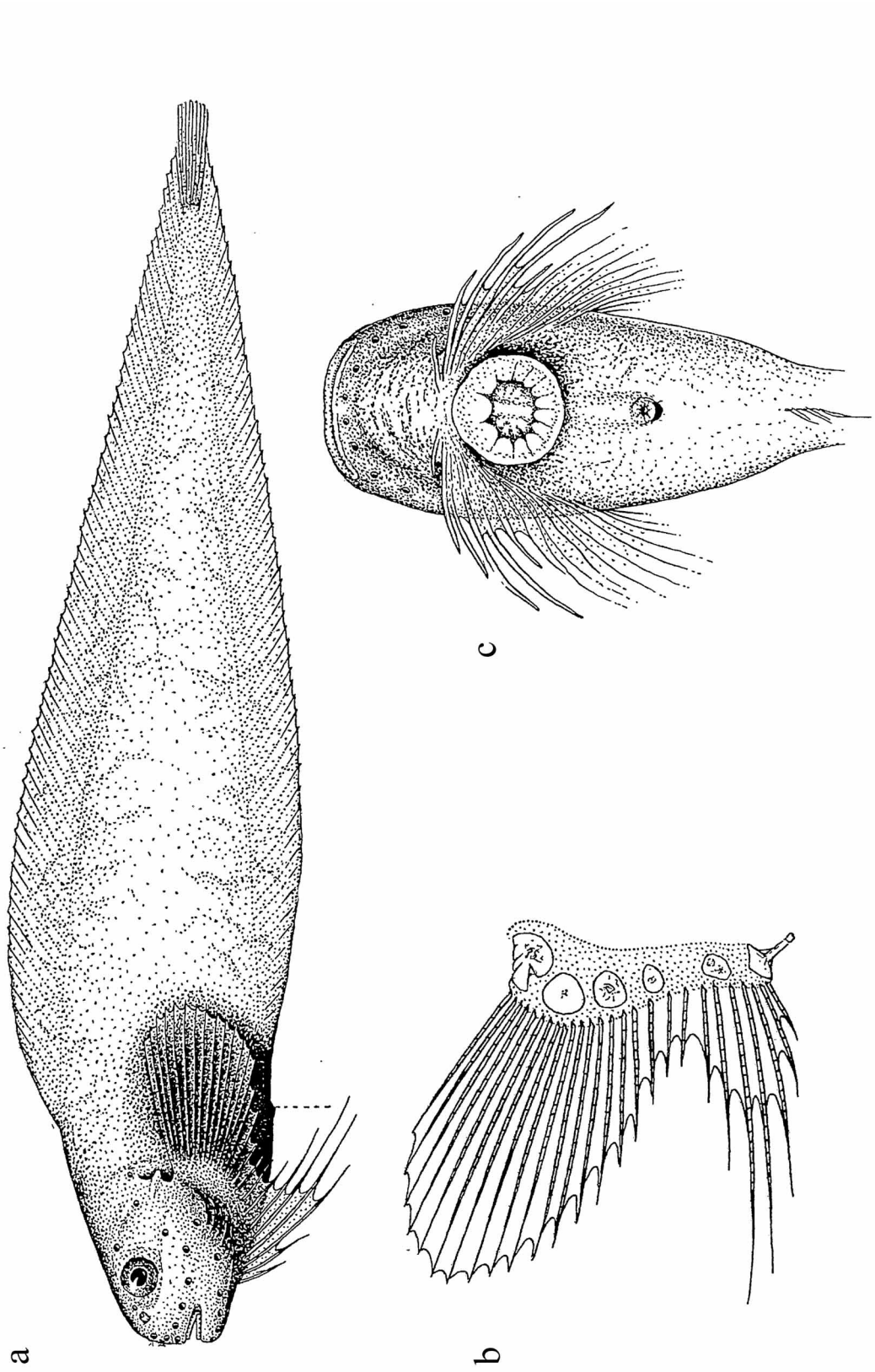

FIGURE 6. *Careproctus inflexidens* Andriashev & Stein 1998. Holotype, LACM 11142–1, 200 mm SL. From Andriashev & Stein, 1998: Fig. 15; a. lateral view; b. pectoral girdle, ZIN N 665; c. ventral view.

Careproctus inflexidens Andriashev & Stein 1998

Figs. 6, 7

Careproctus inflexidens Andriashev & Stein 1998:26, Fig. 26; Andriashev 2003:127, Figs. 63, 64.

Holotype. LACM 11142–1, female, 220 mm TL, 200 mm SL, 75°52′ S, 168°53′ W, USNS *Eltanin*, Stn. 2091, 3 Feb. 1968, 2049–2089 m.

Material examined. Holotype.

Expanded diagnosis. Counts. V 64 (8+56), D 60, A 54, C 10 (1+4/4+1), P 26 (16+3+7), radials 4 (3+1), gr 6, pc 6, pores 2–6–7–1. Ratios. HL 16.5, HW ~14.5, sn 5.2, E 3.3, orbit 5.5, io 7.0, uj 6.0, go 3.0, md 7.7, disk 6.5, da 5.9, bd 18.5, preD 23.5, preA 33.3, sna 22.5, ma 20.0, aAf 10.8, UPL 12.0, LPL ~19, pcl 4.0–7.5% SL. In % HL: HW 89.5, sn 31, E 19.7, orbit 34.1, io 42, go 18.0, disk 39.4, ma 126.6, da 35.5, aAf 66.9, UPL 73, LPL 120.4.

Head short, broad, its width and depth similar, slightly less than its length. Snout blunt, short, not projecting. Nostril with appearance of a large pore without raised rim. Mouth terminal, horizontal, upper jaw extending to below anterior margin of eye. Teeth simple, strong, recurved closely set canines forming a broad band of oblique rows; symphyseal gaps absent in both jaws. Lower jaw teeth larger, blunter. Eye and orbit small. Gill opening short, entirely above pectoral fin base. Pectoral fin upper lobe deeply notched, rudimentary rays absent, lower lobe longer than upper, its ventralmost ray far forward, below front of eye. Radials irregularly rounded; scapula without helve, blade with posterior notch; coracoid with long slender helve, basal notch absent. Disk large, segments and margin well developed, distinctly wider than long, its length more than 1/3 HL. Anus distant from posterior margin of disk. Two pair of pleural ribs present. Hypural plate fused, unslit. Body dark dusky or blackish anteriorly, opaque pinkish-white caudally; orobranchial cavity dusky, peritoneum black, stomach and caeca pale.

Distribution. Known from a single specimen taken by bottom trawl in the northeastern Ross Sea at 2049–2089 m.

Comparisons. This species' large number of vertebrae (64), dorsal (60), and anal fin (54) rays and its short head (16.5% SL) distinguish it from most Southern Ocean *Careproctus* (V 46–54, D 41–48, A 33–45, HL 28–32% SL). It is similar to the South African *C. albescens* Barnard 1927, but differs in many characters including fewer pectoral fin rays (26 vs 33–35), hypural plate structure (undivided vs divided), pectoral radials (round, unnotched vs notched), and peritoneum color (black vs brown). Its short head is similar to *C. leptorhinus* Andriashev & Stein 1998 from off Burdwood Bank, but it differs in tooth shape (simple vs trilobed), radials (four unnotched vs two, R1 notched) and other characters.

Careproctus polarsterni Duhamel 1992

Figs. 8, 9

Careproctus polarsterni Duhamel 1992:188, Fig. 3; Andriashev 1994:317, Figs. 1–3; Andriashev & Stein 1998:38, Fig. 22; Andriashev 2003:162, Figs. 83, 84.

Holotype. MNHN 1991–357, adult female, 51.9 mm SL, 74°37′03″ S, 29°38′02″ W, Halley Bay, Weddell Sea, R/V *Polarstern*, Stn 249 GSN 11, 4 Feb. 1989, 701–702 m.

Material examined. LACM 11103–1, female, ~52 mm TL, 45 mm SL, 73°50′ S, 178°14′ E, Ross Sea, USNS *Eltanin*, Stn. 2021, 15 Jan. 1968, 495–503 m.

Expanded diagnosis. Counts. V 51–55 (8–9+43–46), D 47–50, A 41–45, C 10 (1+4/5), P 26–31 (20–23+6–8), radials 3 (2+0+1), pc 4–6, pores 2–5–7–1. Ratios. HL 25.9–28.0, HW 16–19, E 6.5–7.1, io 9.2–9.5, go 6.7–7.9, md 11.4–12.3, disk 7.9–9.8, da 3.1–3.5, bd 20.3–21.9, preA 35.5–39.1, ma 23.8–26.6, aAf 11.4–13.8, UPL 21.3–23.8, LPL 21.6–23.8. In % HL: E 25.0–25.8, orbit ~27, go 26–28, da 12.0–13.5, UPL 77–85, LPL 77–85.

Head moderately large, broad. Snout high, blunt. Mouth terminal, upper jaw extending to below anterior of pupil, oral cleft below anterior edge of eye. Teeth very small, simple, in oblique rows forming moderately wide bands; symphyseal gap absent in both jaws. Circumoral pores large, distinct; upper preopercular pore, postorbital, and suprabranchial pores small. Symphyseal pore pair small, opening in one common oval pore. Gill opening above pectoral fin and in front of 1–3 rays, less than 10% SL. Gill flap sharply lobed, its tip extending to behind pectoral base. Anterior lobe of disk almost absent, slightly convex. Pectoral fin with 26–31 (20–23+6–8) rays; upper lobe short; notch moderately deep, notch rays indistinct from upper lobe rays, none rudimentary; lower lobe

about as long as or slightly longer than upper lobe, distinct, its most ventral ray well anterior, below pupil of eye. Radials small, round. Scapula without helve, hemicircular; coracoid with long triangular helve aligned with girdle rather than pointing anteriorly, basal notch absent. Pleural ribs absent. Hypural plate single, unslit. Body pale, orobranchial cavity gray, peritoneum black, visible through body wall, stomach pale.

Distribution. Circumantarctic, known from the Weddell Sea, Princess Martha Coast, and the northern Ross Sea at 495–830 m.

Comparisons. *Careproctus polarsterni* differs from other ribless Antarctic species in having a single chin pore. In this character it is similar to *C. cactiformis* Andriashev 1990b and *C. acaecus* Andriashev 1991c from Patagonia, but both of them have fewer vertebrae (46–47 vs 51–55), a pale peritoneum (vs dark), and a scapular helve (vs absent).

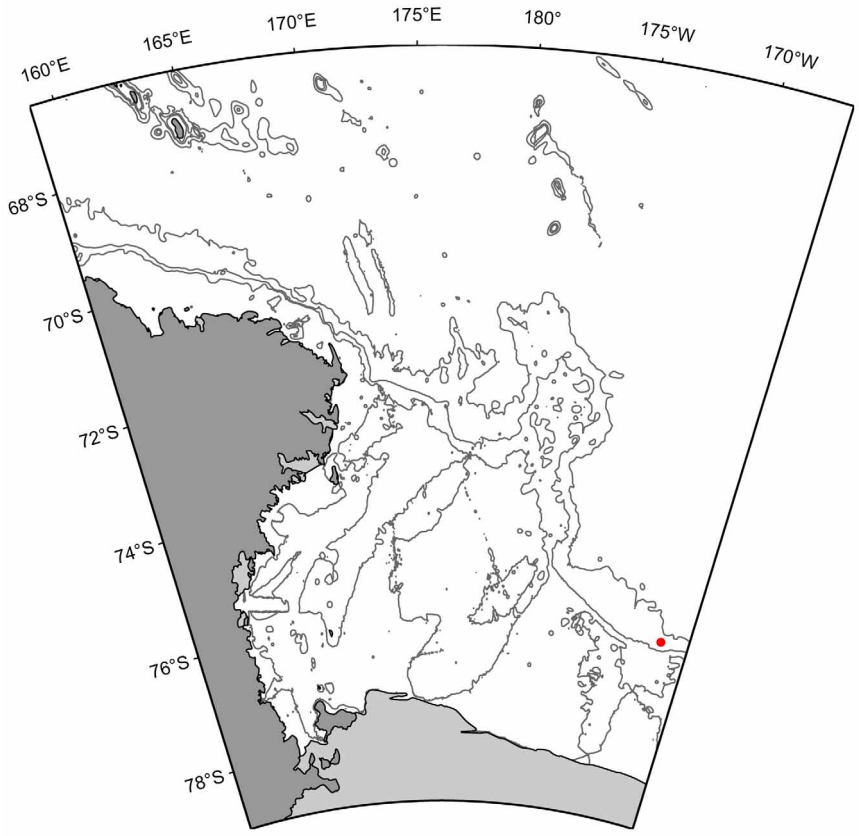

FIGURE 7. Distribution of *Careproctus inflexidens.*

Careproctus pseudoprofundicola Andriashev & Stein 1998

Figs. 10, 11

Careproctus pseudoprofundicola Andriashev & Stein 1998:43, Fig. 24; Andriashev 2003:169, Figs. 87, 88.

Holotype. LACM 11142–3, male, >110 mm TL, 102 mm SL, 75°52′ S, 169°53′ W, USNS *Eltanin*, Stn. 2091, 3 Feb. 1968, 2049–2089 m.

Material examined. Holotype.

Expanded diagnosis. Counts. V 58 (10+48), D 52, A 46, C 10 (1+4/5), P 21 (12+4+5), radials 2 (1+0+0+1), pc absent, pores 2–6–7–1. Ratios. HL 25.0, HW 17.6, sn 5.8, E 4.7, go 11.3, md 8.8, disk 6.9, da 1.0, bd ~20–21, preD 27.8, preA 36.7, ma 16.2, aAf 17.2, UPL 30.4, LPL ~24. In % HL: HW 80.6, sn 23.3, E 19.0, go 43.4, disk 27.7, ma 68.8, da 5.5, preD 112.2, aAf 69.6, UPL 124.5.

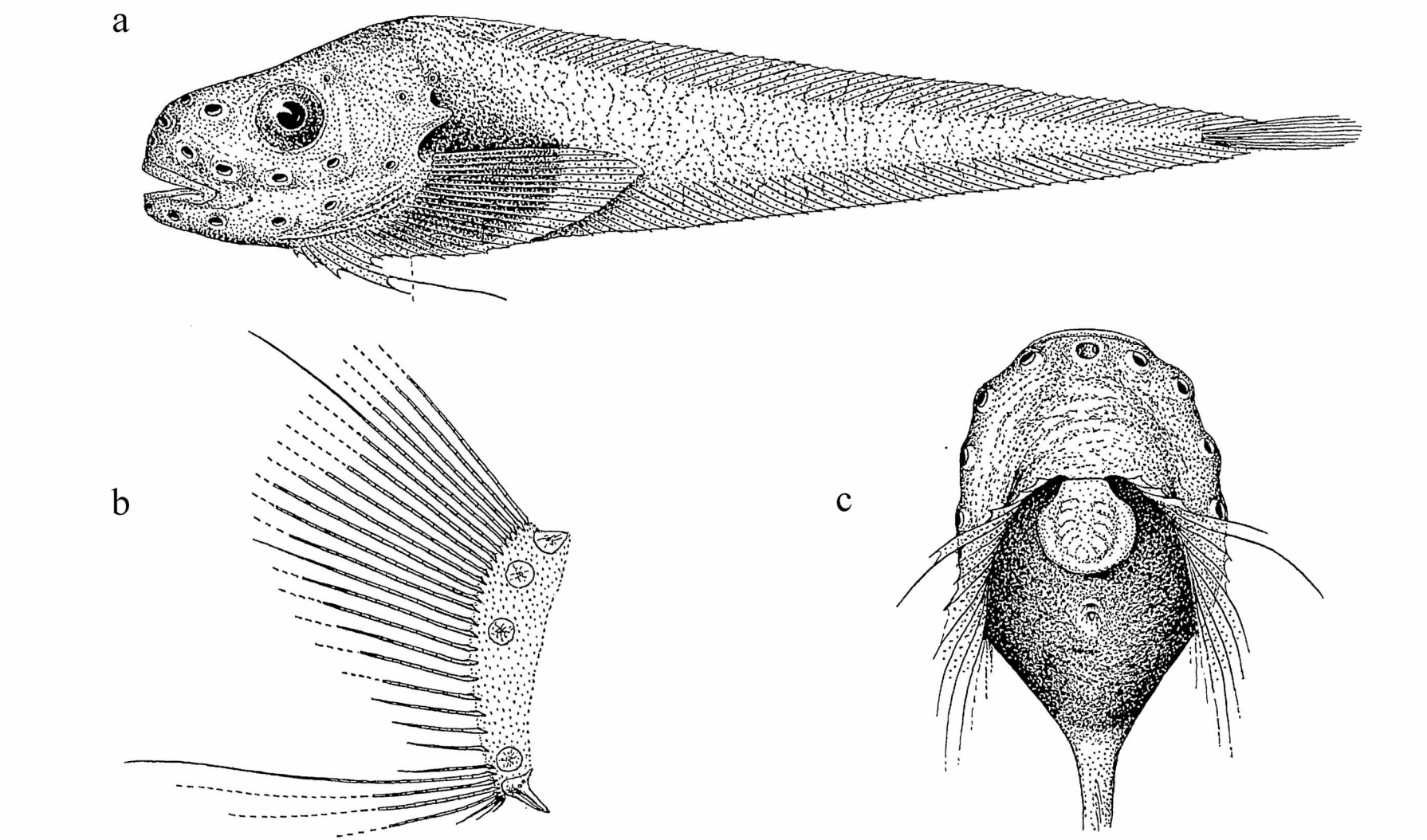

FIGURE 8. *Careproctus polarsterni* Duhamel 1992. ISH 64–1991, 63 mm SL, a. lateral view; c. ventral view. ZIN 50284 (formerly ISH 43–1991), 58 mm SL, b. pectoral girdle ZIN 655. All from Andriashev & Stein 1998: Fig. 22, incorrectly labeled as LACM 11142–1.

Head small, bulbous, its depth slightly greater than its width. Snout blunt, almost vertical. Nostril short, tubular. Mouth terminal, oblique, upper jaw extending to below rear margin of eye, oral cleft to below mid-eye. Teeth simple, small, in short rows of 2–3 teeth each, forming narrow bands; premaxillary symphyseal gap present, mandibular symphyseal gap absent. Gill opening long, about 40% head, distinctly oblique, supported by almost straight opercle. Opercle rod-like, directed nearly vertically down, its end almost at level of oral cleft. Disk small, flat, anus just posterior to it. Pectoral fin low, much longer than head, of 21 (12+4+5) rays, deeply notched, rudimentary rays absent; origin of uppermost ray about on horizontal with posterior of oral cleft and below posterior edge of preopercle rather than behind it as usual, insertion of lowest ray below anterior of eye. Radials 2 (1+0+0+1), small, round; scapular helve long, coracoid with basal notch. Predorsal length less than 1/3 SL; two free interneurals present anterior to dorsal fin. Pleural ribs absent. Deciduous prickles present, leaving small pits in skin when lost. Hypural plate single, unslit. Pyloric caeca absent. Anteriorly, skin dark dusky with lighter mottling, gill cavity dusky, peritoneum black, stomach pale.

Distribution. The only known specimen was caught in the northeastern Ross Sea at 2049–2089 m.

Comparisons. The distinctive characters of *C. pseudoprofundicola* are the very low position of the pectoral fin, greatly oblique gill opening and almost vertical orientation of the long rod-like opercle, and the suprabranchial pore far above the gill opening. It is very similar to *C. profundicola* Duhamel 1992, but differs in number of vertebrae (58 vs 52), number of dorsal and anal fin rays (52, 46 vs 47, 41), larger mouth (extending to below rear edge of eye vs to anterior edge), pyloric caeca (absent vs 12), and other characters. It is also similar to *C. rimiventris* Andriashev & Stein 1998 from the Scotia Ridge, from which it differs in pectoral fin position (about even with oral cleft vs distinctly below it), pyloric caeca (absent vs 16 present), caudal rays (10 vs 9), and gill opening (oblique, behind preopercle vs almost horizontal, below preopercle).

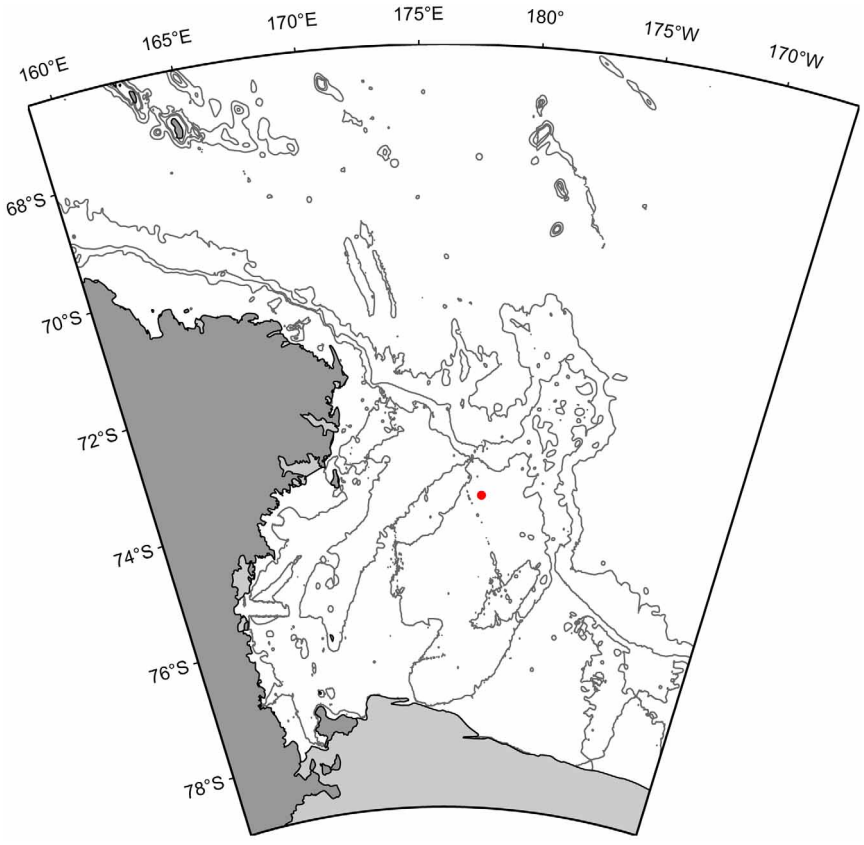

FIGURE 9. Distribution of *Careproctus polarsterni* in the Ross Sea.

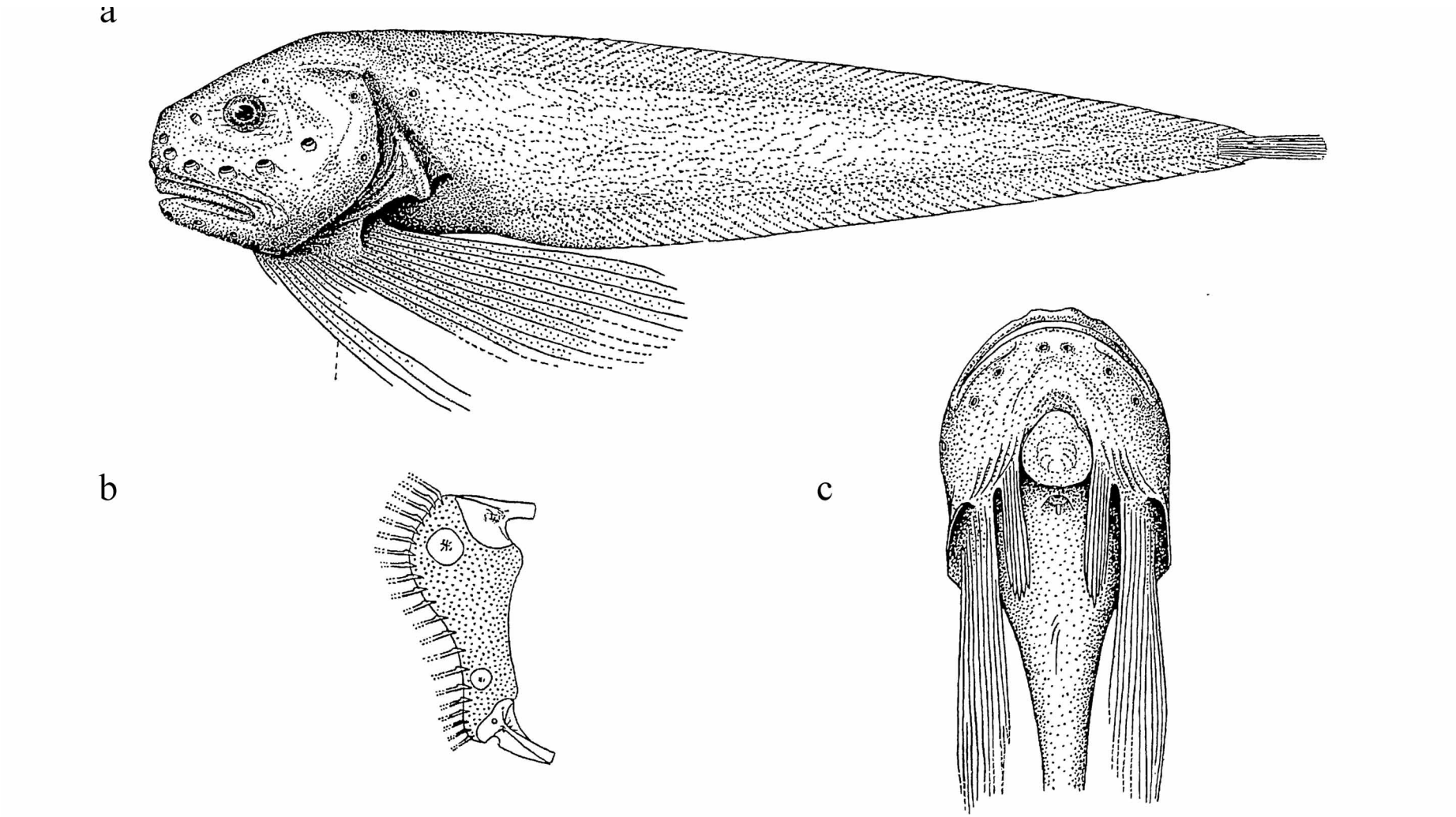

FIGURE 10. *Careproctus pseudoprofundicola* Andriashev & Stein 1998. Holotype, LACM 11142–3, 102 mm SL. From Andriashev & Stein, 1998: Fig. 24; a. lateral view; b. pectoral girdle, ZIN N 666; c. ventral view.

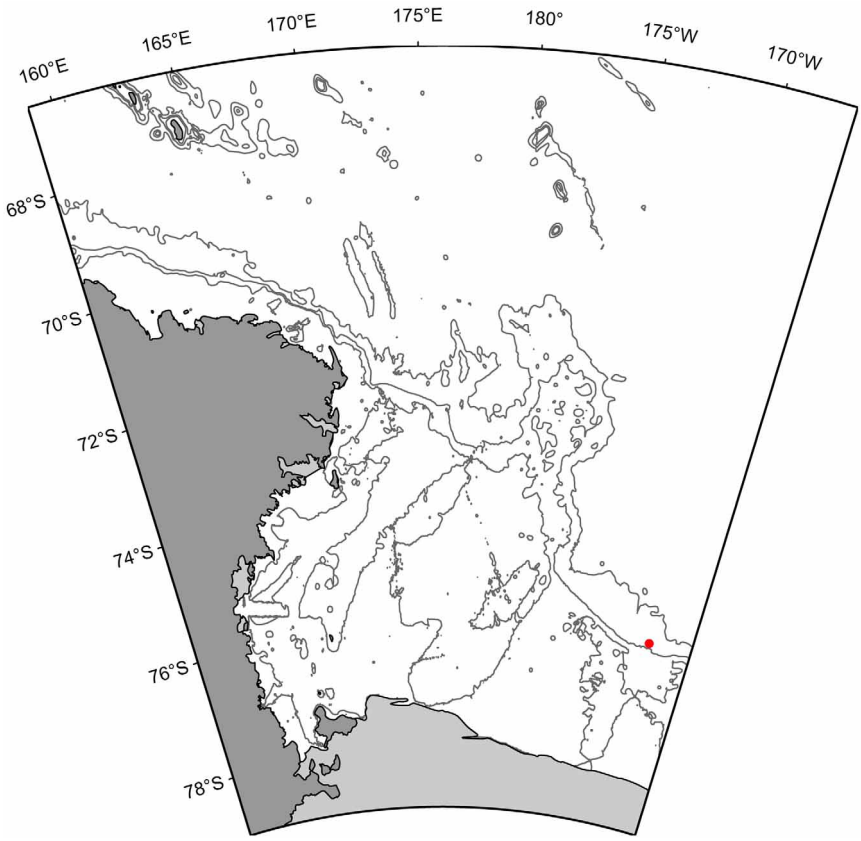

FIGURE 11. Distribution of *Careproctus pseudoprofundicola*.

Careproctus vladibeckeri Andriashev & Stein 1998

Figs. 12, 13

Careproctus vladibeckeri Andriashev & Stein 1998:54, Fig. 30; Andriashev 2003:191, Figs. 99, 100.

Holotype. LACM 10526–1, male, 199 mm TL, 173 mm SL, 63°00′ S, 49°20′ W, Weddell Sea, USNS *Eltanin*, Stn. 529, 3–4 March 1963, 2653–2941 m.

Material examined. Holotype. Paratypes, LACM 11460–1, female, 267 mm TL, 228 mm SL, 74°07′ S, 174°58′ W, USNS *Eltanin*, Stn. 2110, 8–9 Feb. 1968, 2350 m; LACM 11351–3, female, TL unknown, 133 mm SL, 70°56′ S, 172°04′ W, USNS *Eltanin*, Stn. 1867, 13 Jan. 1967, 2273 m. Other material. ZISP 50830 (formerly LACM 10729–1), female, 104 mm TL, 91 mm SL, 58°54′ S, 44°31′ W, Scotia Sea, USNS *Eltanin*, Stn. 484, 16–17 Feb. 1963, 2088–2271 m.

Expanded diagnosis. Counts. V 52 (10–11+41–42), D 46–48, A 40, C 10 (1+4/4+1), P 28–29 (21–22+7), radials 2 (1+0+0+1), pc 10–12, pores 2–6–7–1. Ratios. HL 28.3–29.6, HW ~21.5, sn 8.8–9.6, E 4.5–4.8, orbit 7.0–8.4, go 6.4–6.8, md 14.2–17.5, disk 8.3–10.5, da 5.0–5.6, bd 21.5–24.6, preD ~32, preA 43.7–46.2, ma 26.6–29.2, aAf 13.9–15.0, UPL 17.3–19.2, LPL 16.8–20.4, pcl 7–8% SL. In % HL: E 15.6–17.0, orbit 27.1–31.3, go 20.0–21.4, disk 28.6–36.6, preD 99.5–106.6, UPL 59–68.

Head large, its width and depth about equal. Mouth terminal, horizontal, teeth simple, their shape conical to canine, arranged in oblique curved rows in both jaws forming moderately wide bands, their width about 16% of their length; symphyseal gaps present in both jaws. Nostril porelike. Eye small, about 1/6 head. Symphyseal pore pair rather closely spaced, somewhat smaller than more posterior pores. Gill opening almost vertical, above and completely above or extending ventrally in front of 1–2 pectoral fin rays. Pectoral fin upper ray about even with lower margin of orbit, fin of 21–22+7 rays, notch moderately deep, its rays not clearly distinct in spacing from those of upper lobe. Lower lobe about as long as upper. Radials two, round, unnotched, opposite. Scapula and coracoid with long slender helves; coracoid basal notch absent. Disk flat, a little wider than long. Anus relatively distant from disk by about 2/3 disk length. Pleural ribs absent. Hypural incompletely fused. Pyloric caeca elongated. Body pale brown, orobranchial cavity pale, peritoneum brown-black, stomach pale.

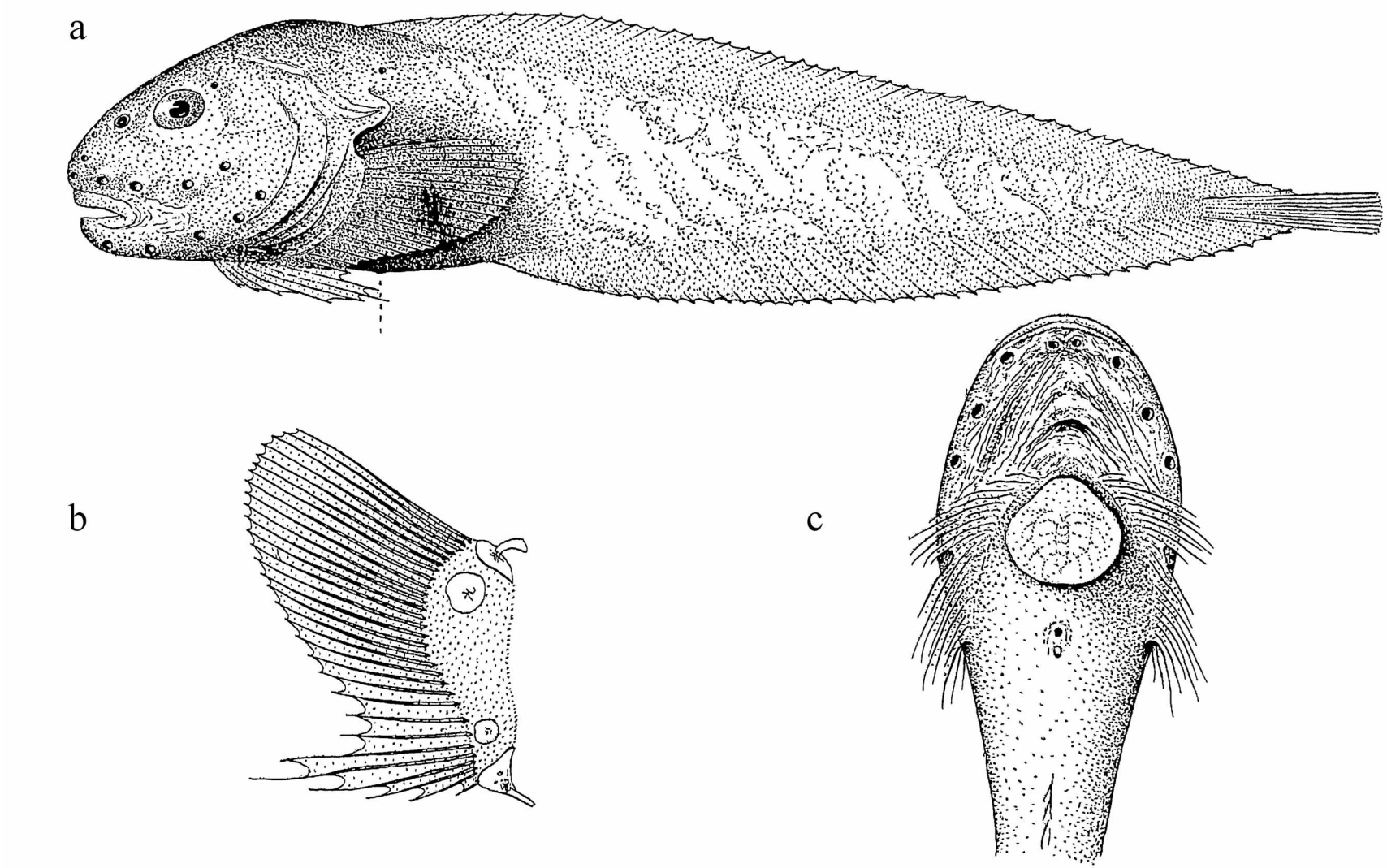

FIGURE 12. *Careproctus vladibeckeri* Andriashev & Stein 1998. Holotype, LACM 10526–1, 173 mm SL. From Andriashev & Stein, 1998: Fig. 30; a. lateral view; b. pectoral girdle, LACM 11460–1; c. ventral view.

Distribution. Probably circumantarctic: the holotype was collected east of the tip of the Antarctic peninsula, and both paratypes are from the northern Ross Sea. The collection depth of 952m given by Andriashev & Stein (1998) for ZISP 50830 is almost certainly a labeling error.

Comparisons. Most similar to *C. parviporatus* Andriashev & Stein, 1998, but differs in having larger circumoral pores, more closely spaced chin pores (half pore diameter vs one pore diameter), larger terminal mouth (11–13 vs 8% SL and subterminal), length of pyloric caeca (7–8 vs 3–4% SL), and a darker peritoneum (brown-black vs pale brown).

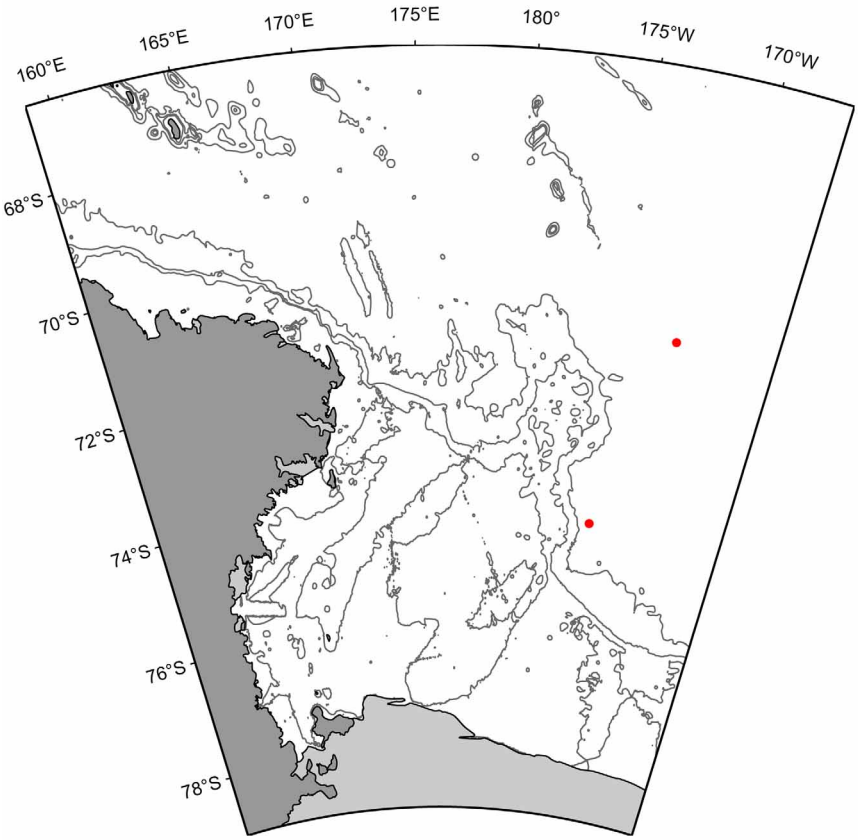

FIGURE 13. Distribution of *Careproctus vladibeckeri* in the Ross Sea.

Genus *Genioliparis* Andriashev & Neelov 1976

Genioliparis Andriashev & Neelov 1976. Type species *Genioliparis lindbergi* Andriashev & Neelov 1976 by designation.

Diagnosis (modified from Balushkin & Voskoboinikova, 2008)**.** One pair of nostrils. Disk, pseudobranchs, and pleural ribs absent. Branchiostegal rays six. Head large. Mouth large, terminal; lower jaw massive. Teeth simple, sharp, often depressible canines. Mandible to anus distance half or more of mandible to anal fin origin distance. Barbels on snout present. Three species known: *G. lindbergi* Andriashev and Neelov 1976 (South Shetland Islands), *G. ferox* (Stein 1978) (northeastern Pacific), and *G. kafanovi* Balushkin & Voskoboinikova 2008 (Ross Sea).

Genioliparis kafanovi Balushkin & Voskoboinikova 2008

Figs. 14, 15

Holotype. ZIN 54079, female, 373 mm TL, 340 mm SL, 75°50′ S, 170°06′ W, Ross Sea, F/V *Yantar'*, December 2005, 987–1727 m.

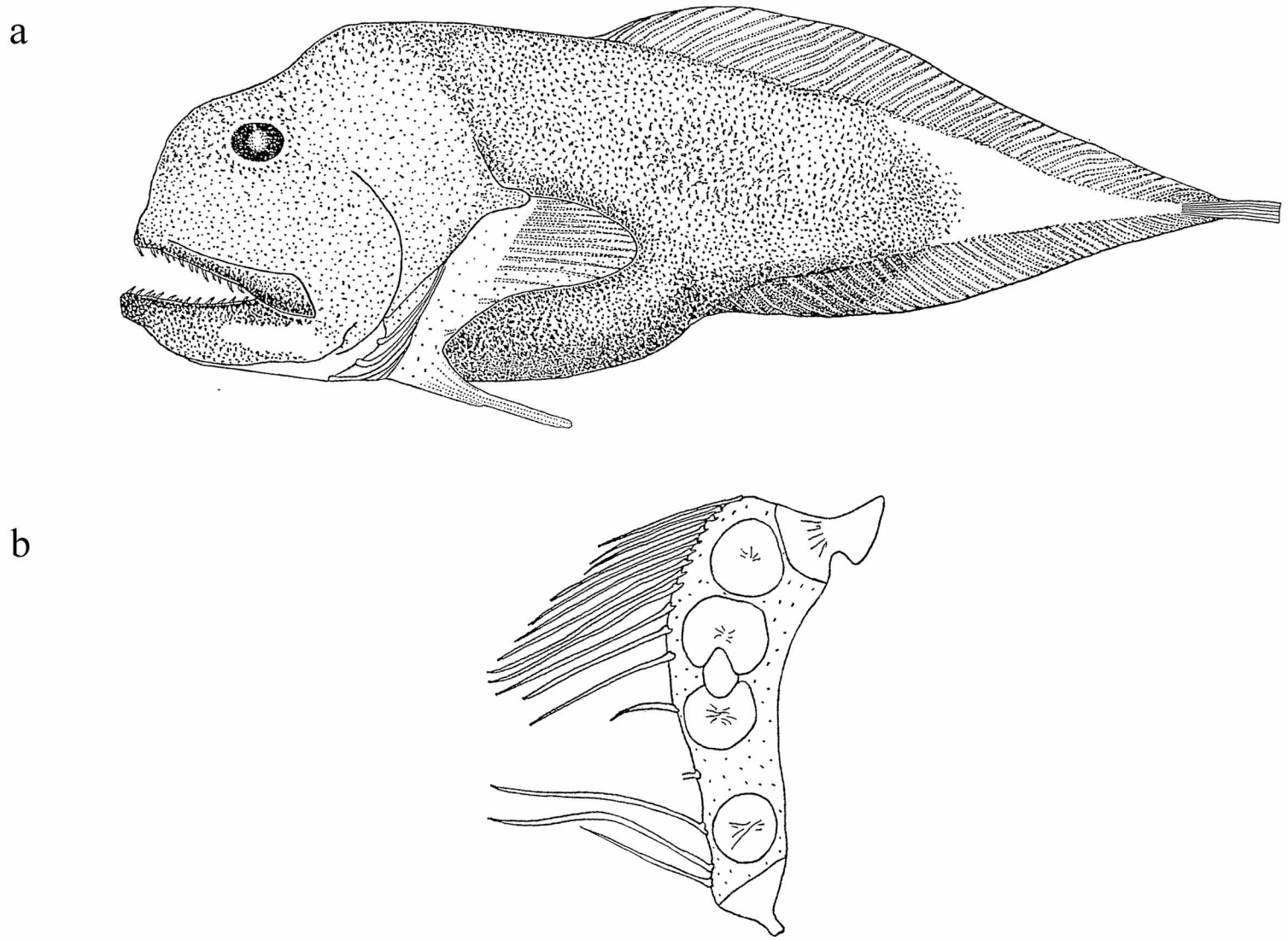

FIGURE 14. *Genioliparis kafanovi* Balushkin & Voskoboinikova 2008. Holotype, ZIN 54079, 340 mm SL; a. lateral view, from Balushkin & Voskoboinikova 2008: Fig. 1; b. pectoral girdle, ZIN N 983, ibid.: Fig. 4a.

Material examined. None.

Expanded Diagnosis. V 59 (12+47), D 54, A 46, C 6, P 17. Head massive, 32% SL, its width 61% of its length. Snout broad, obtusely rounded. Eye small, suborbital space very broad. Mouth large, horizontal, terminal, upper jaw extending to behind vertical through posterior margin of eye. Teeth simple, conical, sharp canines up to 5 mm long, arranged in irregular rows forming a band no more than five teeth wide. Gill opening about 1/9 SL, extending ventrally to about third pectoral fin ray; opercular lobe pronounced. Pectoral fin of 17 (12+2+3) rays, none rudimentary, those of lower lobe almost entirely free. Pectoral girdle with 4 (3+1) radials, R2-R3 notched, a fenestra between them. Scapula double-headed, coracoid with short helve. Body deep; anus about below margin of pectoral fin notch. Skin apparently covered with small prickles. Pyloric caeca two, long. Caudal fin well developed, long.

Distribution. Taken from a toothfish stomach at depths between 987–1727 m, probably bentho- or mesopelagic.

Comparisons. *Genioliparis* species cannot be mistaken for any other liparids, owing to their large, sharp teeth, massive head, and cephalic papillae, although it is possible that they would not be recognized as liparids owing to their unusual (in liparids) predatory appearance. However, once identified as liparids, they should be easily identifiable, even if damaged.

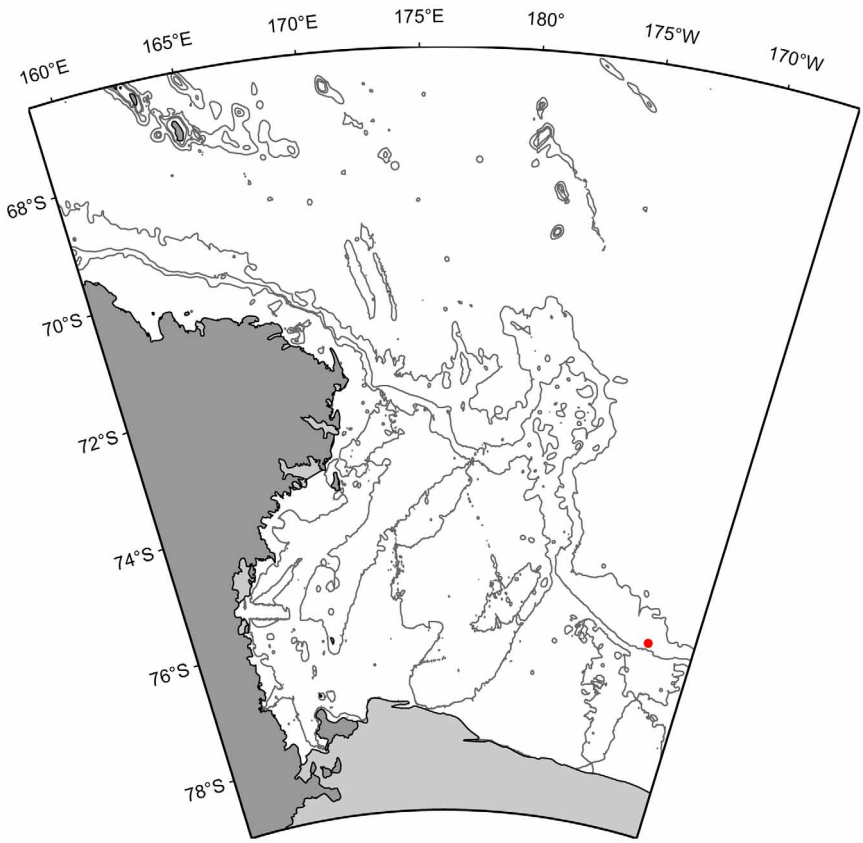

FIGURE 15. Distribution of *Genioliparis kafanovi.*

Key to Ross Sea *Paraliparis*

1a. Fin rays generally unstriated, pectoral lower lobe rays 2 . . . . . *P. amerismos* n. sp.
1b. Fin rays normally striated, pectoral lower lobe rays more than 2 2
2a. Teeth entirely absent from both jaws. Radials 2 (1+0+0+1) . . . . . *P. terraenovae* Regan
2b. At least a few teeth present 3
3a. Teeth primarily uniserial in both jaws, at least posterior half a single row 4
3b. Teeth in both jaws in oblique rows forming bands 17
4a. Chin pore single, not in a pit, lacking anterior skin fold. Radials 4 (3+1), scapula without helve. Head width 95% HL. . . . . *P. ekaporus* n. sp.
4b. Chin pores paired; may be in a pit or with an anterior skin fold. Radials 4 (3+1) or other, scapula with or without helve, coracoid

notched or unnotched. Head width less than 90% HL, usually less than 80%. 5

5a. Chin pores not in a pit or depression, no anterior skin fold present (smaller *P. stehmanni* with shallow depression). Interorbital 45% HL or less (except for *C. camilarus* n.sp., about 50%). 6

5b. Chin pores in a pit or depression or with an anterior skin fold. Interorbital 45–50% HL. 15

6a. Chin pores relatively distant from tip of mandible, posterior to symphyseal knob, close together. Snout-anus about 77% HL, preanal fin length about 225% HL. Radials 4 (1+1+1+1), similar in size, radials R2, R3 sharply notched. Scapular helve absent, coracoid notch present. . . . . *P. posteroporus* n. sp.

6b. Chin pores closer to mandible tip, not as in 6a. Snout-anus 80% HL or greater, preanal fin length 230% HL or longer. Radials otherwise 7

7a. Three or four radials notched. Chin pores 5–6% HL apart 8

7b. Radials not as above, usually two or fewer (if any) notched. Chin pores 4% HL or less apart. 9

8a. Radials R1, R2, R3 deeply notched or slit, notches large and regular. Gill flap present, small, opercle divides gill flap. LLD about 25% HL. . . . . *P. stehmanni* Andriashev

8b. At least radials R1, R2, R3 notched, notches of different sizes, irregular, R4 possibly notched. Gill flap absent, opercle tip at bottom of opening. LLD about 13% HL. . . . . *P. camilarus* n. sp.

9a. Chin tip sharply angled in ventral view. Upper jaw longer than 9% SL, 50% HL. Radials 4 (3+1), R2, R3 shallowly notched, R1, R3 small, helve of coracoid unnotched. . . . . *P. epacrognathus* n. sp.

9b. Chin rounded in ventral view. Upper jaw equal to or less than 8% SL, 43% HL. Radials other than in 9a. 10

10a. Radials 4 (3+1), R1, R3 notched. Longest pyloric caecum 13% SL. Scapula with helve. Chin pores probably with anterior fold (see description) . . . . . *P. longicaecus* n. sp.

10b. Radials 4 (3+1) unnotched, or 3 (2+0+1) notched or unnotched. Longest pyloric caecum usually shorter than 13% SL. Scapula with or without helve. Chin pores without anterior fold. 11

11a. Scapula without helve. E 17–18% HL, ma 80–90% HL. D 60–62 12

11b. Scapula with helve. E 20–27% HL, ma not 80–90% HL. D 60–71. 13

12a. R2 notched, coracoid notch present. D insertion between V 9–10. LPL 77% HL. PreA 242% HL. Radials 3. LLD about 25 % HL. . . . . *P. nullansa* n. sp.

12b. Radials unnotched, coracoid notch absent. D insertion between V 5–6. LPL 62% HL. PreA 280% HL. Radials 3 or 4 (see description). LLD about 20 % HL . . . . . *P. voroninorum* n. sp.

13a. Radials 3 (2+0+1), small, oval. A 54, C 7, P 22, E 27% HL, aAf 198% HL. Coracoid base deeply notched. . . . . *P. parviradialis* n. sp.

13b. Radials 3 or 4, large, round. A 52–58, C 6, P 19–21, E 20–24% HL, aAf 137–180% HL. Coracoid notch absent. 14

14a. Radials 4 (3+1). Sn–anus 18% SL, 109% HL. PreD 174% HL. LLD about 16% HL. . . . . *P. alius* n. sp.

14b. Radials 3 (2+0+1). Sn–anus ~20% SL, >117% HL. PreD 163–168% HL. LLD about 10% HL. . . . . *P. neelovi* Andriashev

15a. Chin pore pair in a clear pit or depression. Radials 3 (2+0+1), R2 possibly with two narrow slits or notches. V more than 70, A 56, preD about 162% HL. . . . . *P. mentikoilon* n. sp.

15b. Clear tissue fold anterior to chin pore pair and possibly surrounding them. Radials 4, notched or unnotched. V probably less than 70, A probably about 53 or fewer, preD about 124% HL or more than 180% HL. 16

16a. Radials 4 (3+1), radial notches and slits absent; coracoid notch absent. PreD 196% HL, aAf 177% HL, UPL 79, LPL 88% HL. LLD about 28% HL. . . . . *P. plicatus* n. sp.

16b. Radials 4 (1+1+1+1), radial notches and slits absent; coracoid notch present. PreD 124%, aAf 195, UPL 65, LPL 69% HL. LLD unknown. . . . . P. *tangaroa* n. sp.

16c. Radials 4 (3+1), R1, R3 notched; coracoid notch present. PreD probably more than 180, aAf~137, UPL 70, LPL 88% HL. LLD about 21% HL. . . . . *P. longicaecus* n. sp.

17a. Pectoral fin extremely long, reaching well past A origin to about 14th ray, 34–37% SL, about 143–154% HL; pectoral fin rays 14–15. . . . . *P. macropterus* n. sp.

17b. Pectoral fin upper lobe reaching no farther than first few anal fin rays, less than 25% SL, less than 100% HL; pectoral fin rays 20 or more. 18

18a. Peritoneum pale or light brown, dark internal organs often visible through body wall. Gill opening 10–16% SL, extending ventrally in front of 15–20 pectoral fin rays. Pectoral fin upper lobe 17–23% SL. . . . . *P. antarcticus* Regan

18b. Peritoneum dark brown or black. Gill opening above P, less than 45% HL or extending down in front of no more than about 8 rays. Pectoral fin upper lobe less than 18% SL. 19

19a. Vertebrae fewer than 57. D 49–50, C 9. HL 25–28% SL. 20

19b. Vertebrae more than 61. D more than 55, C 7–10 (*P. haploporus* n. sp. and *P. magnoculus* n. sp. unknown). HL less than 23% SL. 21

20a. Teeth lanceolate, sharp, with weakly developed lateral lobes. Chin pore pair about equal in diameter to more posterior pores; circumoral pores small, about 1/5–1/6 nostril diameter. Vertical fins overlap caudal by about 40% of caudal fin length. Body color pale . . . . . *P. rossi* Chernova & Eastman

20b. Teeth simple, not lanceolate. Chin pore pair about 1/3 diameter of more posterior pores; other circumoral pores large, contoured, about 1/3 nostril diameter. Vertical fins overlapping caudal by about 25% of caudal fin length. Body color anteriorly rosy, posteriorly dark gray. . . . . *P. macrocephalus* Chernova & Eastman

21a. Chin pore single, not in pit or depression. Radials 3 (2+0+1). Gill opening 12% HL. V 75, D 68. . . . . *P. haploporus* n. sp.

21b. Chin pores paired, may be in a pit or depression. Radials 3 or 4. Gill opening more than 12% HL. V usually fewer than 75 (except *P. nigrolineatus* n. sp. V 74–75) 22

22a. A narrow black line present posteriorly on the abdominal ventral midline. V 74–75, D 68, C 6–7. Radials 3 (2+0+1), coracoid

notch present. Head length ~17% SL . . . . . *P. nigrolineatus* n. sp.
22b. No black line present on ventral abdominal midline. V 72 or fewer, D 69 or fewer, C 7–10. Radials 3 or 4, coracoid notch absent. Head length 19% SL or more. 23
23a. Radials 3 (2+0+1), small and round. Gill opening short, less than 20% HL, completely above pectoral fin base. Snout relatively long, about 30–38% HL. C 7, V 68–72, D 62–69. . . . . *P. devriesi* Andriashev
23b. Radials 4 (1+1+1+1 or 3+1), large. Gill opening longer than 23% HL, extending ventrally over 1–8 pectoral rays. Snout shorter than 26% HL (*P. fuscolingua* unknown). C more than 7 (*P. magnoculus* unknown), V 69 or fewer, D fewer than 63. 24
24a. Radials 4 (3+1). Gill opening above and in front of no more than 2 rays, about 32% HL. Upper jaw length about 50% HL. Scapular helve present, coracoid helve absent . . . . . *P. fuscolingua* Stein & Tompkins
24b. Radials 4 (1+1+1+1 or 3+1). Gill opening above and in front of 5–8 rays, longer than 23% HL. Upper jaw length less than 48% HL. Scapular helve present or absent, coracoid helve present, strongly or weakly developed. 25
25a. Preanal fin length 166–168% HL. Orbit 31–43%, io greater than 30% HL. Scapular helve of pectoral girdle absent, coracoid helve present, weakly developed. Gill opening 32–39% HL. Pyloric caeca at least 8–11. . . . . *P. andriashevi* Stein & Tompkins
25b. Preanal fin length 161 or 176% HL. Orbit 36–39%, io ~30% HL. Scapular helve present or absent, coracoid helve present, well developed. Gill opening 32% HL or less. Pyloric caeca about 6. 26
26a. Snout-anus length ca. 65% HL. Upper jaw length 42–43% HL. Gill opening about 32% HL, extending in front of 4–5 rays. Predorsal length 93%, aAf 113% HL. . . . . *P. magnoculus* n. sp.
26b. Snout-anus length about 97% HL. Upper jaw length 36% HL. Gill opening about 23% HL, extending in front of 6–7 rays. Predorsal length 114%, aAf 85% HL. . . . . *P. orbitalis* n. sp.

Systematics

Paraliparis Collett 1879

Paraliparis Collett 1879:34. Subgenus of *Liparis*. Type species *Liparis bathybii* Collett 1879. Type by monotypy.

Diagnosis. Ventral disk absent. Pseudobranchs absent. One pair of nostrils. Pleural ribs rarely present. No skin flaps or barbels on head. Suprabranchial pore single, coronal pore absent. Opercular flap present or absent. Pectoral fin divided into two lobes or not; lower lobe not forming a single filament. Pectoral girdle radials 4, 3, or 2, notched or unnotched. Hypural plate fused with terminal vertebral centrum, not divided. Epurals absent or one.

Paraliparis alius n. sp.

Figs. 16, 17, 18

Holotype. NMNZ P.042623, female, 330 mm TL, 299 mm SL, 70°29.80′ S, 179°07.60′ E, SW of Iselin Seamount, F/V *San Aotea II*, Stn. OBS 2332/106, 27 January 2007, 1225–1332m. NMNZ P.042623/1, cleared and stained right pectoral girdle.

Diagnosis. V 71, A 57, C 6, P 20, radials 4 (3+1). Pectoral fin notch rays rudimentary. Teeth mostly uniserial, eye 22% HL, interorbital about 40% HL, 6% SL. Gill opening 14% HL, 2% SL. Opercular flap present, small, triangular. Dorsal fin insertion between V 6–7. Preanal fin length 46% SL, lower pectoral lobe distance 16% HL. Longest pyloric caeca flattened, thin-walled, 60% HL or longer. Body color pale purplish, mouth pale dusky.

Description. Counts. V 71 (11+60), D 63, A 57, C 6, P 20 (14+2–3+3–4), radials 4, pc 6, pore formula unknown. Ratios. HL 16.2, HW 12.4, sn 4.9, E 3.6, orbit 4.6, io 6.4, uj 6.0, go 2.3, preD 28.2, preA 45.7, sna 17.7, ma 15.0, aAf 28.2, UPL 12.0, LPL 12.3, pcl 10.2. In % HL: HW 76.6, sn 30.2, E 22.1, orbit 28.3, io 39.9, uj 37.2, go 14.0, preD 174.0, preA 282.2, sna 109.3, ma 92.8, aAf 174.0, UPL 74.0, LPL 76.2, LLD 16.3, cp 3.1, pcl 63.2.

Head small, about 1/6 SL, low, dorsal profile rising evenly from snout through flat interorbital region to above proximal end of opercle. Snout short, low, bluntly rounded, projecting slightly beyond upper jaw. Nostrils with raised rim, on horizontal through mid-orbit and spaced anterior to it. Mouth barely subterminal; lower jaw clearly included, oral cleft barely reaching to below anteriormost margin of orbit. Premaxillary teeth consist of about 35 simple, conical, sharp, evenly spaced canines, arranged uniserially for about 80% of jaw length, then irregularly bi- or tri-serial for remaining distance to wide gap at symphysis. Mandibular teeth tiny, in a row of at least 60, closely spaced, forming a sharp cutting edge along jaw; anteriormost teeth much smaller and difficult to see. Eye prominent, orbit slightly more than ¼ head length, not quite entering dorsal profile of head. Gill opening entirely above pectoral fin base; opercular flap a short obtuse triangle, supported by dorsally curved opercle, its tip slightly lower

than its hyomandibular attachment joint, clearly not reaching posteriorly to base of pectoral fin. Pores of mandibular series appear to be of equal size, rims pale, thickened. Chin pores damaged, closely paired, possibly with anterior skin fold but more likely without; their distance apart about 3% of head, near lower lip. Suprabranchial pore single.

Pectoral fins shorter than head, upper lobe not reaching midpoint of abdominal cavity, about half distance to anal fin origin. Uppermost ray even with or slightly above lower margin of orbit. Upper lobe possibly sharp-tipped, of 14 rays. Notch rays 2–3, right side fin with two rudimentary notch rays, uppermost short, filamentous, lacking segmentation; lower reduced to base only. Lower lobe long, of 3–4 rays, the longest not reaching to below tip of upper lobe; insertion of lowest ray below or slightly anterior to proximal end of opercle. Distance between lower fin lobes wide, about 16% head. Right pectoral girdle with 4 (3+1) large, round, closely and almost evenly spaced radials of similar size, R3-R4 space short, about twice that between more dorsal radial pairs; no notches or slits present. Radial R1 largest, R3 distinctly smallest. Scapula double-headed with long helve. Coracoid with unusually long slender helve, ventral notch absent.

Body behind head dorsoventrally flattened, deepest well behind head over mid- abdomen. Postcleithrum prominent, extending posteroventrally at about 45 degree angle from above tip of opercle to about level of oral cleft, ending bluntly in abdominal wall. Dorsal fin insertion between vertebrae 6–7, anal fin insertion between vertebrae 12–13. Dorsal and anal fins very low, with short rays anteriorly, becoming much more prominent at about 40% SL; deepest points and longest rays at about 2/3 SL. Anus on vertical behind opercle tip, below or slightly posterior to upper base of pectoral fin lobe. Peritoneum clearly visible through whitish body wall. Body cavity long and deep, its dorsal outline about level with upper margin of orbit. Hypural complex fused, slit absent. Caudal fin of six (3/3) rays, auxiliary rays absent. Pyloric caeca six, in two groups of three; those of one group are long, flattened and thin-walled (the longest about 60% head length); in other group, caeca plump, digitate, thick-walled, half as long or shorter. SECM probably well developed. Skin thin but not easily torn, very loose, hanging in folds, presumably from loss of SECM during capture and preservation.

Color of fresh specimen translucent white, dorsal and anal fins with blackish edges, snout and interorbital area dusky; peritoneum clearly visible, black through body wall and skin (Fig. 17). Color of body in alcohol pale rosy, snout and area around mouth dusky brown, skin on tail same as anteriorly, dorsal and anal fins brown edged. Mouth dusky pale, branchial cavity blackish, stomach and pyloric caeca pale.

This female has eggs up to 2.7 mm diameter.

Distribution. Known only from the holotype, collected SW of Iselin Seamount at depths of 1225–1332m.

Etymology. The name *alius* from the Latin *alius*, another, because this species differs from all others in its different combination of characters but has no outstanding particular trait.

Comparisons. Externally, *Paraliparis alius* is most similar to *P. longicaecus* (see below), the southern *P. copei* Goode & Bean 1896 group (see Andriashev 2003:252–261) and to *P. neelovi* in its counts, proportions, and mostly uniserial teeth. It differs from the second in having fewer caudal fin rays (6 vs 8), a smaller eye (22 vs 25–36% HL), more anal fin rays (57 vs 52–56), gill opening longer, with an opercular lobe, not porelike (14 vs less than 14% HL, porelike), and a more posterior anal fin distance (46 vs 33–40% SL). It differs from the last in the number of radials (4 vs 3), the distance between the lower pectoral lobes (16 vs 11% HL), dorsal fin insertion (between V 6–7 vs 4–6), and other characters.

***Paraliparis amerismos* n. sp.**
Figs. 19, 20

Holotype. NMNZ P.041444, sex unknown, 36 mm TL, 33 mm SL, 72°08.20´ S, 175°38.60´ E, Hillary Canyon (near Pennell Bank) Ross Sea, 30 December 2004, F/V *San Aspiring*, Stn. OBS 2011/018, 1149–1358 m. Good condition but dorsoventrally flattened.

Diagnosis. V 74, D 66, A 61, P 22 (15+5+2). Dorsal, anal, caudal, and pectoral-fin rays unstriated or with very few striations; pectoral lower lobe rays two; gill opening above pectoral fin or in front of 1–2 rays. Teeth small, simple, thorn-like, forming moderately wide bands. Body pale with scattered melanophores except for black peritoneum showing through abdominal wall. Coronal pore absent.

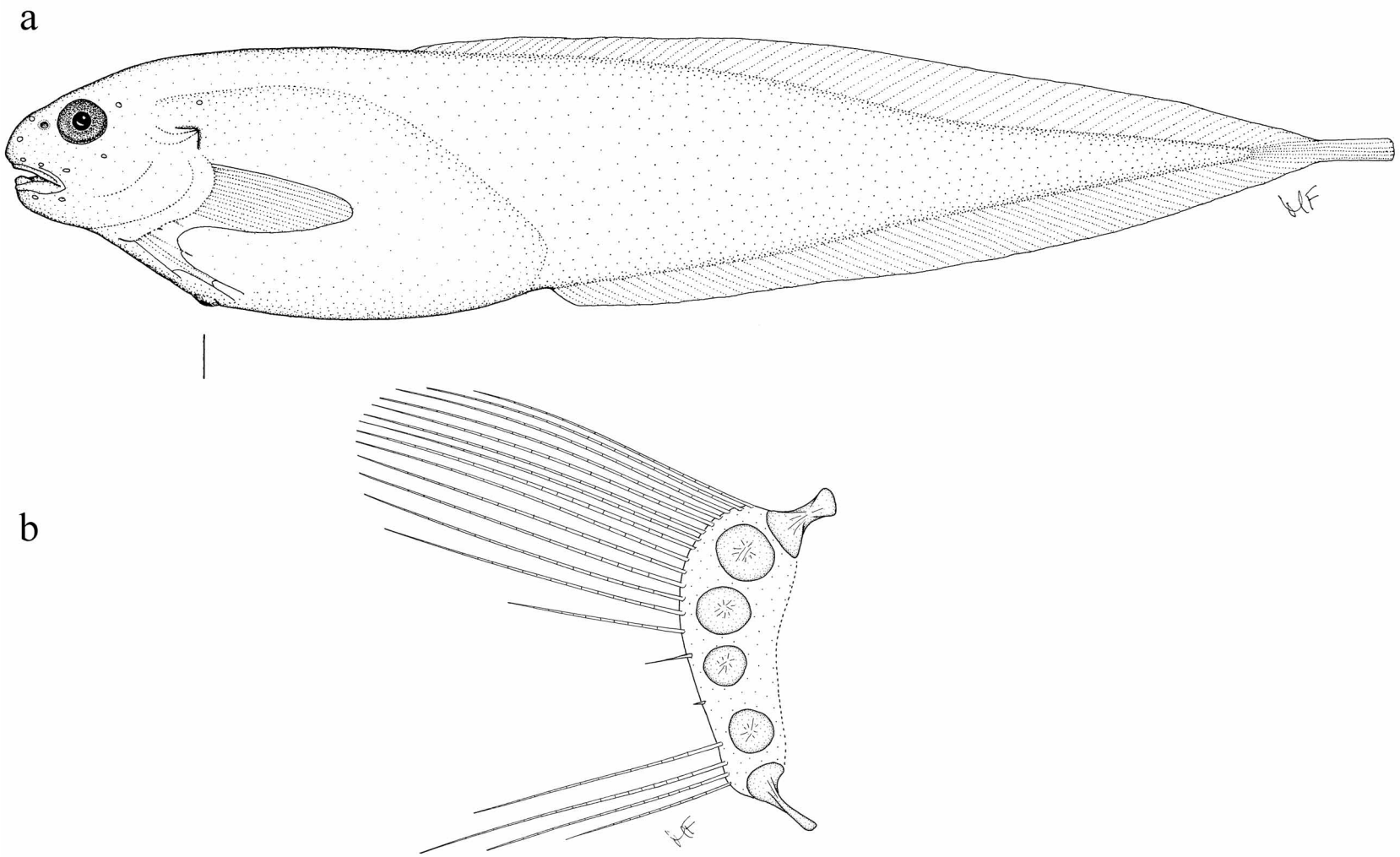

FIGURE 16. *Paraliparis alius* n. sp. Holotype, NMNZ P.042623, 299 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.042623/1.

FIGURE 17. *Paraliparis alius* n. sp. NMNZ P.042623, 299 mm SL. Photograph of fresh specimen by C. Struthers, NMNZ.

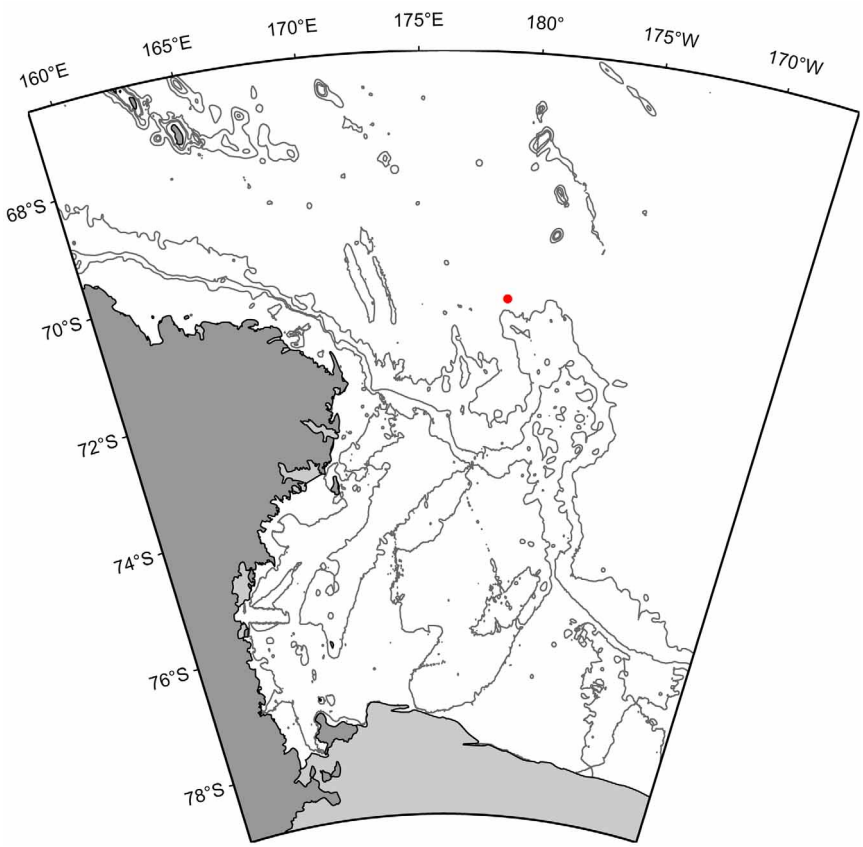

FIGURE 18. Distribution of *Paraliparis alius.*

Description. Counts. V 74 (11+63), D 66, A 61, C 7 (3/4), P 22 (15+5+2), pc unknown, pore formula unknown. Ratios. HL 18.6, E 4.2, orbit 4.8, uj 6.9, go 3.9, bd 19.2, preD 23.1, preA 33.0, ma 21.0, aAf 12.7, UPL 12.3, LPL 7.5. In % HL: E 22.6, orbit 25.8, uj 37.1, go 21.0, ma 112.9, bd 103.2, preD 124.2, preA 177.4, aAf 67.7 UPL 66.1, LPL 40.3.

Head small, short, about 1/5 SL, anterior dorsal profile of head flat, sloping gradually down to blunt snout. Nostrils lacking tube or raised rim, about on a horizontal with upper margin of eye. Eye prominent, almost ¼ head. Mouth moderately (~30°) oblique, terminal, oral cleft reaching posteriorly to below front of eye, upper jaw to below mid-eye. Teeth small, sharp, thorn-like simple canines forming bands in both jaws. Premaxillary teeth in about 6–7 rows of 3–4 teeth each on each side of jaw forming a moderately wide band of well-spaced teeth, symphyseal gap present. Lower jaw teeth in 8–9 irregular oblique rows of up to four teeth each, forming narrower band of more closely spaced teeth than in premaxilla, symphyseal gap absent. Sensory pores damaged, pattern not discernible. Chin pores damaged, farther posterior than usual, probably widely separated, suprabranchial pore apparently single, difficult to find, coronal pore absent. Opercular flap small, crescent-shaped, above pectoral fin and extending ventrally over no more than 1–2 rays; opercular spine curved dorsally so tip points a little upwards.

Pectoral fin upper ray on horizontal between lower margin of orbit and posterior end of upper jaw; fin upper lobe moderately short, extending posteriorly almost to end of abdominal cavity above or slightly anterior to first anal fin ray. Lower lobe of only two rays, much shorter than upper. Notch moderately shallow, its rays much more widely spaced than upper and lower lobe rays, all well developed. Pectoral girdle not examined.

In alcohol, body pale with evenly distributed melanophores dorsally and ventrally, but somewhat denser on head; black peritoneum clearly visible through body wall. Orobranchial cavity dotted similarly to head, tongue dotted with melanophores.

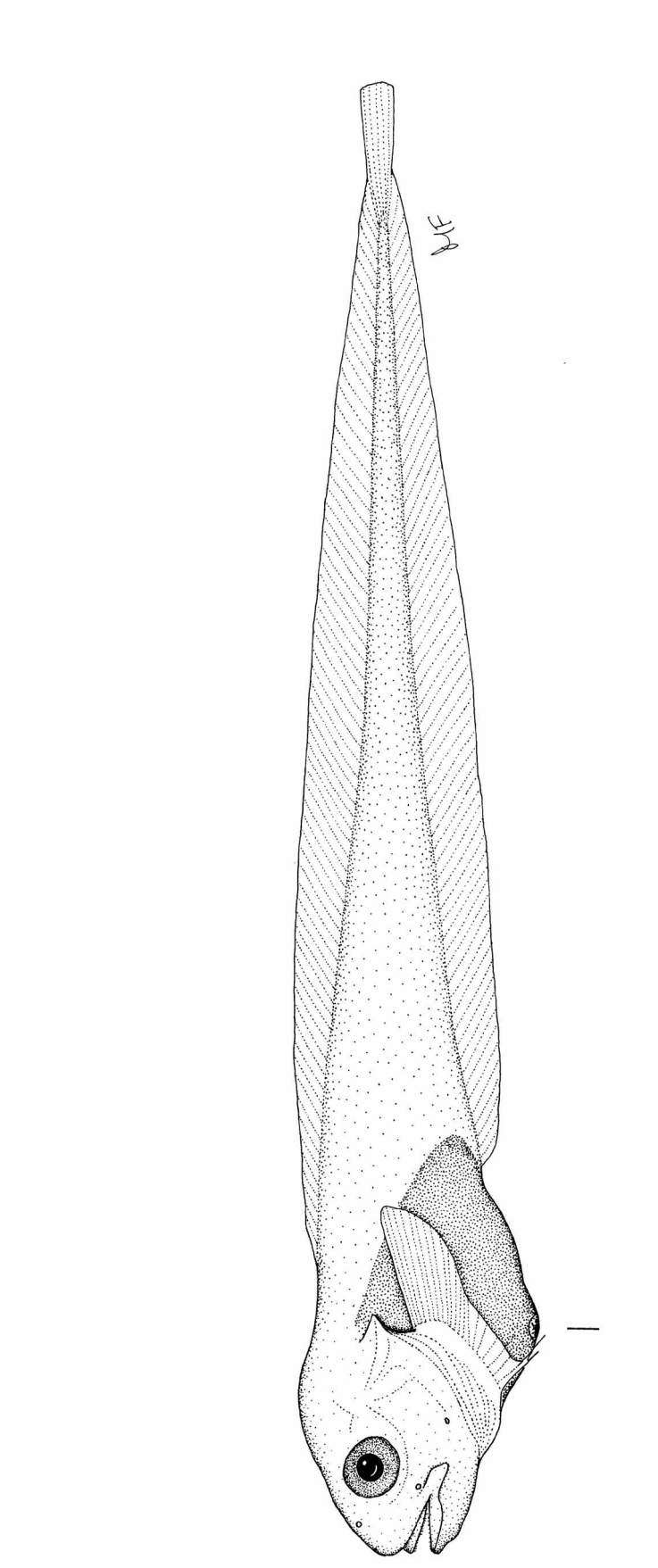

FIGURE 19. *Paraliparis amerismos* n. sp. Holotype, NMNZ P.041444, 33 mm SL.

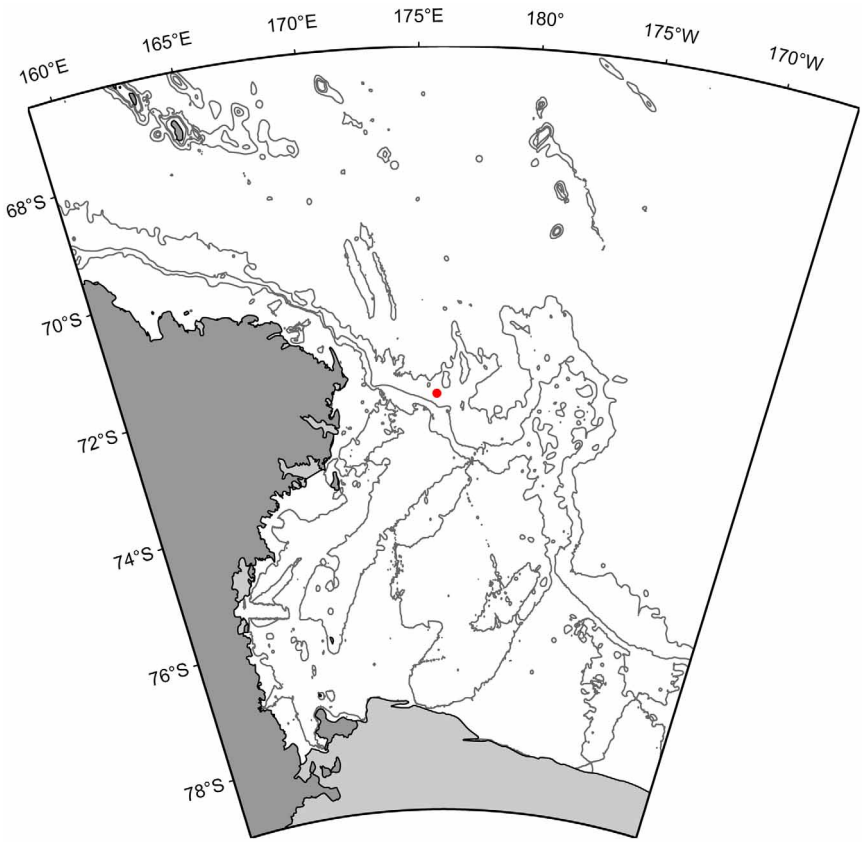

FIGURE 20. Distribution of *Paraliparis amerismos.*

Distribution. Known only from the holotype, collected at 1149–1358 m near Pennell Bank in the outer Ross Sea, Antarctica.

Etymology. From the Greek *a-*, absence of something, and *merismos*, division, denoting the general absence of fin ray segmentation.

Comparisons. The only other known liparid species with unsegmented fin rays is *Praematoliparis anarthractae* (Stein and Tompkins 1989) from the Strait of Magellan, Tierra del Fuego. Andriashev (2003) described a new genus for this species based on its low numbers of vertebrae, dorsal and anal fin rays, lack of segmentation in the latter, and presence of a coronal pore. The new species similarly lacks almost all segmentation in the dorsal, anal, and caudal fins, but has no coronal pore and many more vertebrae (74 vs 45–48). Therefore it is described as a *Paraliparis* rather than *Praematoliparis*. It reduces the differences between the two genera to a single trenchant character, the presence or absence of a coronal pore. The presence of two lower lobe rays is noteworthy; few liparids (*Rhodichthys regina* Collett 1879 and *R. melanocephalus* Andriashev & Chernova 2010) have such a reduced lower lobe, although in them the lower lobe is distinctly separate from the rest of the pectoral fin.

Comments. Owing to the small size and fragility of the specimen, it seemed unwise to try to dissect it to determine the characteristics of either the pectoral girdle or the stomach and internal organs. The lack of segmented fin rays in this specimen is unlikely to be the result of ontogenetic change. *P. anarthractae*, also a small species (to about 70 mm SL), displays no difference in segmentation between specimens from 25 mm SL to almost three times as long. In addition, the two-rayed lower pectoral fin lobe of *P. amerismos* is distinctive.

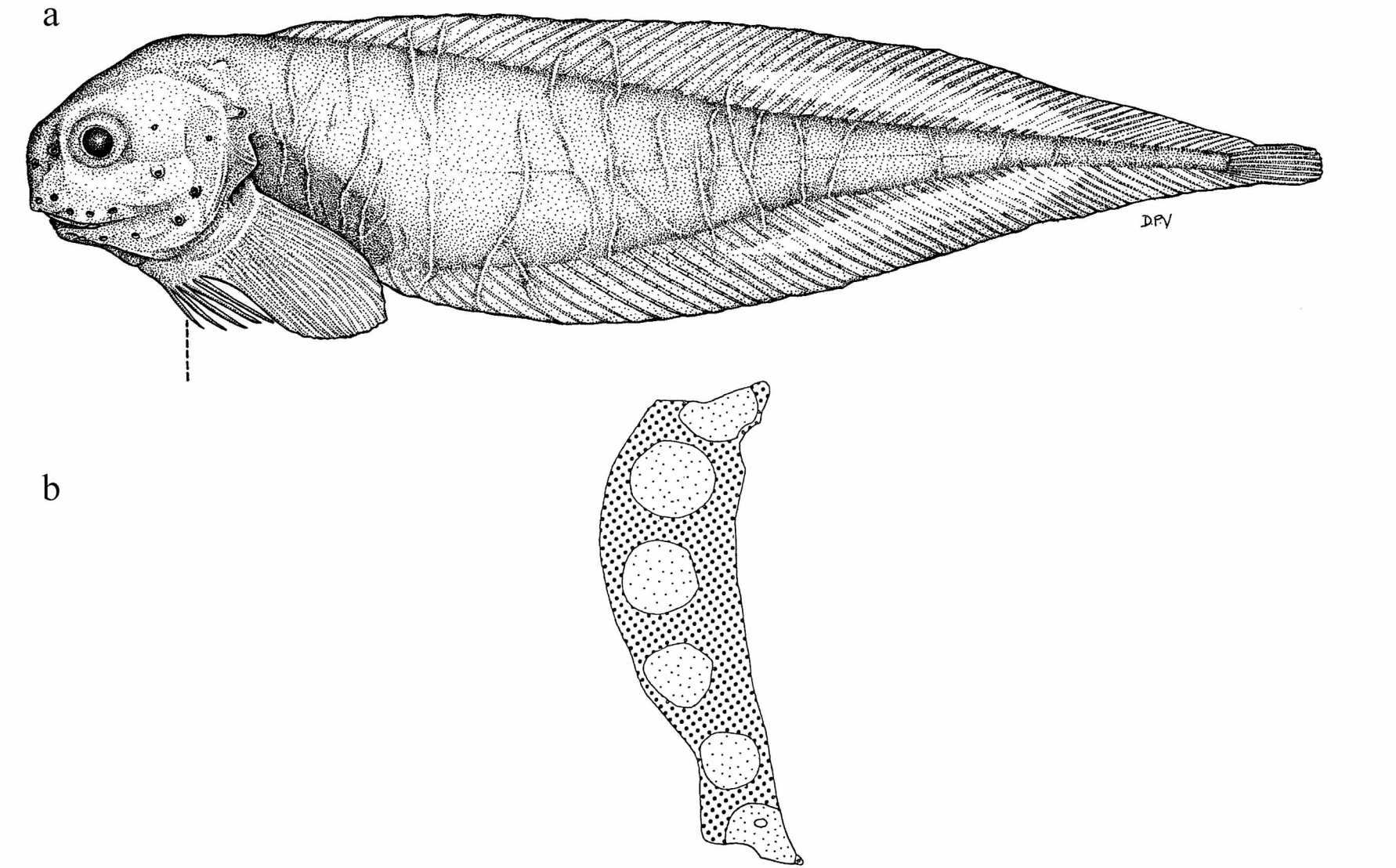

FIGURE 21. *Paraliparis andriashevi* Stein & Tompkins 1989. Holotype, LACM 11467-2, 181 mm SL. From Stein & Tompkins, 1989: Fig. 5; a. lateral view; b. pectoral girdle, LACM 11401–1.

***Paraliparis andriashevi* Stein and Tompkins 1989**
Figs. 21, 22, 23

Paraliparis andriashevi Stein and Tompkins, 1989:4, Figs. 5, 6; Stein & Andriashev 1990:237, Fig. 9; Andriashev 2003:228 Figs. 113–114.

Holotype. LACM 11467–2, male, 198 mm TL, 181 mm SL, 72°26.5′ S, 177°08.0′ E, USNS *Eltanin*, Stn. 2121, 12 Feb. 1968, 1883–1890 m.

Material Examined. Holotype. Paratype, LACM 11401–1, male, ~144 mm SL, 74°38.5′ S, 175°27′ W, USNS *Eltanin*, Stn. 1929, 28 January 1967, 2212–2306 m. Other material. NMNZ P.045477, male, 228 mm TL, 209 mm SL, 71°28.5′ S, 179°04.8′ W, Iselin Seamount, Ross Sea, F/V *San Aotea II*, Stn. OBS 2731/006, 3 January 2009, 1260–1280 m. NMNZ P.045477/1, cleared and stained right pectoral girdle. NMNZ P.043693, male, 157 mm TL, 144 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043693/1, cleared and stained right pectoral girdle.

Comparative material. *P. somovi* Andriashev & Neelov 1979. Paratype, ZIN 44101, 175 mm TL, 161 mm SL, 61°39′ S, 55°39′ W, SW Elephant Is., South Shetland Islands, FR/V *Prof. Mesyatsev*, Trawl 21b, 4 February 1975, 750–850 m. *P. valentinae* Andriashev & Neelov 1984. Paratype, ZIN 46834, female, 207 mm SL, 68°02′ S, 34°33′ E, Cosmonaut Sea, R/V *Volny Veter*, Trawl 145, 23 February 1983, 950–1100 m.

Diagnosis (modified from Stein & Tompkins 1989). V 60–64, D 55–58, A 50–52, C 9–10, P 24–25, pc 8–11. Teeth simple, short, stout, blunt, forming bands in both jaws. Mandibular pore pair closely set. Gill opening above pectoral fin, extending ventrally over about six fin rays. Dorsalmost pectoral fin ray level above posterior corner of upper jaw, pectoral fin notch shallow with greatly exserted lower fin rays. Radials four, rounded, unnotched. Anus below preopercle. Stomach and body completely pale.

Abbreviated description (including NMNZ specimens). Counts. V 60–64 (9–10+51–54), D 55–58, A 50–52, C 9–10 (5/5 or 4/5+1), P 24–25, radials 4, pc 8–11, pores 2–6–7–1. Ratios. HL 20.1–22.2, HW ~12–14.9, sn 4.5–5.6, E 4.6–6.9, orbit 6.6–9.4, io 6.2–10.1, uj 8.0–10.6, go 7.2–8.3, bd 19.0–22.8, preD 23.6–25.6, preA 35.6–37.0, aAf 17.3–21.6, UPL 15.4–16.2, LPL 10.2–12.2. In % HL: HW 61.7–73.1, sn 21.4–25.3, E 21.7–30.9, orbit 30.9–43.1, io 29.2–45.3, uj 37.4–48.3, go 32.2–38.8, preD 110.6–115.3, preA 166.6–168.0, aAf 81.1–100.9, UPL 71.9–76.9, LPL 45.9–56.9.

The NMNZ specimens fit the original description well, with the following additions and changes: Eye prominent, orbit large but not entering profile of head, about 1/3 HL. Gill opening 1/3 head or slightly more, reaching ventrally to about level of oral cleft, extending ventrally in front of as many as 7–8 rays, its lower margin vertical. Opercular flap well developed, triangular, its tip dividing gill opening about in half and barely reaching pectoral fin base; supported by long curved opercle, vertical dorsally and slightly curved so tip angles posteriorly at about 45°; exposed skin above it blackish, below, black streaked. Most pores missing, but chin pores closely set, smaller than remaining mandibular pores. Pectoral fin rays 24–25 (19+1–2+4), none rudimentary. Right pectoral girdle of both specimens with 4 (3+1) round unnotched radials, all almost round, dorsal pair largest, R4 smallest. Radial spacing increases ventrally, e.g. R1-R2<R2-R3<R3-R4. Scapula large, broad, hemicircular, without helve, its dorsal edge shallowly indented; coracoid with a short stout helve completely supported by a broad dorsal blade. Notch rays not well separated from upper and lower fin lobes. Dorsal fin insertion between vertebrae 4–6, anal fin insertion between vertebrae 10–11. Dorsal and anal fins deepest far caudally, about 71% SL posterior. Anus below anterior end of opercle. Pyloric caeca digitate, bluntly pointed, of similar lengths, longest ~29% HL.

Fresh color pink, tail blackish; black peritoneum clearly visible through body wall (Fig. 22). Color of body in alcohol pale rosy, head, distal part of upper pectoral fin lobes, and lower lobe rays brown, anal region blackish-brown. Peritoneum dark brown or black. Orobranchial cavity dusky, stomach and caeca pale.

Distribution. Known from the Ross Sea at depths of 1260-2306 m.

Comparisons. *Paraliparis andriashevi* could easily be confused with *P. valentinae* from the eastern Antarctic and is also similar to *P. somovi* from the tip of the Antarctic Peninsula. It is similar to the former in pectoral girdle structure, counts and many proportions; however, *P. andriashevi* differs in pectoral girdle structure (scapular helve absent vs present), larger eye (5–7 vs 4–5% SL), shorter snout (4–5.6 vs 5.7–5.9), longer gill opening (7–8 vs about 6), longer lower pectoral fin lobe (10–12 vs 8–10), and a longer preanal fin length (36–37 vs 33–35). *P. andriashevi* is similar to the latter in counts and many proportions, but differs distinctly in scapula and coracoid structure (no helve on either vs clear helves on both), stomach color (pale vs black-veined), smaller eye (22–31 vs 30–34% HL), shorter snout (21–25 vs 27–35% HL), shorter preanal fin length (36–37 vs 36–41% SL), and longer gill opening (32–39 vs 27–33% HL).

FIGURE 22. *Paraliparis andriashevi*, NMNZ P.043693, 144 mm SL. Photograph of fresh specimen by P. McMillan, NIWA.

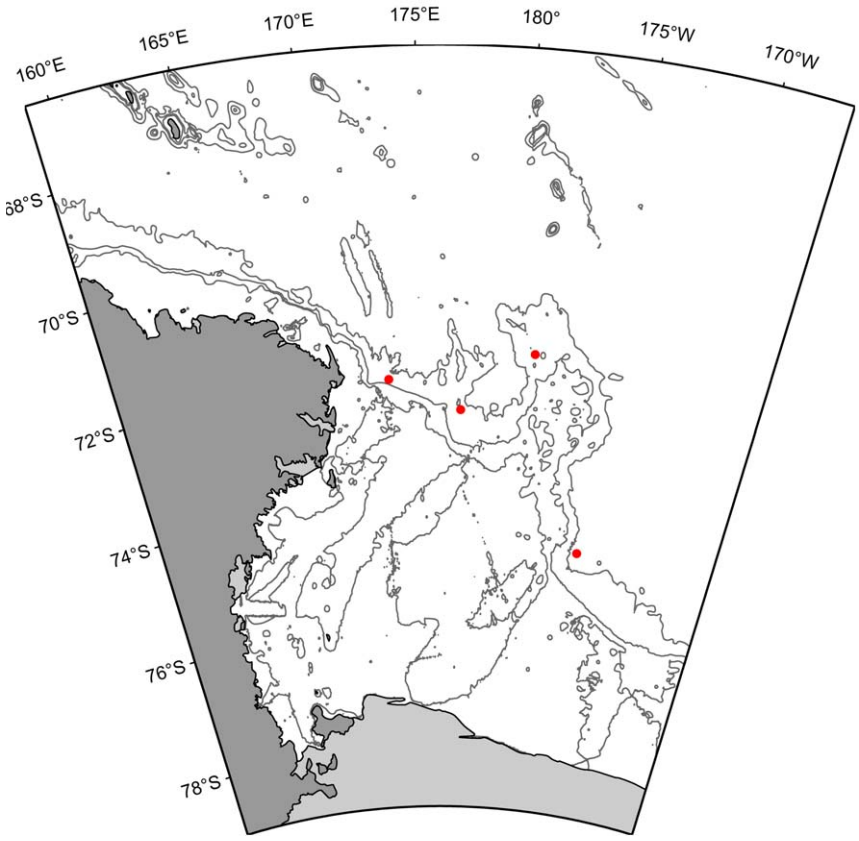

FIGURE 23. Distribution of *Paraliparis andriashevi.*

Comments. The new specimens, collected not far from the locality of the types in shallower water (1260–1280 m and 1431–1658 vs 1883–2306 m), differ slightly from the type specimens in many characters, most of them proportional. The most important difference is probably the spacing between the radials. The types have equal radial spacing. Other differences include peritoneum color (black vs dark brown), pectoral fin ray spacing (notch rays not as well separated as in the types, but still clearly distinguishable). However, the important characters are the same (pectoral girdle structure, absence of a significant pectoral fin notch, tooth arrangement and shape, unusually long pyloric caeca, body color and general proportions, exserted lower pectoral fin rays, and others). The proportional differences are not unexpected, given the much greater size of NMNZ P.045477 (209 mm vs 181 and 144 mm SL) and the paucity of specimens. The many similarities (including collection location) support identification as *P. andriashevi*.

Paraliparis antarcticus **Regan 1914**

Figs. 24, 25, 26

Paraliparis antarcticus Regan, 1914a:11, Regan 1914b:13, 39, Pl. II, Fig. 1; Regan 1916:377 (as *P. wildi* Waite); Norman 1937:80; Andriashev & Tokarev 1958:200; Andriashev 1982c:536, Figs. 3, 5; Andriashev 1986:31, Figs. 6–9; Stein & Andriashev 1990:238, Fig. 10; Matallanas 1999:1026; Andriashev 2003:231, Figs. 115–117; Duhamel et al. 2010:333, Fig. 15.
Paraliparis wildi Waite 1916:43, Fig. 9, Pl. IV, Fig. 1
Paraliparis sp. Iwami & Abe 1981:131.

Lectotype. BMNH 1913.12.4.58–60, 140 mm SL, south of Balleny Is., 370 m (designated by Andriashev [1982c] as “the largest of three syntypes”).

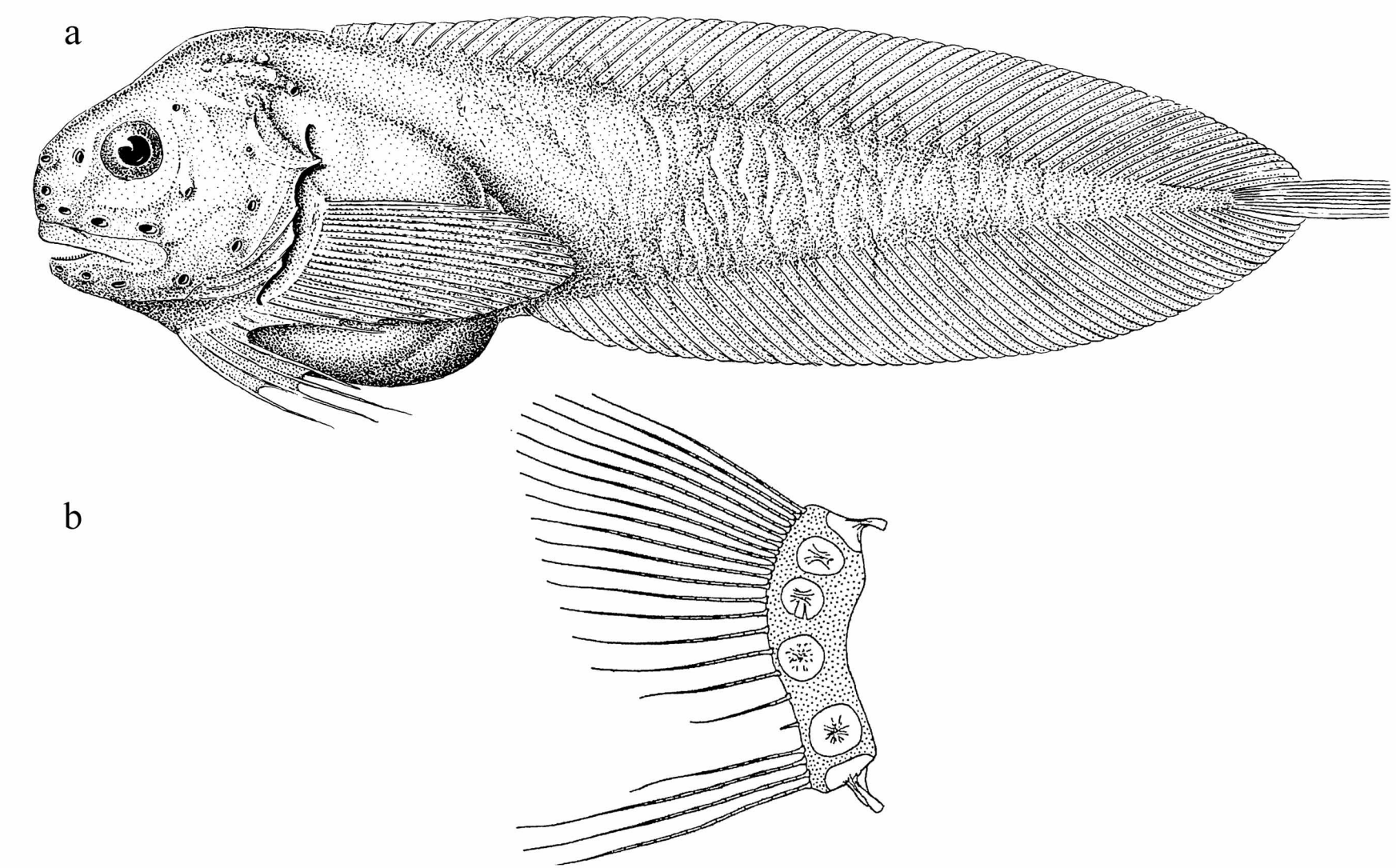

FIGURE 24. *Paraliparis antarcticus* Regan 1914. NMNZ P.012008, 203 mm SL. From Andriashev, 1986: Fig. 6; a. lateral view; b. pectoral girdle, ZIN 46009.

Material Examined. NMNZ P.012008, ripe female, 220 mm TL, 203 mm SL, 77°30.0′ S, 165°30.0′ E, Ice Harbour, McMurdo Sound, 18 January 1958, depth unknown; NMNZ P.041528, sex unknown, 248 mm TL, 227 mm SL, 67°24.77′ S, 165°15.07′ E, W of Sturge Id., Balleny Is., R/V *Tangaroa*, Stn. TAN 0402/214, 03 March 2004, 1340–1444 m; NMNZ P.042279, TL, SL unknown, > 121 mm, 75º03.30′ S, 164º12.60′ E, Terra Nova Bay, Ross Sea, F/V *San Aotea II*, Stn. OBS 2184/074, 23 January 2006, 880–973 m; NMNZ P.043388, 102 mm TL, 92 mm SL; NMNZ P.043389, 164 mm TL, 148 mm SL, 74°43.10′ S, 167°01.15′ E, between Crary Bank and Cape Washington, Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/041, 12 Feb 2008, 898–926 m; NMNZ P.043422, TL unknown, 202 mm SL, 75°37.94′ S, 169°52.99′ E, Crary Bank, Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/056, 14 Feb 2008, 525–530 m; NMNZ P.043479, 158 mm TL, 143 mm SL, NMNZ P.043480, 150 mm TL, 136 mm SL; NMNZ P.043481, 151 mm TL, 137 mm SL, 76°46.02′ S, 167°49.75′ E, south of Franklin Island, Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/070, 15 Feb 2008, 724–752 m; NMNZ P.043559, 115 mm TL, 103 mm SL, 76°11.95′ S 176°16.19′ E, NW of Ross Bank, Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/094, 17 Feb 2008, 447–450 m.

Diagnosis (modified from Andriashev 2003). V 67–74 (8–10 + 57–64), D 61–65, A 55–60, C 9–10 (5/5, 4/5), P 23–28, radials 4 (rarely 3), pores 2–6–7–1.

Mouth terminal. Teeth simple, forming narrow bands in both jaws. Mandibular symphyseal pores rather closely set. Gill opening very large, extending ventrally in front of 15–20 pectoral rays, about 10% SL, 60% HL or greater. Upper pectoral fin lobe 66–87 % HL. Pectoral notch may or may not have one or two rudimentary rays. Head 25–26% SL, preanal fin length 39–42%. Fresh color white or pink; peritoneum pale or brownish, variably dark stomach and esophagus visible through body wall and skin (Fig. 25).

These specimens fit the description provided by Andriashev (2003) well, and in fact, NMNZ P.012008 was included in his description. Therefore, only Andriashev's (*ibid*.) diagnosis slightly modified is provided. The pore formula of 2–7–6–1 given by Andriashev (ibid.:232) is almost certainly an error. Judging by his figure (2003:233, Fig. 115) it should be 2–6–7–1.

Distribution. Circumantarctic, reported from the Ross, Mawson, Cooperation, Cosmonaut, and southern Weddell Seas at depths from less than 100 m (juveniles) to over 700 m. The Balleny Island Specimen (NMNZ P.041528) is outside of the 'normal' geographic range and at least 550 m deeper than the normal range.

Comparisons. *Paraliparis antarcticus* differs from most Antarctic species of the genus in having a very long gill opening (~10–15% SL, 52–62% HL) that extends from above the pectoral fin ventrally in front of 15–20 pectoral rays. It also has a pale peritoneum, the only Ross Sea *Paraliparis* with one. The length of the gill opening is similar to that in *P. meganchus* Andriashev 1982b (~15% SL) and *P. macropterus* n.sp. (see below for comparison). *Paraliparis antarcticus* differs from *P. meganchus* in number of vertebrae (67–74 vs 57–63), rudimentary pectoral fin notch rays (sometimes present vs absent), head width (~18 vs 13–14% SL), upper pectoral fin lobe length (17–23 vs 13–16% SL), and peritoneum color (pale vs brown). It should be noted that Andriashev (1982b) wrote that *P. meganchus* might be a subspecies of *P. antarcticus*, although the unusually great range of vertebral number (57–74) suggests it is unlikely.

Paraliparis camilarus n. sp.

Figs. 27, 28, 29

Holotype. NMNZ P.043687, male, 282 mm TL, 260 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043687/1, cleared and stained right pectoral girdle.

Diagnosis. V 68, D 61, C 7, P 21, radials 4 (3+1), R1, R2, R3, R4 notched; pc 5. Teeth simple, mostly uniserial except irregular near symphysis. Mandibular symphyseal pores well separated. Gill opening short, completely above pectoral base, not reaching uppermost pectoral fin ray. Gill flap absent. Pectoral notch rays rudimentary. Head 17% SL, interorbital wide, about 50% HL, LLD 13% HL. Gill cavity blackish, peritoneum black, stomach probably solid black.

Description. Counts. V 68 (13+55), D 61, A 53, C 7 (1+3/3), P 21 (15+2+4), radials 4 (3+1), pc 5. Ratios. HL 16.6, HW 11.8, sn 5.6, E 3.7, orbit 4.5, io ~8.3, uj 5.2, go 1.7, preD 27.9, preA 45.1, aAf 29.8, UPL 10.6, LPL 13.1, pcl 9.1. In % HL: HW 71.3, sn 33.8, orbit 27.3, io 49.8, uj 31.5, go 10.2, preD 167.8, preA 271.5, aAf 179.6, UPL 63.6, LPL 78.9, LLD 13.2, pcl 54.6, cp 5.2.

FIGURE 25. *Paraliparis antarcticus*; a. NMNZ P.043389, 148 mm SL. Photograph of fresh specimen by P. McMillan, NIWA; b. NMNZ P.043481, 138 mm SL. Photograph of fresh specimen by P. Marriott, NIWA

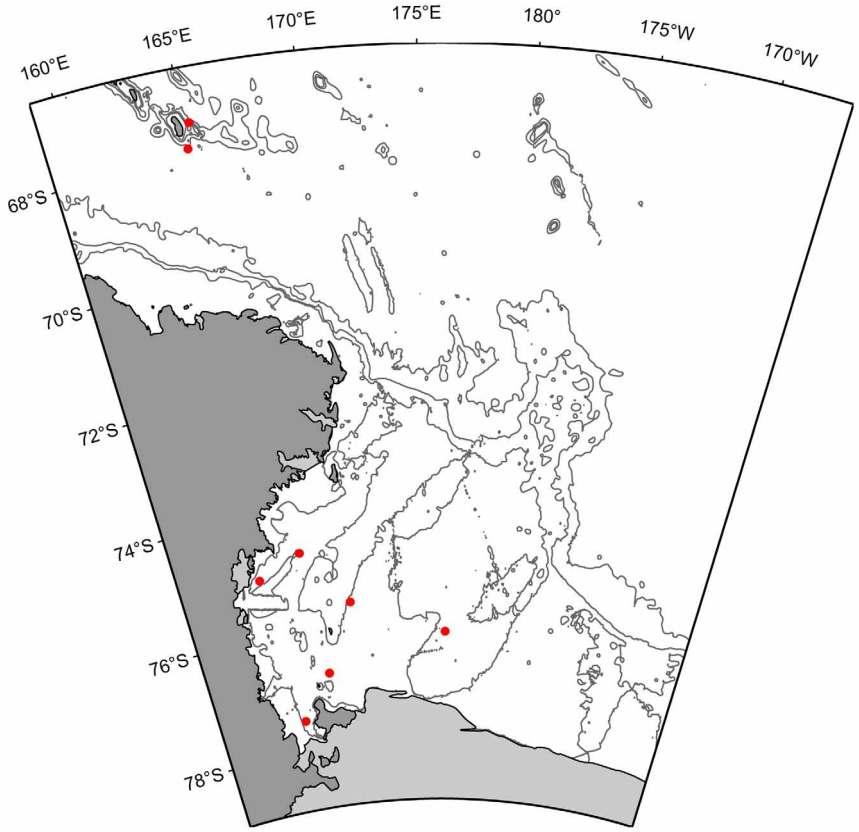

FIGURE 26. Distribution of *Paraliparis antarcticus* in the Ross Sea.

Head low, snout blunt; dorsal profile of head almost flat, rising slowly from snout to above abdominal cavity. Mouth subterminal or inferior, upper jaw reaching to below mideye, oral cleft short, barely reaching to below anterior margin of orbit. Premaxillary teeth uniserial for about 18 posterior teeth, irregularly biserial for another 10 anterior teeth. Posterior teeth larger, stouter, not as sharp as those anterior. Symphyseal gap present, with deep anterior notch. Mandibular teeth much smaller than premaxillary teeth, uniserial for posterior 50–60 teeth, an irregular band of tiny teeth near symphysis. Posterior teeth extend well behind posterior end of premaxillary tooth row. Chin pores small, paired, well separated. Gill opening above pectoral fin upper ray, extending ventrally to just above opercle tip. Opercle not supporting edge of gill opening, visible as a ventrally curved spine, its tip horizontal. Gill flap absent, margin of opening fleshy, slightly concave.

Pectoral fins short, upper ray about on horizontal with lower margin of orbit; upper lobe rounded, notch deep, lower lobe rays bound together by skin for about 2/3 their length. Right pectoral girdle with 21 (15+2+4) rays, notch rays rudimentary, strongly reduced, one present as base only; lower lobe of four rays, the dorsalmost a bit more widely separated from lower three than they are to each other, lowest rudimentary, short, fine. Radials 4 (3+1); R1, R2, R4 round, large, R3 somewhat smaller, located at edge of girdle but not D-shaped. R1, R2, R4 notched, R3 probably abnormal, with teardrop-shaped hole extending to edge, possibly an incompletely developed notch. Notch of R4 possibly abnormal. Fenestrae present, in abnormal positions between and anterior to R1-R2, R2-R3. Scapula with broad basal plate, helve narrow; coracoid with long, slender helve, basal notch present.

Body relatively slender but still deeper than head, deepest over mid-abdomen. Dorsal fin insertion between vertebrae 8–9, anal fin insertion between vertebrae 13–14. Dorsal and anal fins distinctly deeper posteriorly, dorsal fin rays not visible until approximately mid-length. Anus about between bases of lowest pectoral fin lobe rays, below and distinctly anterior to vertical through gill opening. A small genital papilla present. Peritoneum clearly visible through body wall. Body cavity short, deep, extending dorsally to about level of upper margin of orbits. Hypural complex fused, slit absent. Caudal fin of seven (1+3/3) rays. Pyloric caeca five, long, slender and thick-walled, of different lengths, the shortest about half the longest. Skin tough, rugose, thin, but not easily damaged, attached to body. SECM apparently minimal.

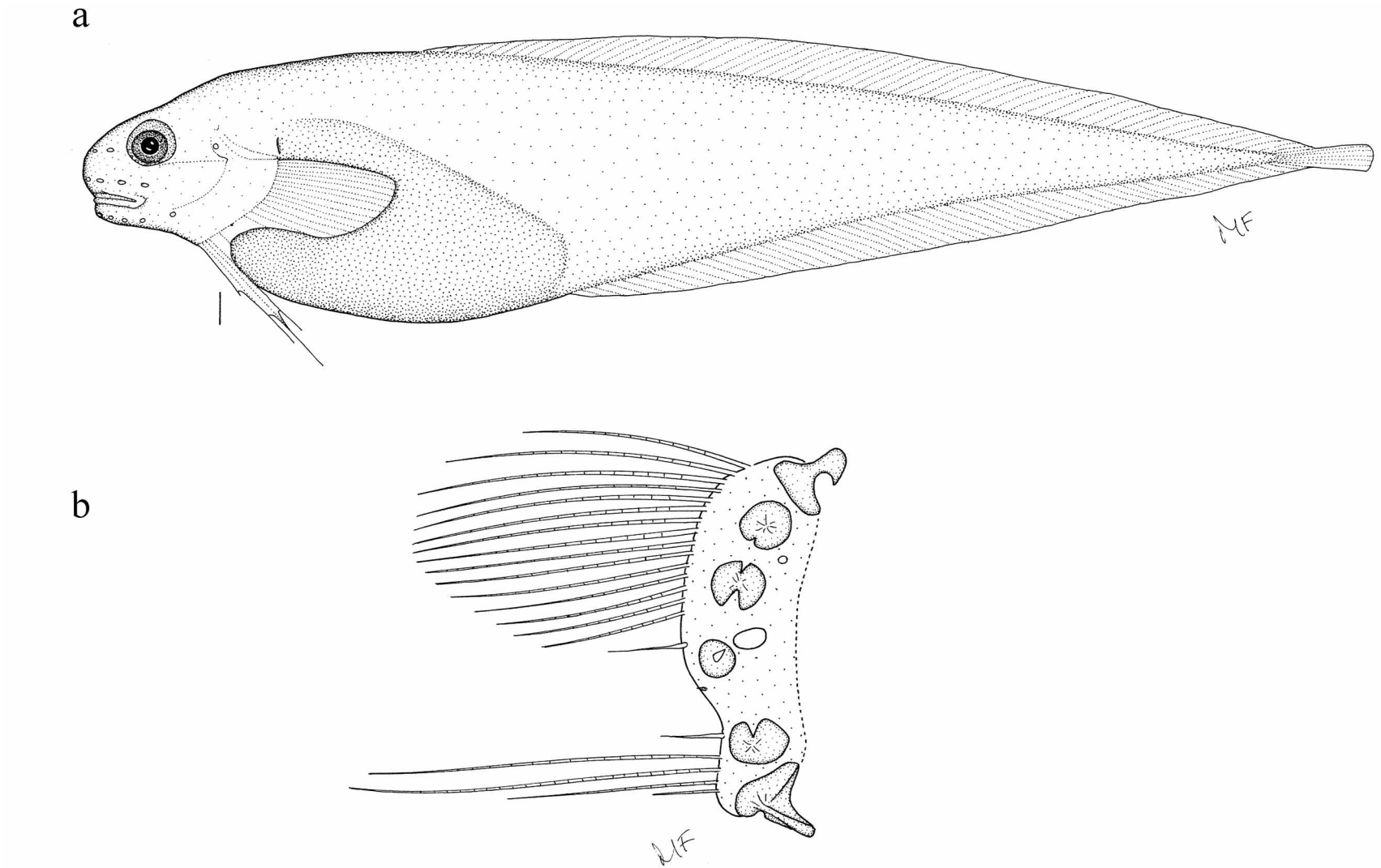

FIGURE 27. *Paraliparis camilarus* n. sp. Holotype, NMNZ P.043687, 260 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043687/1.

FIGURE 28. *Paraliparis camilarus* n. sp. Holotype, NMNZ P.043687, 260 mm SL. Photograph of fresh specimen by P. McMillan, NIWA.

Fresh color dusky rose, darker dorsally and posteriorly; snout, head, and pectoral fins darker, tail rosy (Fig. 28). Body in alcohol translucent brown, darker ventrally, on snout, pectoral fin edges, and belly; black peritoneum visible through body wall. Pectoral fin lower lobe filamentous rays blackish. Mouth dusky, branchial cavity blackish, surface of stomach damaged but stomach apparently all black, pyloric caeca also possibly black but now pale except for black remnants.

Distribution. The holotype was captured to the northwest of Mawson bank at 1431–1658 m.

Etymology. The new species is named in honor of the Commission for the Conservation of Antarctic Living Resources, CCAMLR, under whose auspices this species was collected. Thus the specific epithet *camilarus*.

Comparisons. Although very similar to *P. stehmanni* (NMNZ P.043719 and those previously described) (especially in predorsal, preanal fin, and anus to anal fin lengths), *P. camilarus* differs in some regards from them all (Table 2, Table 3). In particular, head length is slightly less (16.6 vs 17–21 SL) and the gill opening is shorter (2 vs ~3% SL). The right (possibly abnormal) pectoral girdle differs in having radials R1, R2, and R3 not as deeply notched, having R4 notched (vs unnotched) and a basal coracoid notch (vs absent). An oval fenestra is present anterior to space R2-R3 (vs between the radials). In addition, the number of premaxillary teeth differs, and *P. camilarus* has irregularly biserial teeth anteriorly for 10 (vs 20) teeth. It lacks a gill flap (vs present, small and rounded) and has the opercle at the ventral end of the gill opening (vs in the middle, supporting a small lobe). Its caudal fin is of 1+3/3 rays (vs 3/4 clear principal rays). The peritoneum is clearly visible through the body wall (vs visible but whitish-black) and its stomach is apparently all black (vs pale). Finally, its skin texture is different (thin, rugose vs thin and smooth).

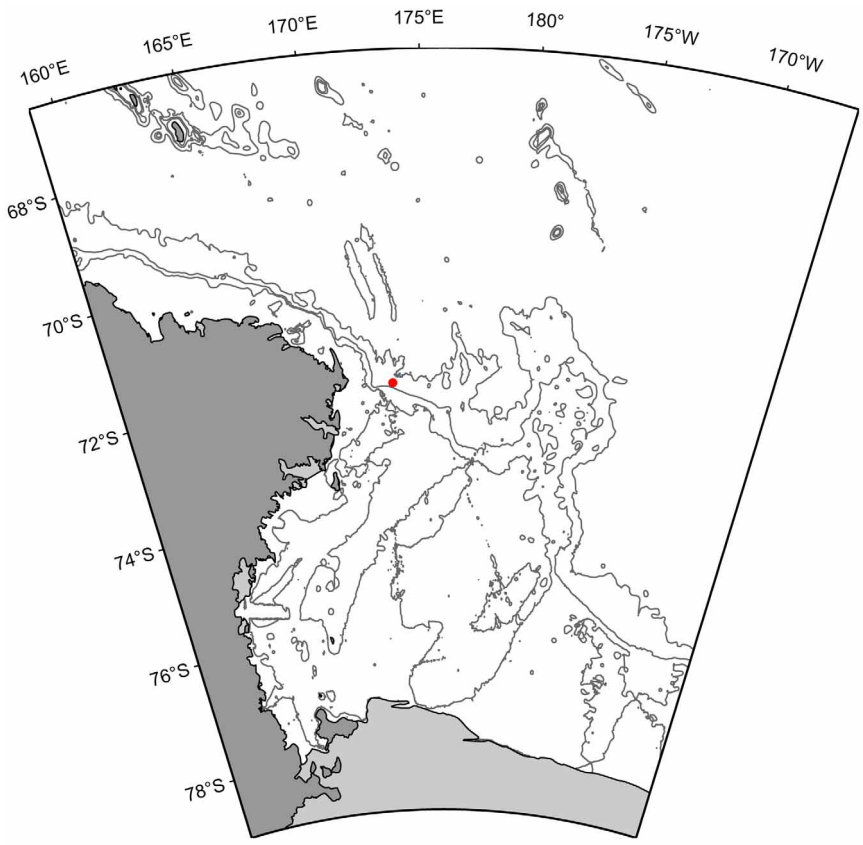

FIGURE 29. Distribution of *Paraliparis camilarus.*

TABLE 2. Comparison of *Paraliparis camilarus* n. sp. with *P. stehmanni* Andriashev from the Ross Sea. Trenchant characters in bold type. Asterisk: probable abnormalities.

Character	*P. camilarus* n. sp. P.043687	*P. stehmanni* P.043719	Character	*P. camilarus* n. sp. P.043687	*P. stehmanni* P.043719
SL (mm)	260	307			
Sex	male	female			
Vertebrae	68 (13+55)	67 (13+54)			
Dorsal insertion	8–9	6–7			
Anal insertion	13–14	13–14			
Dorsal rays	61	60			
Anal rays	53	53			
Caudal rays	7 (1+3/3)	7 (3/4)			
Pectoral rays	21 (15+2+4)	21/20 (14–15+2+4)			
Rudimentary rays	2, bases only	1–2, > bases			
Pectoral radials	4 (3+1)	5* (4+1) (3+1?)			
Radials notched	R1–4* (R1–3?)	R1–3			
Scapula	helve present	helve present			
Coracoid	notch present	notch absent			
Pyloric caeca	5	6			
Gill flap lobe	absent	present			
Gill opening	to opercle tip	below opercle tip			
<u>In % SL</u>			<u>In % HL</u>		
Head length	16.6	17.0			
Head width	11.8	13.2	Head width	71.3	77.4
Head depth	na	~14.8	Head depth	na	87.0
Body depth	na	22.7	Body depth	na	133.7
Eye diameter	3.7	3.3	Eye diameter	22.2	19.5
Orbit width	4.5	4.8	Orbit width	27.3	28.2
Interorbital	~8.3	6.7	Interorbital	49.8	39.3
Snout	5.6	4.5	Snout	33.8	26.6
Upper jaw	5.2	7.6	Upper jaw	31.5	**45.0**
Gill opening	1.7	2.6	Gill opening	10.2	**15.3**
Mandible-anus	13.9	15.7	Mandible-anus	83.6	92.1
Snout-anus	16.2	18.2	Snout-anus	97.4	107.3
Upper P lobe	10.6	11.1	Upper P lobe	63.6	65.5
Lower P lobe	13.1	14.1	Lower P lobe	78.9	82.8
Predorsal length	27.9	27.9	Predorsal length	167.8	164.0
Preanal length	45.1	45.5	Preanal length	271.5	267.6
Anus-anal fin	29.8	30.1	Anus-anal fin	179.6	177.4
Pyloric caeca l.	9.1	10.9	Pyloric caeca l.	**54.6**	**64.0**
Chin pore width			Chin pore width	5.5	5.2
Lower lobe distance	**2.2**	**4.0**	Lower lobe distance	**13.2**	**23.7**

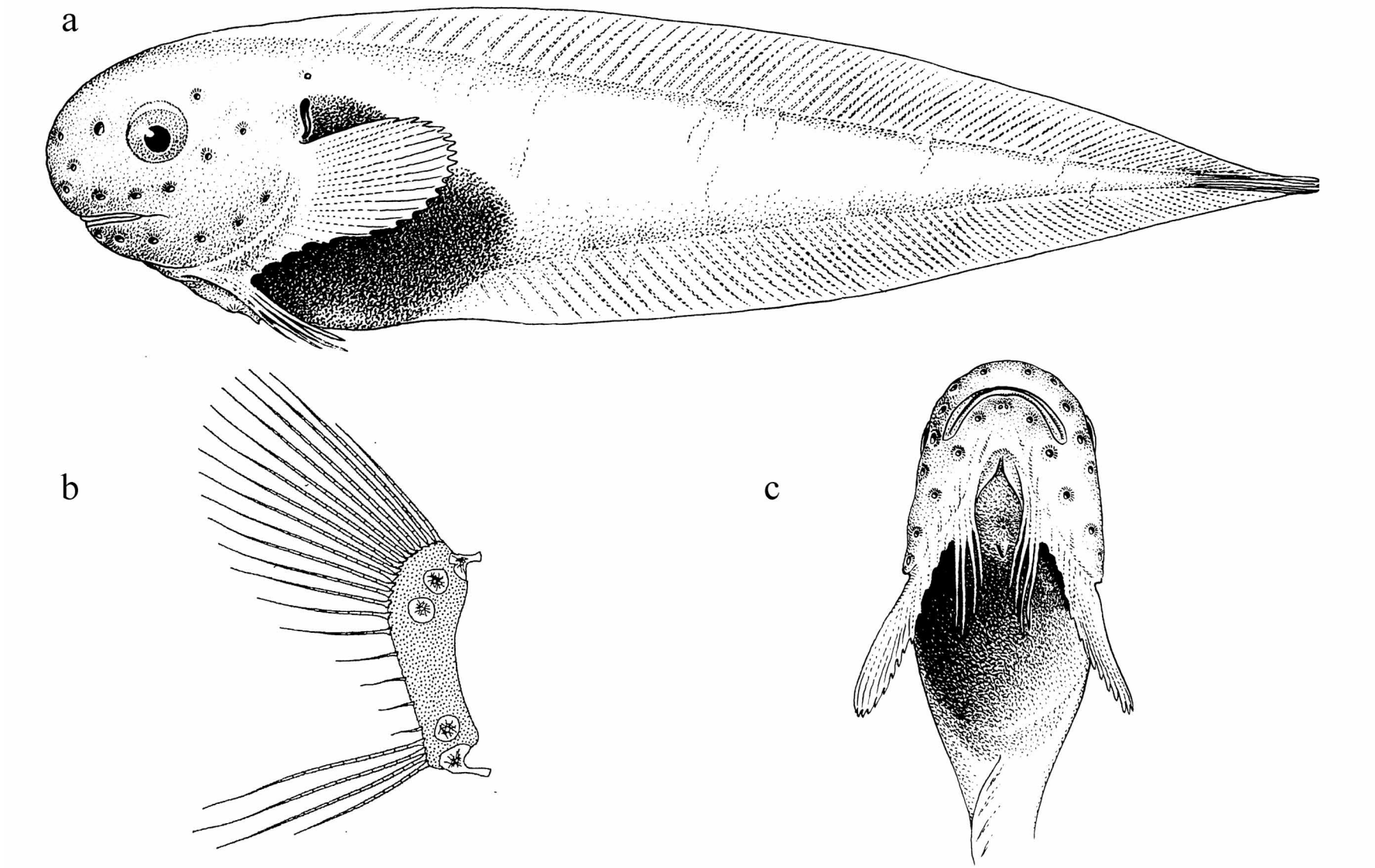

FIGURE 30. *Paraliparis devriesi* Andriashev 1980. Holotype, ZIN 43577,170 mm SL. From Andriashev, 1986: Fig. 23; a. lateral view; b. pectoral girdle, ZIN 43578; c. chin pores.

FIGURE 31. *Paraliparis devriesi* Andriashev. NMNZ P.038577, 178 mm SL. Photograph of fresh specimen by R. McPhee, NMNZ.

Paraliparis devriesi Andriashev 1980
Figs. 30, 31, 32

Liparis sp. DeVries 1971:160
Paraliparis DeVriesi Andriashev in DeVries & Lin, 1977:443 (*nomen nudum*)
Paraliparis devriesi Andriashev 1980:150, Fig.; Andriashev 1982c:538, Figs. 4–5; Andriashev 1986:61, Figs. 23, 24, 28; Stein & Tompkins 1989:7; Stein & Andriashev 1990:240, Fig. 14; Andriashev 2003:265, Figs. 135, 136.

Holotype. ZIN 43577, female, 170 mm SL, 7 km SW of McMurdo Stn., 1–6 January 1974, 700 m.

Material Examined. NMNZ P.038577, female, 192 mm TL, 178 mm SL, 71°38.00′ S, 176°59.30′ E, between Mawson Bank and Iselin Seamount, Ross Sea, F/V *San Aotea*, Stn. OBS 1595A/pot 6, 1 March 2002, 875 m; LACM 32735–1, male, 154 mm TL, 140 mm SL, wire fish trap, McMurdo Stn. 64K, 7/8 distance from McMurdo Station to Williams Field, 46 m off Ross Ice Shelf, 28 July 1964, 500 m.

Diagnosis (modified from Andriashev 2003). V 68–72 (9–10 +58–63), C 7 (3/4), P 22–25, radials 3 (2+0+1), pores 2–6–7–1. Mouth inferior. Snout bluntly rounded and projecting. Teeth banded. Mandibular symphyseal pores very closely set in a shallow pit. Gill opening small, above pectoral fin, about pupil diameter. Head 20–23% SL, preanal fin length 33–37%. Mouth cavity pale, peritoneum black. (Andriashev, 2003). Fresh color whitish, skin translucent, dorsal and anal fins pale pinkish, black peritoneum clearly visible through body wall. (Fig. 31).

The NMNZ specimen fits the description provided by Andriashev (2003:266) well. Therefore, only Andriashev's 2003 diagnosis is provided.

Distribution. Known only from the Ross Sea. Previous to the capture of NMNZ P.038577, the species was known only from the southwest Ross Sea near McMurdo at depths of 500 to about 900 m and temperatures below 1.9° C. Although the new record possibly extends its distribution to the entire Ross Sea, it is clearly more abundant near McMurdo.

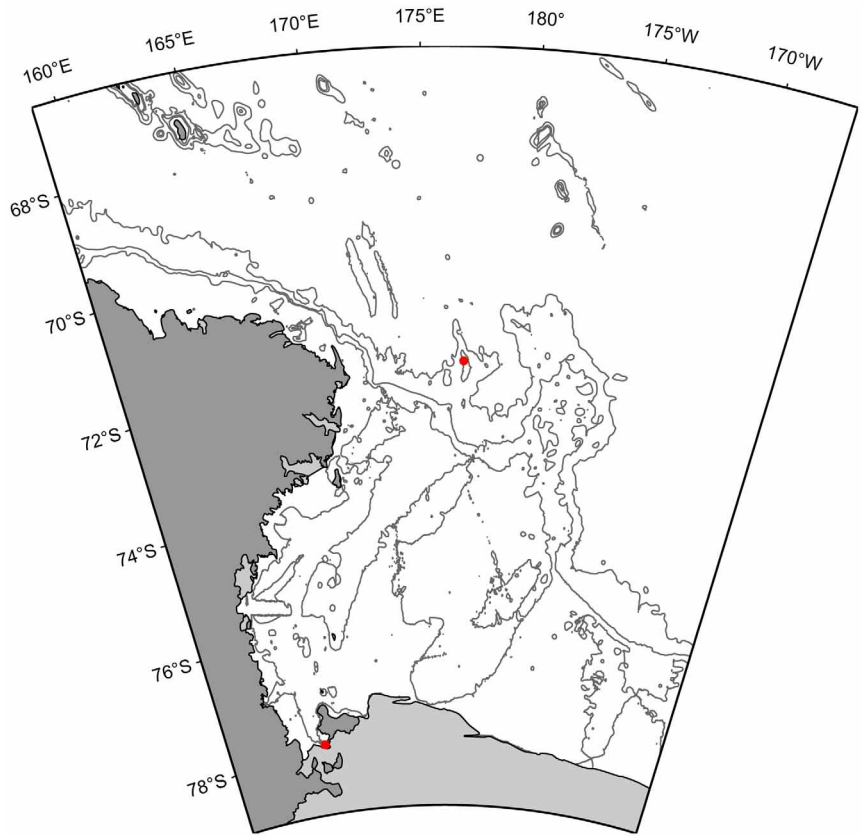

FIGURE 32. Distribution of *Paraliparis devriesi.*

Comparisons. This species is similar to *P. monoporus* Andriashev & Neelov 1979 in its general body shape, number of radials, vertebrae, and other meristic characters. It differs in having shorter, almost rudimentary, pectoral fin notch rays (vs about 1/3 lower lobe length in the latter), paired chin pores (separate vs a single pore), and longer preanal fin distance (34–37 vs 27–30% SL).

Comments. There are some discrepancies in the collection information for the holotype as given in the original publication (Andriashev 1980) and in Andriashev 2003:266. Originally, standard length was given as 272 mm, but in 2003 it was 270 mm; the date was originally given as December 1974, but in 2003 as 1–6 January, 1974, which is the date in the ZIN fish collection records. I follow the 2003 data. Additionally and of greater importance, Andriashev (2003:266) gave different vertebral counts in his Russian ["vert. 68–76 (10+58–65)]" and English ["vert. 68–72 (9–10+58–63)"] Diagnoses. The latter data are correct (N. Chernova, pers. comm. July 2011). Furthermore, 10+65 equals 75, not 76. On page 267 he listed vertebral counts from 20 specimens identified as *P. devriesi*, ranging from 68–76 vertebrae, and further stated that abdominal vertebrae are "usually 10, rarely 9 or 11". Such great variation in vertebral counts is unusual in other liparid species. These data should be checked, because it's possible that not all the specimens included were *P. devriesi*. The NMNZ and LACM specimens listed above have counts of 71 and 72 respectively, so the lower count is used here.

***Paraliparis ekaporus* n. sp.**
Figs. 33, 34

Holotype. NMNZ P.043688, ripe male, 315 mm TL, 287 mm SL, 71°55.80′ S, 173° 18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043688/1, cleared and stained right pectoral girdle.

Diagnosis. Teeth uniserial in at least posterior halves of both jaws, then forming a gradually wider band anteriorly. V 67, C 7, P 20, radials 4, scapular helve absent. Chin pore single. Head short, HL 18% SL, and broad, HW 96% HL; snout short, 5% SL, 25% HL. Dorsal fin insertion between V 8–9, anal fin insertion between V 16–17. Preanal fin length about 46%, anus-anal fin distance about 31% SL. Body color purplish, snout and pectoral fin edges brown.

Description. Counts. V 67 (15+52), D 60, A 54, C 7, P 20 (14+3+3), radials 4 (3+1), pc unknown, pore formula unknown. Ratios. HL 18.1, HW 17.3, sn 4.6, E 4.4, orbit 6.0, io 6.9, uj 8.4, go 2.1, bd 19.5, preD 31.6, preA ~46, aAf 30.6, UPL 12.6, LPL 12.1% SL. In % HL: HW 95.8, sn 25.2, E 24.3, orbit 33.1, io 38.3, uj 46.2, go 11.6, bd 107.9, preD 174.6, preA ~257, aAf 169.0, UPL 69.9, LPL 66.8, LLD 18.7.

Head short, broad, and low, its width about equal to its length; its dorsal profile flattened at interorbital, then anteriorly rounded ventrally to snout. Snout short. Nostrils on a horizontal with pupil. Mouth horizontal, inferior, oral cleft short, reaching below anterior of eye. Lower jaw included, thick, unusually stout. Teeth simple, sharp canines, uniserial in both jaws for about posterior half of jaw; on premaxilla becoming a narrow band two or three teeth wide near symphysis. Teeth gradually and noticeably smaller anteriorly. Symphyseal gap present in each jaw. Eye prominent, pupil large, ½ to ⅔ eye diameter. Gill opening completely above pectoral fin base, a little more than 10% HL, not quite reaching ventrally to uppermost pectoral fin ray; opercular flap broad, triangular, supported by crescent-shaped almost horizontal opercle, its anterior end only slightly higher than the tip. Pore formula unknown owing to damage; remaining mandibular pores moderately large. Chin pore single, large, oblong, located immediately posterior to front edge of lower jaw and apparently pointing anteroventrally. Suprabranchial pore apparently single, directly above opercular flap.

Pectoral fin well developed, longest ray of upper lobe reaching about mid-abdomen. Uppermost ray on horizontal with mid-pupil. Upper lobe rounded, of 14 rays, notch rays three, the two lower rays rudimentary and very short, but more than just bases. Lower lobe of three rays, insertion of lowest ray below cheek and anterior to opercle, lower lobe reaching almost to posterior tip of upper lobe, posterior third of its rays free. Right pectoral girdle with four (3+1) radials, R1 and R2 large, round, about equal in size; R3 small with narrow rudimentary dorsal notch or slit, roughly D-shaped, flat near posterior edge of endochondral plate; R4 round, smaller than R1 and R2 but larger than R3. Fenestrae absent. Scapula hemicircular, helve absent; coracoid with long slender helve.

Body thick, deepest at about mid-abdomen. Dorsal fin insertion between vertebrae 8–9, anal fin insertion between vertebrae 16–17. First 2–3 caudal vertebrae lack anal fin rays, first anal fin ray poorly developed, buried in tissue. Dorsal and anal fins deepest at about 4/5 of SL posterior. Anus well behind symphysis of lower pectoral fin lobes, below anterior end of opercle and bases of lowest rays of upper lobe. Peritoneum visible through ventral part of abdominal wall. Hypural complex fused, slit absent. Caudal fin of seven (3/4) rays, auxiliary rays absent. SECM poorly developed. Skin thick, fibrous.

Color of body in alcohol purplish, darker on abdomen and caudal region; snout, edges of upper lobe, entire lower pectoral lobe brown, anal region blackish. Orobranchial cavity blackish, peritoneum black, stomach pale, pyloric caeca unknown, rotted.

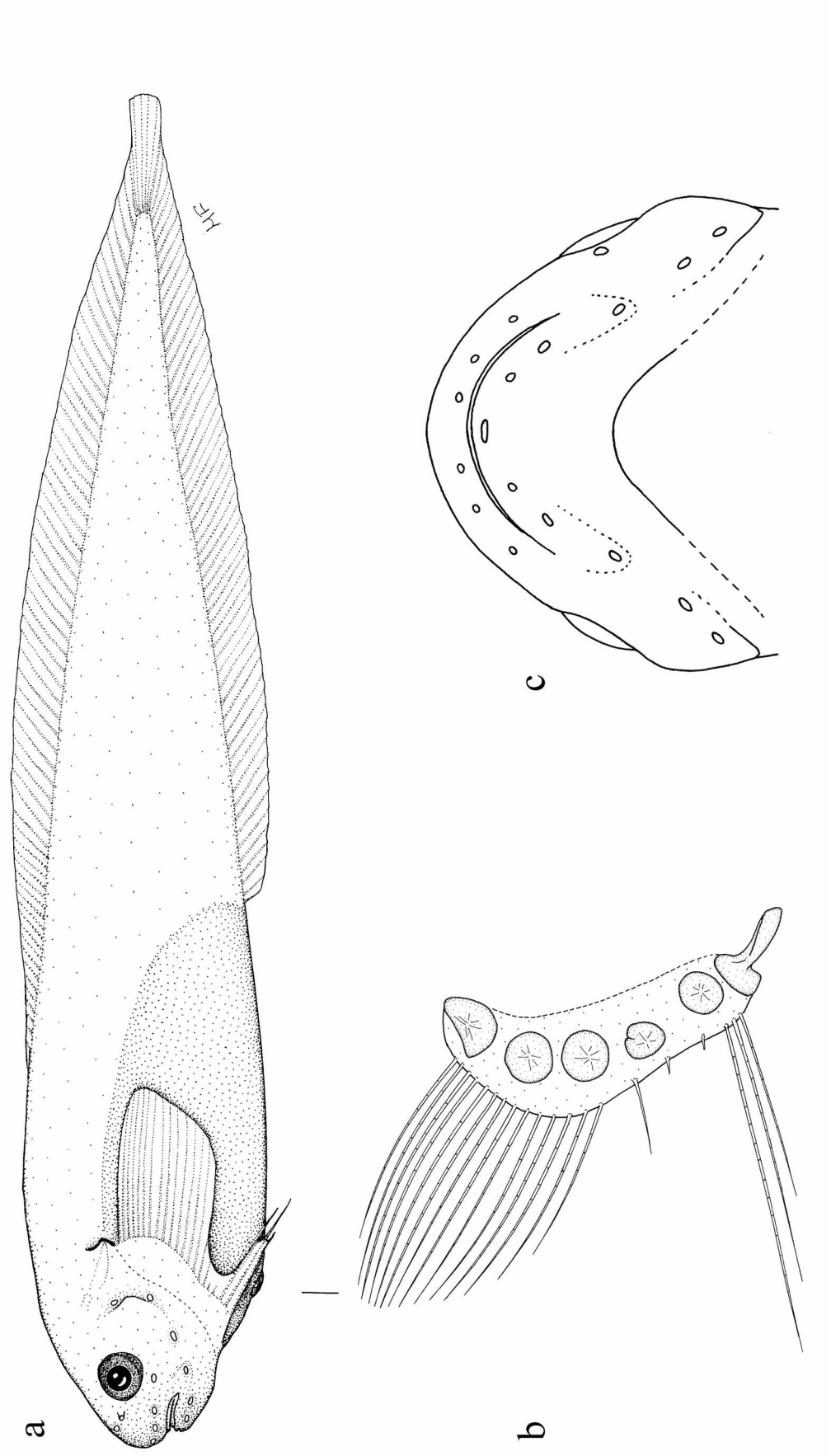

FIGURE 33. *Paraliparis ekaporus* n. sp. NMNZ P.043688, Holotype, 287 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043688/1; c. chin pores.

Distribution. Known only from the type, collected on the northwestern edge of Mawson Bank, Ross Sea, at 1431–1658 m depth.

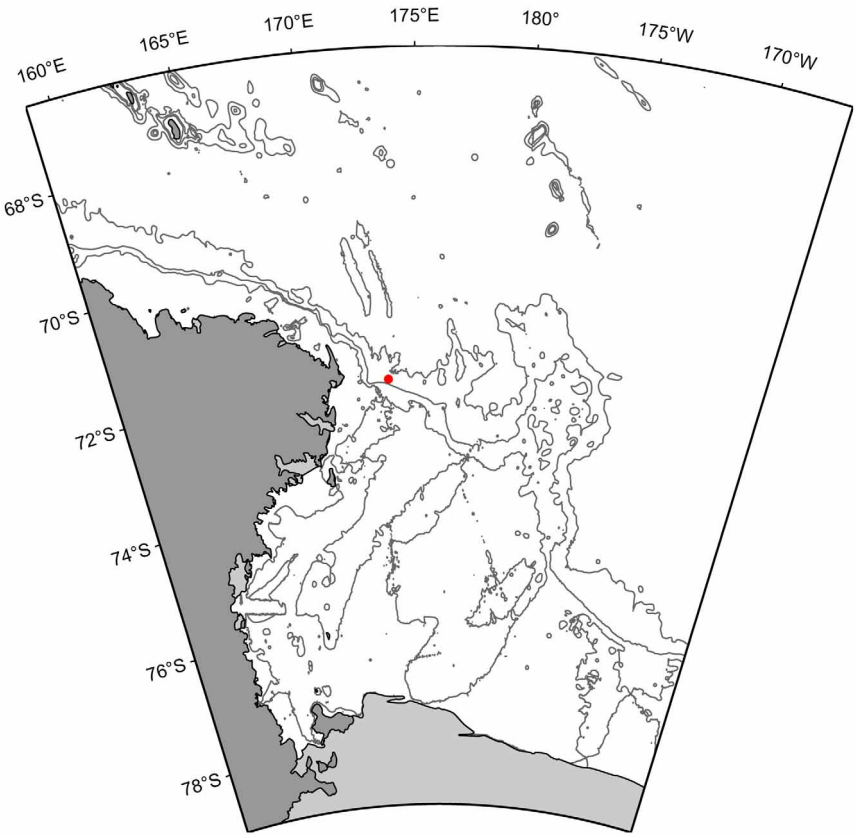

FIGURE 34. Distribution of *Paraliparis ekaporus.*

Etymology. From the Sanskrit *eka*, one, and Greek *poros*, hole, denoting the presence of a single chin pore.

Comparisons. *Paraliparis ekaporus* is most similar to *P. monoporus* but differs distinctly in number of vertebrae (67 vs 72–74), dorsal fin rays (60 vs 63–68), anal fin rays (54 vs 58–62), caudal fin rays (7 vs 6), radials (3+1 vs 2+0+1), and some proportions including body depth (19 vs 26–28% SL), snout length (25 vs 33–35% HL), anus to anal fin distance (31 vs 27–28% SL), and others. It is also similar to *P. haploporus* (see below for comparison). *Paraliparis tetrapteryx* has chin pores opening in a single common oval pore, but differs distinctly in number of vertebrae (76–81 vs 67), pectoral fin rays (26–31 vs 20), the far anterior position of the anus between the bases of the anterior lower pectoral fin lobe rays, and many other characters. *Paraliparis devriesi* is similar in counts and some proportions, but has clearly paired chin pores in a shallow pit; in addition, the new species differs distinctly in its blackish orobranchial cavity (vs pale) and more prominent triangular opercular flap (vs small and shallow).

***Paraliparis epacrognathus* n. sp.**
Figs. 35, 36

Holotype. NMNZ P.043690, male, 281 mm TL, 257 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043690/1, cleared and stained right pectoral girdle.

Diagnosis. V 67, D 60, A 51, C 7, P 21. Lower jaw forming a sharp angle at symphysis; chin pores at symphyseal knob. Teeth primarily uniserial, irregularly biserial near symphysis. Upper and lower jaws long, 53% HL. Pectoral fin notch rays present as rudiments reduced to bases only. Radials 4 (3+1), R1 and R3 smaller than R2 and R4. Coracoid notch absent.

Description. Counts. V 67 (13+54), D 60, A 51, C 7, P 21, pc 5, pore formula unknown. Ratios. HL 17.2, HW 12.3, HD 15.8, sn 5.1, E 3.6, uj 9.2, go 1.9, preD 26.2, preA 41.9, ma 11.9, aAf 27.7, UPL 14.4, LPL 14.2% SL. In

% HL, HW 71.7, HD 91.6, sn 29.4, E 21.0, orbit 26.5, uj 53.4, go 11.3, ma 69.2, preD 152.5, preA 243.4, sna 80.3, aAf 161.1, UPL 83.7, LPL 82.8, LLD 11.3, cp 3.8.

Head deep and compressed, dorsal profile flat, rising steeply from rounded snout to above preopercle; snout low, rounded, projecting a short distance anterior to upper jaw. Nostrils pore-like with thickened rim, opening a short distance anterior to orbit, slightly below horizontal through center of pupil. Mouth subterminal, horizontal, oral cleft reaching to below front of pupil; teeth in both jaws sharp canines. Premaxillary teeth in uniserial row of about 34 except irregularly biserial near symphysis; teeth smaller anteriorly. Mandibular teeth similar but with fewer irregular additional teeth near symphysis. Clear symphyseal gaps in both jaws. Lower jaw triangular, symphysis an acute angle defined by a deep joint. Eye and orbit moderately large, prominent in head; upper edge of orbit defined by interorbital profile but not entering it. Gill opening completely above pectoral fin; opercular flap small, rounded, supported by horizontal crescent-shaped opercle, its tip pointing dorsally. Mandibular pores pale, rims thickened; symphyseal pore pair close, slightly more than one pore diameter apart, located far anteriorly at ventral end of lower jaw symphysis. More posterior mandibular pores larger and more obvious. Remainder of cephalic pores damaged, pore formula unknown.

Pectoral fin distinctly shorter than head, reaching slightly more than half way to abdomen end, its upper ray above a horizontal through mid-pupil. Upper lobe a little more than 80% head, lower lobe of similar length, notch deep, two rudimentary rays present as bases only. Pectoral ray formula 14+3+4, rays in upper and lower lobes distinctly more closely spaced than rays in notch, which are very widely separated from each other. Lower lobe rays free for about half their length. Distance between lower lobes more than 10% head length. Pectoral radials 4 (3+1), small, rounded, oddly sized, R2 and R3 notched. R1 unusually small, R2 much larger, ventral notch sharp and triangular; R3 smallest with broad shallow dorsal notch; R4 largest, round. Scapula axe-shaped, basal plate broadest. Coracoid helve long and slender, ventral basal notch absent, one fenestra in base.

Body gradually tapering from above middle of pectoral fin. Anus located below posterior part of opercular flap. Abdominal cavity long, deep. Predorsal length more than 1 1/2 head length, first dorsal fin pterygiophore insertion between vertebrae 8–9, anal fin insertion between vertebrae 14–15. First anal fin ray rudimentary. Caudal of seven rays (3/4), auxiliary rays absent. Pyloric caeca digitate, matted and flattened against stomach.

Color of skin in alcohol dusky rose, darker anteriorly and ventrally. Pectoral fin upper lobe black-edged, lower lobe rays mostly black. Oral cavity dusky, tongue somewhat paler; branchial cavity blackish, peritoneum black, stomach and pyloric caeca pale.

Distribution. Known only from the holotype, collected off the northwest edge of Mawson Bank, Ross Sea, at 1431–1658 m.

Etymology. From the Greek *epakros*, pointed at the end, and *gnathos*, jaw, to denote the sharply angled lower jaw symphysis.

Comparisons. Because of its primarily uniserial teeth, *Paraliparis epacrognathus* is most likely to be identified as *P. stehmanni*, *P. copei* sensu lato, or *P. neelovi*. It differs clearly from *P. stehmanni* in the absence of the large radials with very deep notches and fenestrae, fewer vertebrae (67 vs 69–71), shorter gill opening (11 vs 15–17% HL), shorter mandible to anus distance (12 vs 13–17% SL) and other characters. Its gill flap (vs none), angular lower jaw symphysis (vs rounded), and anterior chin pore location distinguish it easily from *P. copei*. In addition to having four rather than three radials it differs from *P. neelovi* in having seven (vs six) caudal rays and many proportional ratios just outside the ranges of those of the latter. It could also be mistaken for *P. longicaecus* or *P. plicatus* (see below).

Comments. The endochondral plate and radials of *P. epacrognathus* may be unique in the genus (*P. meganchus* Andriashev 1982b has small radials, but they are noticeably larger), but they may also be anomalous and restricted to this individual. In particular, the small sizes of R1 and R3, and the shallow dorsal notch in R3, are unlike the usual pattern in liparids, in which the size of the dorsal two or three radials decreases ventrally. In addition, where notches are present in the radials, they are usually either triangular or narrow slits, unlike that of R3 in this species. However, regardless of whether these particular characters are anomalous, other characters support designation of the species as new: the sharply angled lower jaw, anterior position and arrangement of the chin pores, presence of four radials in a 3+1 pattern, seven caudal fin rays, and the combination of other characters. Even if this specimen had only 3 radials (2+0+1) it would still not match any described species, owing to its seven caudal rays, chin and chin pore arrangement, and other characters.

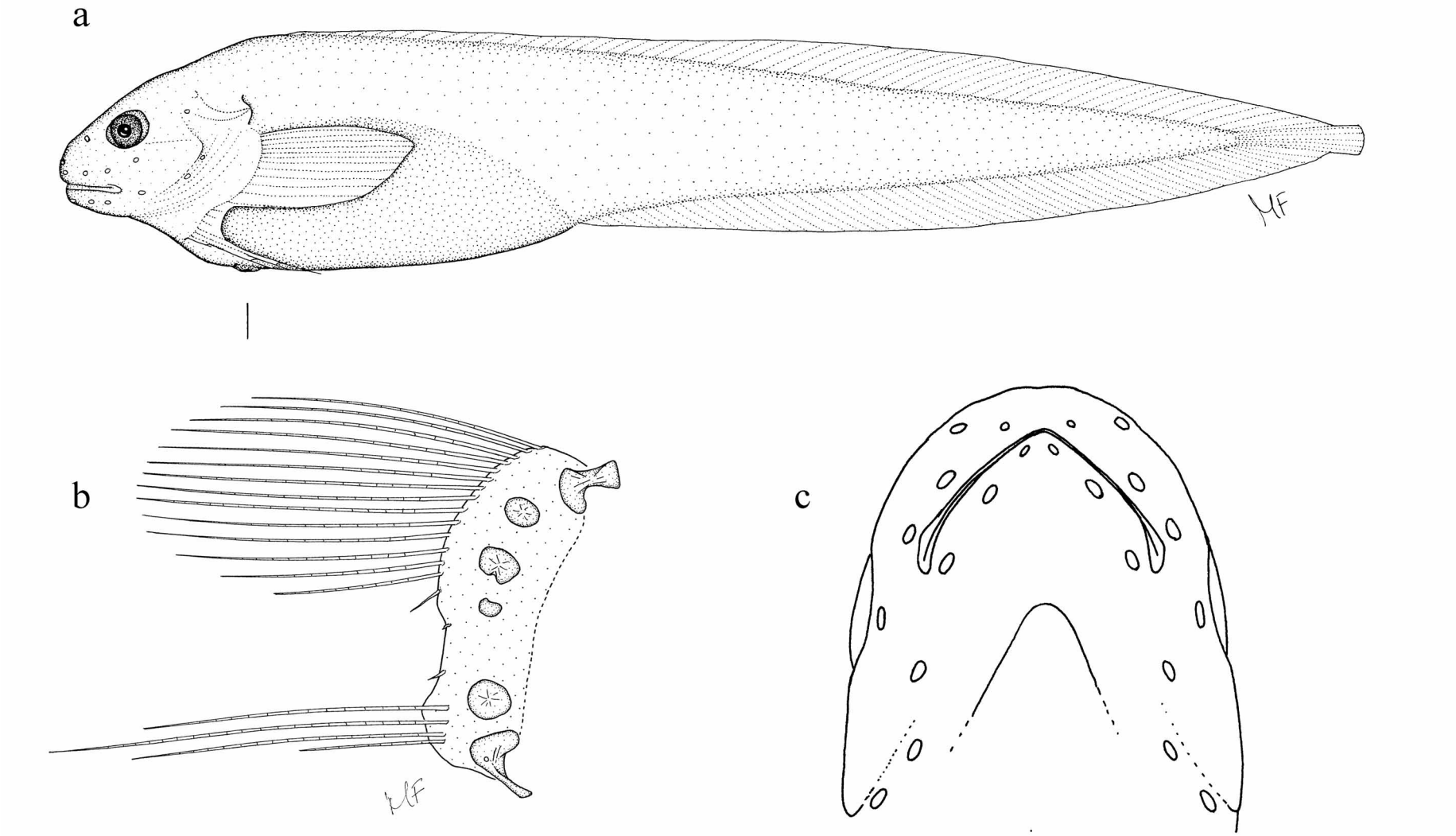

FIGURE 35. *Paraliparis epacrognathus* n. sp. Holotype, NMNZ P.043690, 257 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043690/1; c. chin and chin pores.

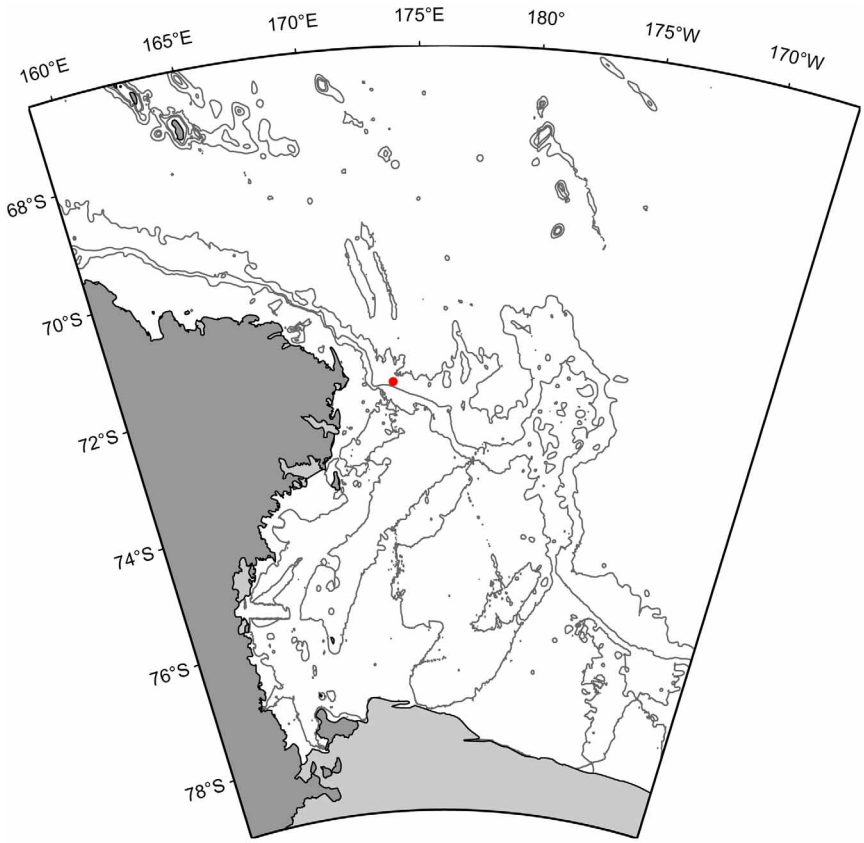

FIGURE 36. Distribution of *Paraliparis epacrognathus.*

Paraliparis fuscolingua Stein & Tompkins 1989

Figs. 37, 38

Paraliparis fuscolingua Stein & Tompkins 1989:5, Figs. 7, 8; Stein & Andriashev 1990:242, Fig. 17; Andriashev 2003:278, Figs. 143, 144.

Holotype. LACM 11351–4, female, >118 mm TL, 115 mm SL, 70°55′ S, 172°59.5′ E, USNS *Eltanin*, Stn. 1867, 13 Jan. 1967, 2273 m.

Material examined. Holotype. Paratype, LACM 11351–7, female, 89 mm TL, 84 mm SL, captured with holotype.

Expanded diagnosis (modified from Stein & Tompkins, 1989). Counts. V 67–68 (9+58–59), D 61–63, A 54–57, C 8 (4+4), P 24–25 (14–16+4–5+5), radials 4 (3+1), pc 8–9, pore formula unknown. Ratios. HL 19.4–19.6, HW 11.8, E 4.3–5.6, uj 9.6–9.9, go 6.2, bd 16.5, preD 20.5–21.3, preA 27.6–30.6, sna 15.8–15.9, ma 12.7–13.0, aAf 14.5–15.8, UPL 13.4, LPL 12.1. In % HL: HW 61.0, E 21.8–29.2, uj 49.8–50.3, go 31.8, ma 64.8–66.8, preD 105.8–108.5, preA 140.6–157.8, aAf 73.9–81.6, UPL 69.0, LPL 62.3.

Head relatively small, snout blunt, rounded. Eyes large, not entering dorsal profile of head. Mouth large, upper jaw extending to below rear of eye. Teeth sharp, recurved canines, forming a narrow band of irregular rows up to four teeth long. A wide symphyseal gap present in upper jaw but not in lower. Gill opening apparently above pectoral fin or in front of 1–2 rays. Anus below interopercle, distinctly nearer tip of mandible than to anal fin origin. Pectoral fin of 24–25 rays; notch moderately deep, its rays more widely spaced, rudimentary rays absent. Radials 4 (3+1), rounded. Scapula with helve, coracoid without helve, ventrally notched. Pyloric caeca short, fat. Tongue and mouth both dusky. Scapula and pectoral radials unnotched.

Distribution. Known from two specimens taken together off Cape Adare at 2273 m.

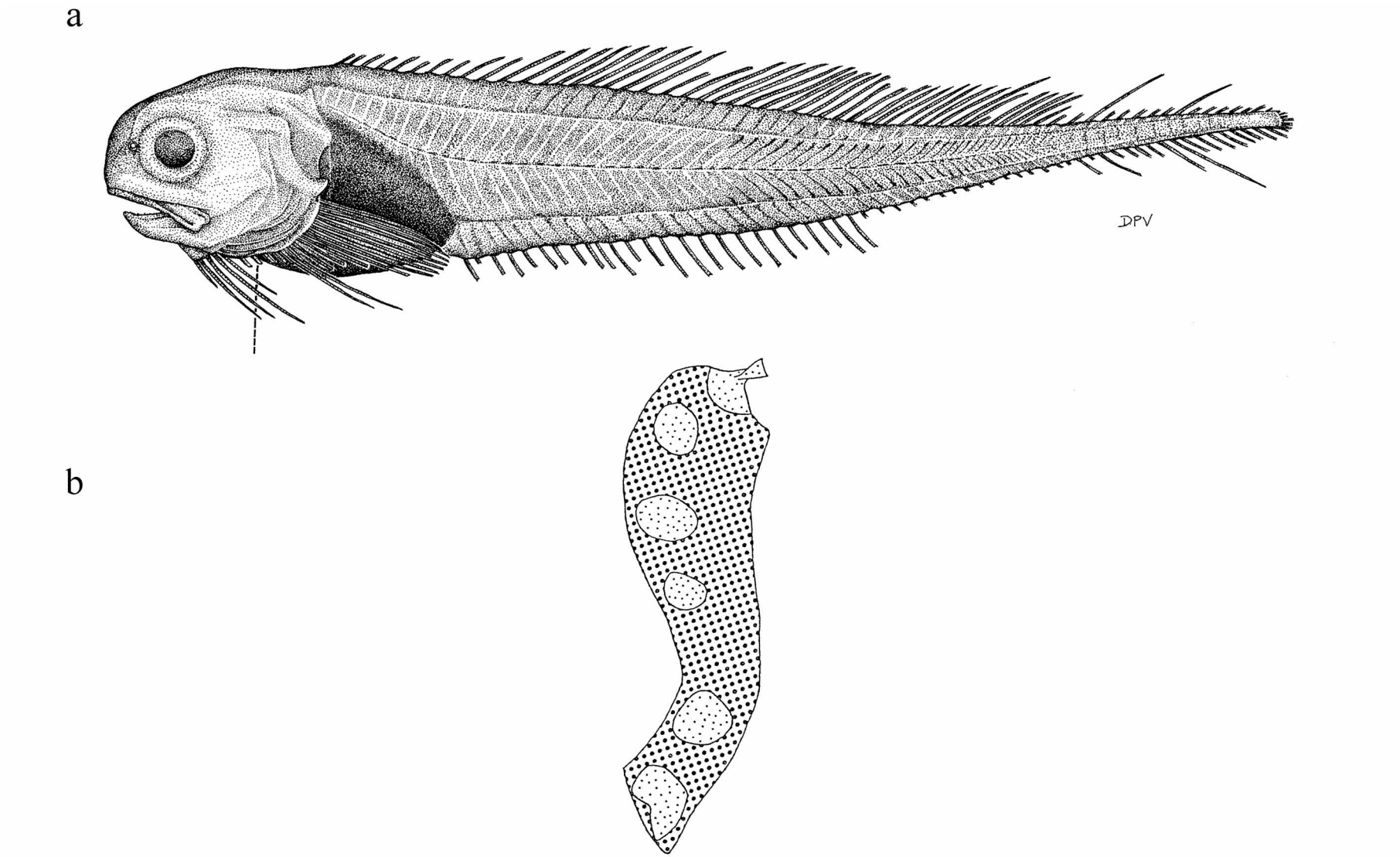

FIGURE 37. *Paraliparis fuscolingua* Stein & Tompkins 1989. Holotype, LACM 11351–4, 115 mm SL. From Stein & Tompkins, 1989: Fig. 7; a. lateral view; b. pectoral girdle, LACM 11351–7.

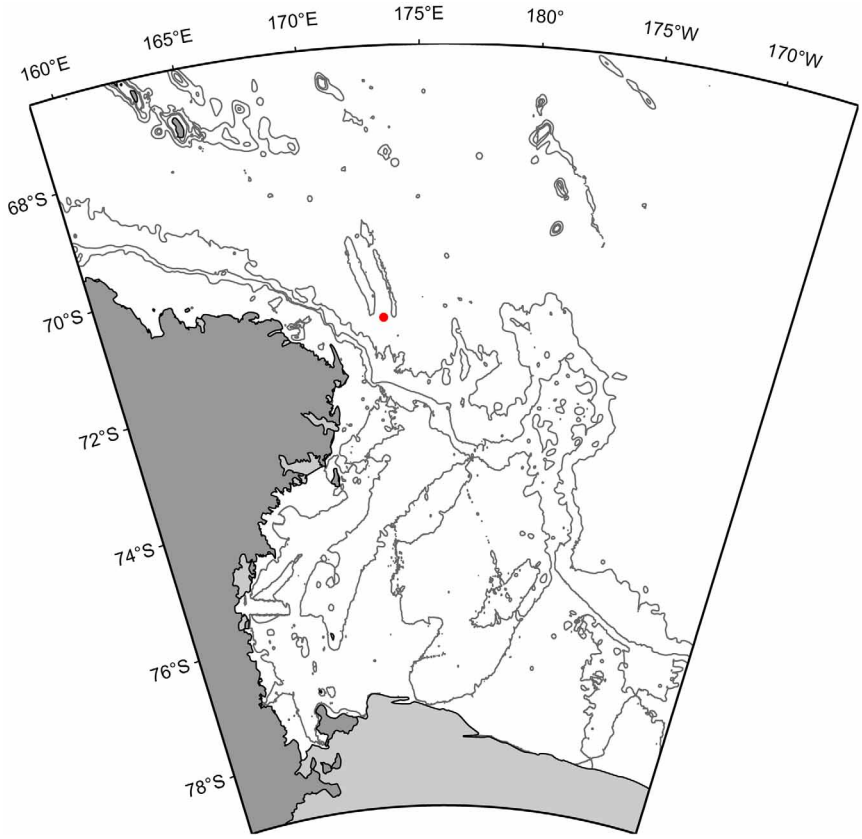

FIGURE 38. Distribution of *Paraliparis fuscolingua.*

Comparisons. *Paraliparis fuscolingua* is most similar to *P. leucoglossus* Andriashev 1986, but differs in tongue color (dusky vs pale), more anterior position of anus (below preopercle vs below posterior of gill flap), distance from mandible to anus (82–88 vs >100% distance from anus to anal fin origin), gill opening apparently above pectoral fin (vs extending ventrally in front of 5–6 rays), and other characters. It is also similar to *P. orbitalis* (see that description for comparison).

***Paraliparis haploporus* n. sp.**
Figs. 39, 40

Holotype. NMNZ P.046423, immature female, TL unknown, 88 mm SL, 71°52.37′ S, 174°04.28′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.046423/1, cleared and stained right pectoral girdle.

Diagnosis. Chin pore single, round. Teeth tiny, simple canines in oblique rows forming moderately wide bands in both jaws. V 75, P 22–23. Head short, HL 18% SL, HW 10% SL, 59% HL, eye not large, 16% HL. Radials 3 (2+0+1). Preanal fin length 33%, preanus length 16%, anus-anal fin distance 17% SL. Pectoral fin upper lobe about 93% HL. Body color probably dark brown.

Description. Counts. V 75 (10+65), D 68, A ~63, C na, P 22–23 (16+2–3+4), radials 3 (2+0+1), pc >3, pore formula unknown. Ratios. HL 17.6, HW 10.3, sn 5.3, E 2.8, orbit 5.4, io 6.7, uj 7.6, go 2.2, bd 15.9, preD 22.7, preA 33.0, aAf 17.3, UPL 16.4, LPL 12.5. In % HL: HW 58.7, sn 30.3, E 16.1, orbit 31.0, io 38.1, uj 43.2, go 12.2, bd 90.3, preD 129.0, preA 187.1, aAf 98.1, UPL 92.9, LPL 71.0.

Head short, narrow, and low, its dorsal profile rising at a shallow angle from snout to behind orbit. Snout short, blunt. Nostrils on a horizontal with upper half of pupil. Mouth horizontal, subterminal, oral cleft short, barely reaching anterior margin of orbit. Lower jaw included. Teeth in both jaws simple, tiny canines, in about 15 oblique rows of up to about seven teeth each, forming moderately wide bands nowhere uniserial. A narrow gap present at premaxillary symphysis, a wide one in mandible. Eye about 1/6 HL, not prominent. Gill opening short, completely

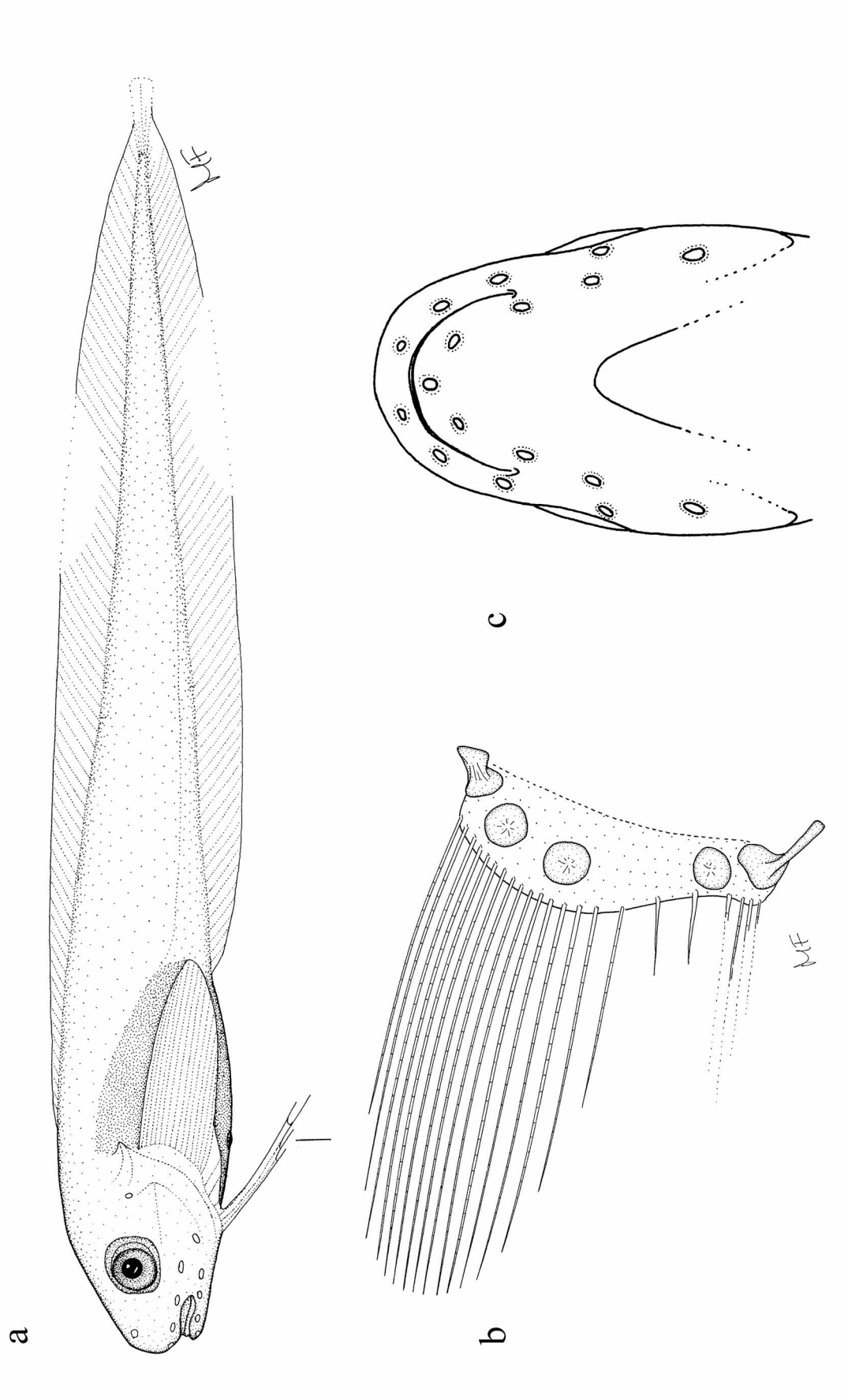

FIGURE 39. *Paraliparis haploporus* n. sp. Holotype, NMNZ P.046423, 88 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.046423/1; c. chin pores.

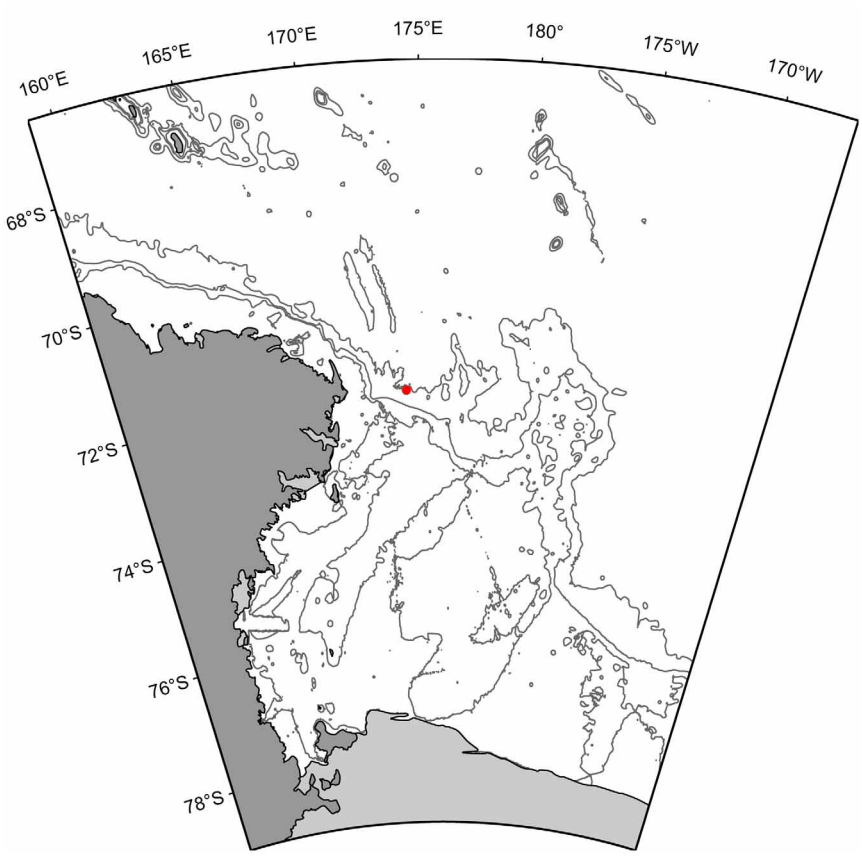

FIGURE 40. Distribution of *Paraliparis haploporus.*

above pectoral fin base, a little more than 10% HL, not reaching ventrally to uppermost pectoral fin ray. Opercular flap obtusely triangular, opercle crescent-shaped, almost horizontal, its anterior end slightly higher than tip. Pore formula unknown owing to damage and absence of skin; remaining mandibular pores moderately large. Chin pore single, large, round, not in a pit or depression, located ventrally near tip of lower jaw; openings of mandibular sensory canals clearly visible in each side of pore. Remaining pores all of similar size, rims pale and thickened.

Pectoral fin well developed, longest ray of upper lobe reaching to end of abdomen and first anal fin ray. Uppermost ray on horizontal with lower margin of pupil, about four rays higher than tip of suborbital stay. Upper lobe of 16 rays, sharp tipped with dorsal rays longest, reaching to about end of body cavity; notch rays two or three, well developed, lower lobe of four rays. Notch rays not distinct from lower rays of upper lobe. Insertion of lowest ray below mid-cheek and anterior to opercle, lower lobe reaching about 2/3 back on abdominal cavity, its tip below bases of lower rays of upper lobe. Radials 3 (2+0+1), round, lacking notches or fenestrae, poorly calcified and stained. Scapula double headed, distal end stout and broad. Coracoid with exceptionally long, slender helve.

Body laterally compressed, deepest about at mid-abdomen. Dorsal fin insertion between vertebrae 5–6, anal fin insertion between vertebrae 10–11. Dorsal and anal fins deepest behind half body length. Anus about below tip of opercular flap, below bases of most ventral upper lobe rays. Peritoneum visible through abdominal wall. Pyloric caeca at least three, short and fat. Hypural complex fused, slit absent. Caudal fin rays missing. Skin thin, fragile.

Color in life was probably black or blackish; remnants of skin on lower jaw and front of head dark brown. Orobranchial cavity dusky, peritoneum black, stomach and pyloric caeca pale. A thin dark line along ventral midline of abdominal cavity.

Distribution. Known only from the type, collected on the northwestern edge of Mawson Bank, Ross Sea, at 1954–1990 m depth.

Etymology. From the Greek *haplos*, single, and *poros*, hole, indicating the single chin pore.

Comparisons. In having a single chin pore, *Paraliparis haploporus* is similar to *P. monoporus* and to *P. ekaporus* (see above). It is distinguished from the former by its shorter preanal fin length (33 vs 42% SL), much narrower head (about 10 vs 14–17% SL) and interorbital distance (38 vs 55% HL), and its smaller eye (16 vs about 22%

HL). It differs clearly from the latter in its banded teeth (vs posteriorly uniserial), having three (vs four) radials, more dorsal fin rays (68 vs 60), more vertebrae (75 vs 67), smaller eye size (16 vs 24% HL), head width (10 vs 17% SL), shorter predorsal and preanal fin lengths (23 and 33 vs 32 and 46% SL), and shorter anus to anal fin distance (17 vs 31% SL).

***Paraliparis longicaecus* n. sp.**
Figs. 41, 42

Holotype. NMNZ P.043691, male, 274 mm TL, 254 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043691/1, cleared and stained right pectoral girdle.

Diagnosis. V 69, P 21, C 7. Radials 4 (3+1), R1, R3 notched; scapula with helve, coracoid with basal notch. Chin pores paired, surrounding tissue fold probably present. Teeth sharp canines. Premaxillary teeth about 30, decreasing in size anteriorly, uniserial except near symphysis, where irregularly bi-or tri-serial for about12 teeth; mandibular teeth smaller, uniserial, about 50. HL 19% SL, upper jaw about 43% HL, preanal fin length about 230, anus-anal fin origin about 130, chin pore interspace 4% HL. Pyloric caeca ~70% HL. Body color pale rosy white.

Description. Counts. V 69 (14+55), D 59, A 52, C 7, P 21 (14+3+4), radials 4 (3+1), pc 7, pore formula unknown. Ratios. HL 18.6, HW na, sn 5.3, E 3.7, orbit 5.6, io 8.4, uj 7.9, go 2.8, bd na, preD ~33, preA 43.3, sna 16.2, ma 13.3, aAf 25.5, UPL 13.0, LPL 16.2, pcl 13.1. In % HL: HW na, sn 28.8, E 19.7, orbit 29.9, io 45.1, uj 42.6, go 15.0, ma 71.4, preD ~180, preA 232.8, sna 87.3, aAf 137.1, UPL 70.1, LPL 87.5, LLD 21.2, cp 3.8, pcl 70.8.

Head short and deep, dorsal profile rising steeply through flat interorbital region. Snout short. Nostrils with thickened raised rim, larger than nasal pores; anterior to orbit by about half eye diameter, on horizontal through mid-pupil. Mouth horizontal, inferior, oral cleft reaching below anterior third of orbit. Teeth simple, sharp canines, uniserial posteriorly in both jaws. About 30 premaxillary teeth in upper jaw, much smaller anteriorly; about 12 irregularly biserial inner teeth near symphysis. Mandibular teeth uniserial, about 50, becoming smaller anteriorly, extending much farther posteriorly than premaxillary teeth. Symphyseal gap present in both jaws. Eye prominent, pupil very large, almost equal to eye diameter. Interorbital space slightly less than half head length. Gill opening completely above pectoral fin base and directly above base of dorsal pectoral fin ray but not reaching it, its length less than1/6 head; opercular flap small, in shape an angle formed by opercle tip, its posterior margin vertical. Chin pore pair well separated, slightly smaller than those more posterior, the distance separating them about equal to two pore diameters. Surrounding skin damaged on left side, right side with clear tissue fold, possibly completely surrounding pore pair. Pore formula unknown.

Pectoral fin moderately short, upper lobe less than 3/4 HL, its longest ray not reaching midpoint of abdominal cavity. Uppermost ray on horizontal with middle of eye. Upper lobe rounded, of 14 rays, notch deep, notch rays three, well developed and long, but rudimentary (unsegmented, filamentous); lower lobe of four rays, insertion of lowest ray below cheek. Lower lobe longer than upper but not reaching to below tip of upper lobe. A wide gap equal to about 1/5 HL present between lower pectoral fin lobes. Right pectoral girdle with four (3+1) round radials; R2, R4 similar in size, larger, R1 and R3 slightly smaller. R1 with a small ventral notch, R3 dorsally notched. No fenestrae evident. Scapular helve well developed, blade larger and broader. Coracoid helve stout, broad, a deep basal notch present.

Body thick, deepest behind head above abdominal cavity. Dorsal fin insertion between vertebrae 9–10, anal fin insertion between vertebrae 15–16. Dorsal and anal fins deepest at about 4/5 of SL towards tail. Anus well behind bases of lower pectoral fin lobes, below upper lobe base and anterior to gill flap. Peritoneum visible through body wall. Pyloric caeca seven, very long, longest about ¾ HL. Hypural complex fused, slit absent. Caudal fin of seven rays (3/4), auxiliary rays absent. SECM apparently not well developed. Skin thick, fibrous.

Color of body in alcohol purplish brown, head, distal part of upper pectoral fin lobes, and lower lobe rays blackish brown, anal region blackish. Orobranchial cavity dusky-blackish. Peritoneum black, stomach and pyloric caeca pale.

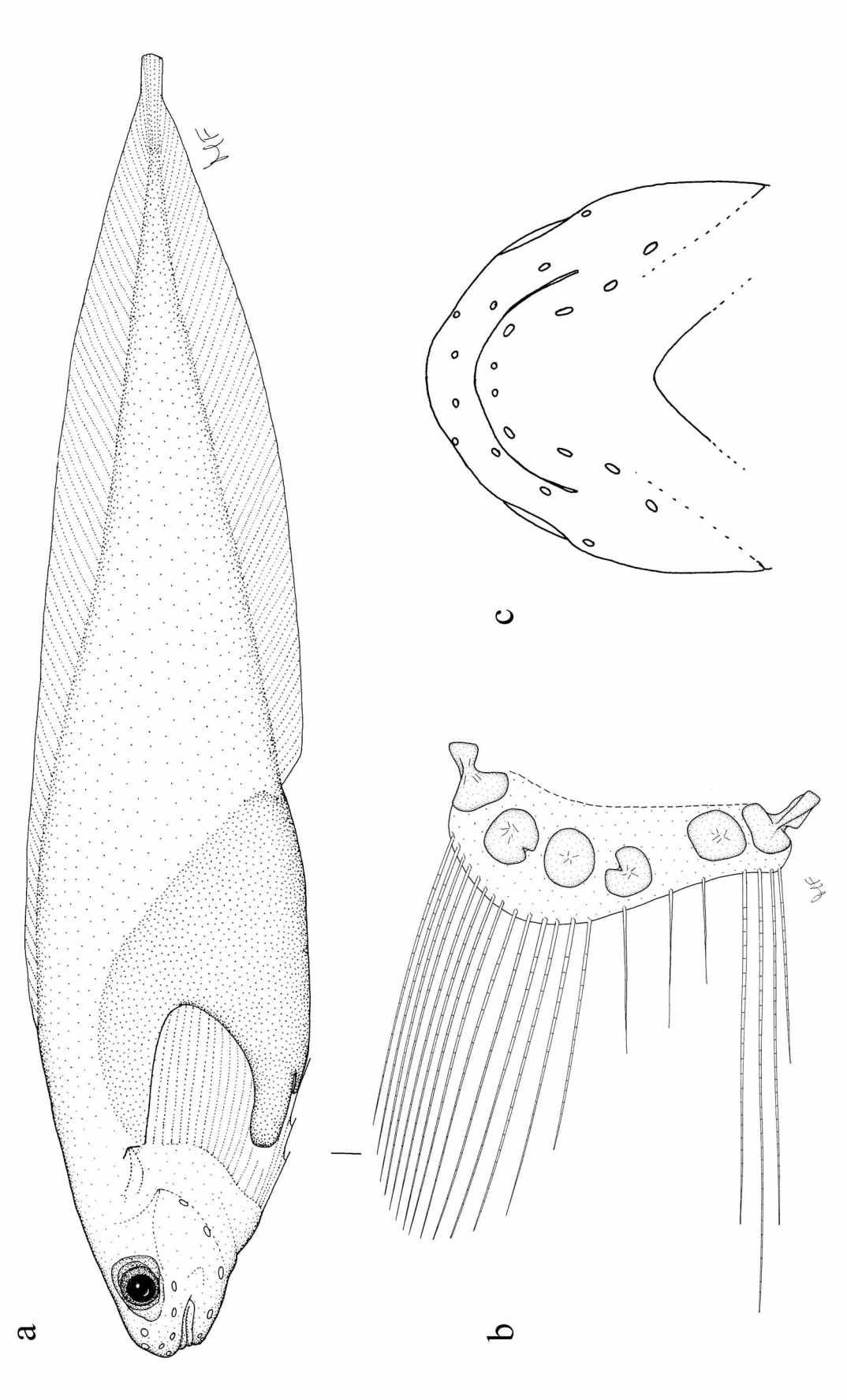

FIGURE 41. *Paraliparis longicaecus* n. sp. Holotype, NMNZ P.043691, 254 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043691/1; c. chin pores.

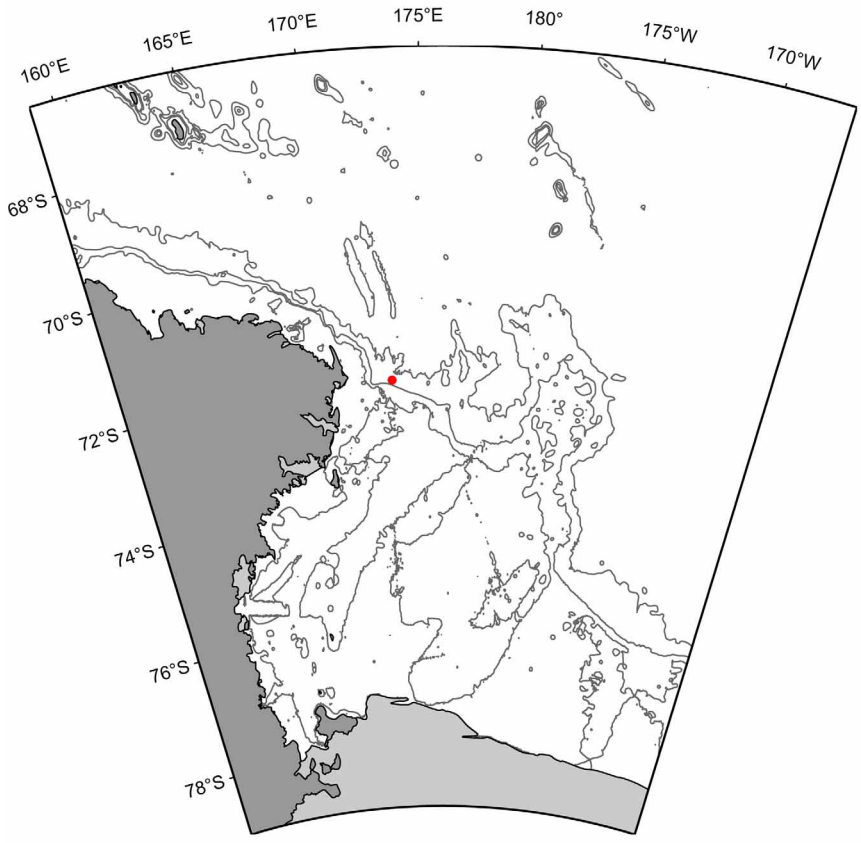

FIGURE 42. Distribution of *Paraliparis longicaecus.*

Distribution. Known only from the type, collected between 1431–1658 m on the northwest edge of Mawson Bank.

Etymology. *Longicaecus* from Latin *longus*, long, and *caecus*, blind, to denote the unusually long pyloric caeca of the holotype.

Comparisons. Most similar to *P. alius* in counts (except for caudal fin rays, 7 vs 6) and many proportions, and in having long pyloric caeca (71 and 63% HL respectively). It differs from P. *alius* in having a more posterior dorsal fin insertion (V 9–10 vs 6–7), longer lower pectoral lobe (16 vs 12% SL), the anus farther forward, resulting in a shorter mandible to anus distance (71 vs 93% HL), shorter snout to anus (87 vs 109), shorter preanal fin length (233 vs 283), and shorter anus to anal fin length (137 vs 174). Although the *P. longicaecus* specimen is an adult male, and that of *P. alius* an adult female, it's unlikely that the preceding differences are the result of sexual dimorphism because *P. longicaecus* not only differs in caudal ray number but also in pectoral girdle structure, having notched R1 and R3 (vs unnotched) and notched coracoid (vs unnotched). It is also similar to *P. plicatus* in counts and proportions (see below) and may lack a chin pore fold, which can't be positively determined owing to damage. *P. longicaecus* can also be distinguished from *P. plicatus* and from most other species by its very long pyloric caeca (almost ¾ HL). It differs from *P. epacrognathus* in having three well developed but unsegmented (rudimentary) pectoral notch rays (vs reduced to bases only), rounded lower jaw symphysis (vs sharply angled), chin pores farther posterior (vs at jaw tip), longer gill opening of about 15% HL (vs 11%), and longer snout to anus distance of about 87% HL (vs 80).

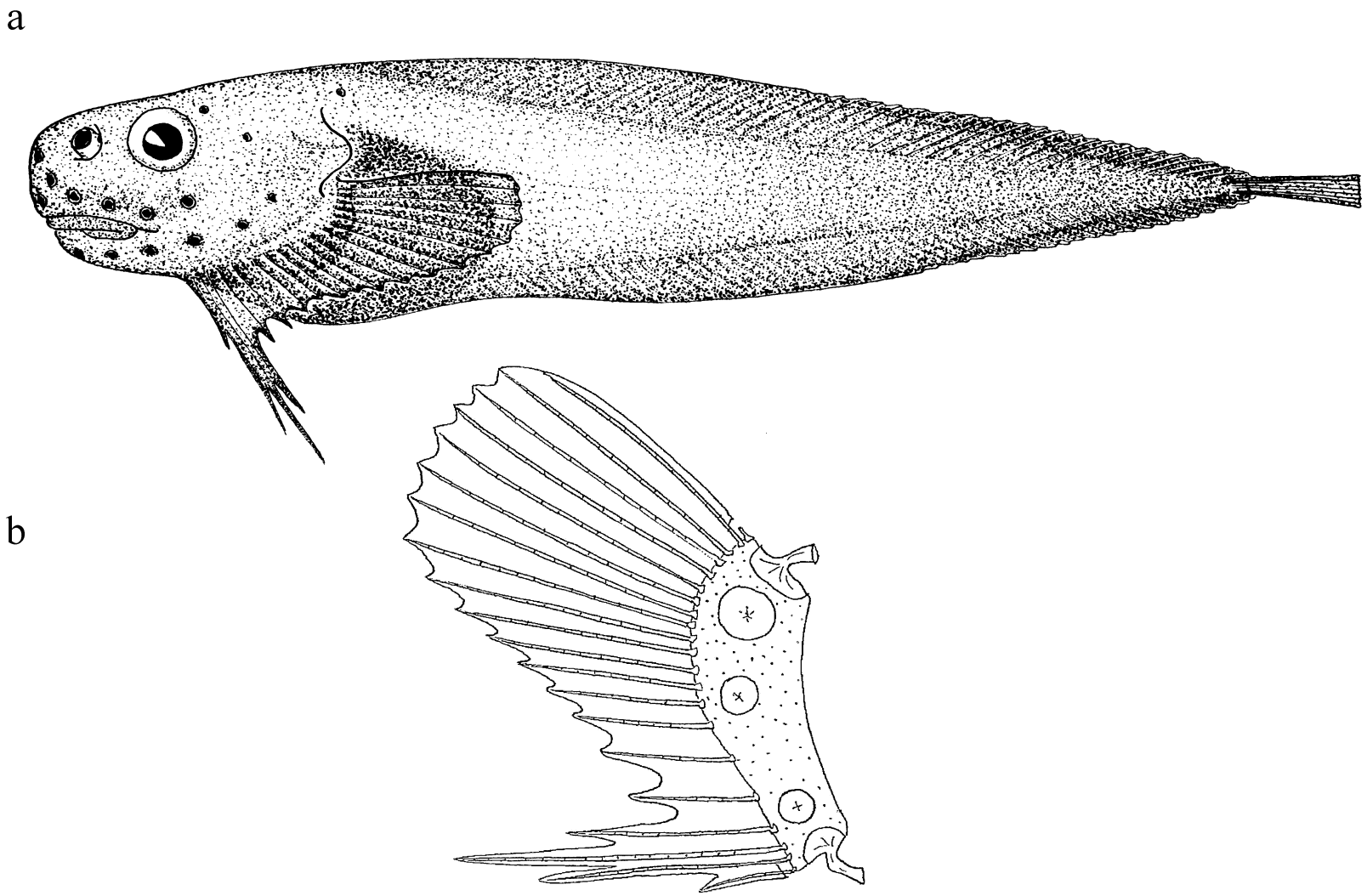

FIGURE 43. *Paraliparis macrocephalus* Chernova & Eastman 2001. Holotype, USNM 361866, 104 mm SL. (Figures 1a, 1b from Chernova & Eastman, 2001: Figs. 1, 3; a. lateral view; b. pectoral girdle, USNM 361866.

FIGURE 44. *Paraliparis macrocephalus*. Holotype, USNM 361866, 104 mm SL. Photograph of fresh specimen by J. Eastman.

***Paraliparis macrocephalus* Chernova & Eastman 2001**
Figs. 43, 44, 45

Paraliparis macrocephalus Chernova & Eastman 2001:93, Figs. 1–4a; Andriashev 2003:310, Figs. 162, 163.

Holotype. USNM 361866, male, 116 mm TL, 104 mm SL, 75°03′60” S, 165°12′30” E, R/V *N.B. Palmer*, Cruise 97–9 Stn. 34, 28 December 1997, 1181–1191 m.

Material examined. None.

Expanded diagnosis (modified from Chernova & Eastman, 2001). Counts. V 56 (10+46), D 49, A 43, C 9 (4/5), P 20 (14+2+4), radials 3 (2+0+1), gr 7, pc 6, pores 2–6–7–1. Ratios. HL 28.0, HW 18.5, sn 12.0, E 5.6, io 17.0, uj 13.6, go 7.8, bd 21, preD 30.0, preA 38.0, ma 18.2, aAf 17.2, UPL 16.8, LPL 18.5, pcl 5% SL. In % HL: HW 66, sn 43, E 20, io 60.7, uj 48.6, go 27.9, bd 75, UPL 60, LPL 66.

Head large, snout large and gelatinous, blunt, and deep, its length almost twice eye diameter. Nostril large, tubular, its diameter and length about 1/3 eye. Mouth horizontal, subterminal, oral cleft reaching to below anterior margin of pupil. Teeth simple, conical, bluntly pointed, forming moderately wide bands of about five teeth in a row near symphysis. Symphyseal gap absent in both jaws. Eye about 1/5 HL. Interorbital wide, almost 2/3 HL. Cephalic pores large, with thickened rims. Symphyseal pores not closely set, not much closer together than more posterior pores, not in a depression or pit, their diameter significantly smaller than those more posterior. Gill opening less than 1 ½ eye diameter, above and reaching ventrally in front of 2–3 pectoral fin rays. Anus about midway between mandibular symphysis and anal fin origin, distinctly forward of gill opening. Dorsal ray of upper pectoral fin lobe on horizontal with lower margin of eye, lobe reaching anal fin origin; notch moderately deep, notch rays well developed, not rudimentary, their spacing markedly wider than that of upper and lower lobe rays; lower lobe longer than upper, but not reaching to below upper lobe tip, its lowest ray below posterior margin of eye. Radials 3 (2+0+1), round, unnotched. Abdomen long, preanal fin distance almost 1 ½ head, more than 1/3 SL. Dorsal and anal fins overlap caudal by 20–25% its length. SECM well developed, especially on head, and dorsal and anal fins. In life, body pink; in alcohol, pale, grayish postabdominally. Peritoneum and gill cavity black, stomach and pyloric caeca pale.

Distribution. The holotype and only known specimen was caught in the Drygalski Trough along the shore of the Victoria Land Coast at 1181–1191 m.

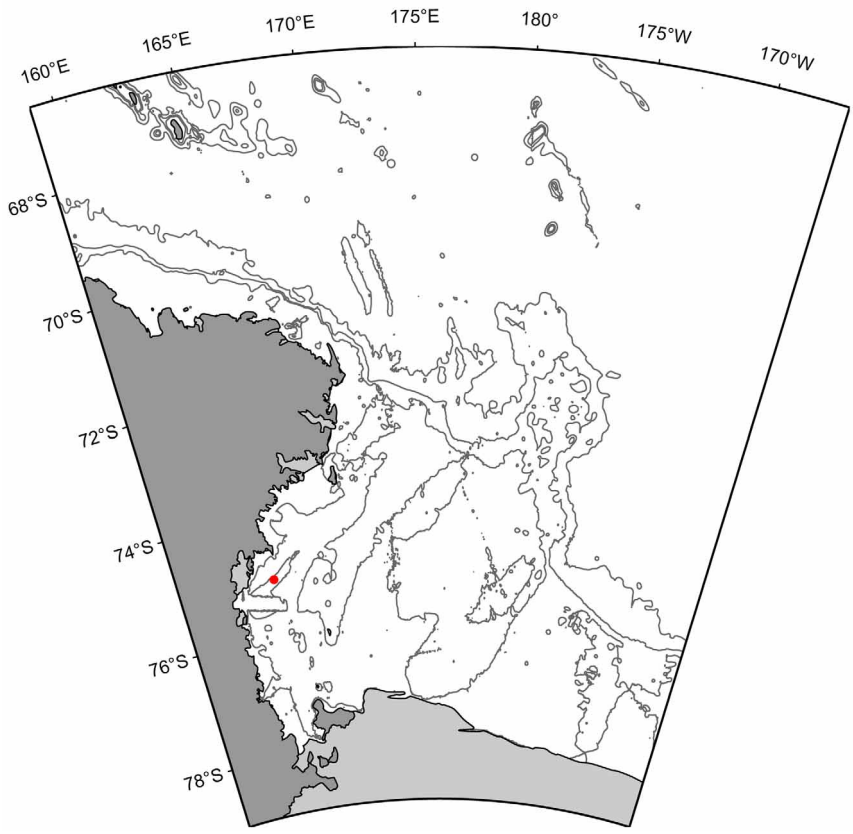

FIGURE 45. Distribution of *Paraliparis macrocephalus.*

Comparisons. This species is similar to *P. hubbsi*, *P. valentinae*, and *P. somovi* in counts, short gill opening, notched pectoral fin without rudimentary rays, and black peritoneum and gill cavity. It differs from all of them in its subterminal (vs clearly inferior) mouth, radials (3 small vs 4 large), head length (28 vs 20–24% SL), large gelatinous snout (43 vs 19–35% HL), interorbital width (61 vs 33–46% HL), and gill opening (extending ventrally in front of 2–3 rays vs 3–7).

***Paraliparis macropterus* n. sp.**
Figs. 46, 47, 48

Holotype. NMNZ P.043716, male, 199 mm TL, 177 mm SL, 71°52.37′ S, 174°04.28′ E, NW edge of Mawson Bank, *R/V Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. **Paratypes**, NMNZ P.049141, male, 256 mm TL, 226 mm SL, NMNZ P.038592, >232 mm TL, male, 217 mm SL, 72°04.39′ S, 176°31.56′ E, Iselin Bank, F/V *San Aotea II*, Stn. OBS 1595A/026, 3 February 2002, 1133–1361 m; P.038592/1, cleared and stained right pectoral girdle. NMNZ P.038582, male, 222 mm TL, 201 mm SL, 71°09.76′ S, 176°25.48′ E, northern Iselin Bank, F/V *San Aotea II*, Stn. OBS 1595A/012, 30 January 2002, 1228–1312 m.

Diagnosis. V 66–67 (9–10+56–57), P 14–15 (10+1–2+3), notch rays rudimentary; gill opening long, 71–74% HL, extending over all or almost all rays, to base of lower pectoral-fin lobe; UPL 34–36% SL, extending to 14th or 15th anal-fin ray; LPL 23–28% SL, extending posteriorly to at least second or third anal-fin ray; pectoral radials 4. HL 18–25% SL. A distinct notch present at symphysis of premaxillae, matching a protrusion at symphysis of lower jaw.

Description. Counts. V 66 (66–67; 9–10+56–57), D 60 (60–62), A 54 (~53–55), C9 (8–9), P 15 (14–15), radials 4 (3+1), pc ~5, pores 2–5–7–1. Ratios. HL 25.6 (~18.4–23.7), HW 15.6 (13.7–15.1), HD ~20, sn 7.4 (6.7–7.0), E 3.7 (3.4–4.0), orbit 8.0 (6.0–7.3), uj 13.3 (13.0–13.2), go 18.1 (16.8–17.3), preD 28.7 (25.8–29.0), preA 37.6 (33.7–36.7), sna 19.1 (18.4–19.8), ma 15.4 (12.0–15.5), aAf 18.9 (17.1–17.9), UPL 36.8 (34.2–36.6), LPL 28.7 (23.6–25.5), pabd 21.6 (19.1). In % HL, HD ~87, sn 29.1 (28.2–30.0), E 14.5 (14.6–17.3), orbit 31.1 (25.6–30.7), uj 51.8 (55.5–55.7), go 70.7 (70.7–74.2), ma 60.1 (57.1–66.4), preD 111.9 (108.9–124.5), preA 146.5 (157.3), aAf 73.6 (76.8), UPL 143.4 (150.7–154.4), LPL 111.9 (101.3–102.1), LLD 10.6 (10.1–12.0), pabd 84.4 (82.0).

Head large, deep, its depth about 4/5 its length, dorsal profile sloping gradually downwards to high blunt snout. Mouth horizontal, subterminal. Upper jaw reaching to below rear margin of orbit or behind it, oral cleft reaching to below mid-pupil. Upper jaw deeply incised below snout. Both upper and lower jaws with wide gaps at symphysis, the lower with convex projection fitting into concavity of symphyseal gap in upper jaw. Premaxillary teeth simple, sharp canines, the largest slightly recurved, in about 38 oblique rows of 4–8 teeth each, forming a narrow band about five teeth wide; anterior teeth very irregularly arranged. Lower jaw teeth larger than premaxillary teeth, arranged similarly. Eye prominent but not large; orbit much larger than eye. Nostrils not tubular, about horizontal with middle or upper half of pupil. Gill opening exceptionally long, extending from above pectoral upper lobe ventrally over almost all rays. Tips of four branchiostegal rays entering margin of opercular membrane below opercle; opercular flap extending posterior to pectoral fin girdle and ray bases and covering them. Chin pores unusually widely separated, the distance between them about 4–5 pore diameters, a little less than 1/3 eye. All pores similar in size, none with raised rim. Pore formula unusual, 2–5–7–1.

Pectoral fin broad-based, deeply divided into two prominent exceptionally long lobes. Dorsal pectoral fin ray about on a horizontal through posterior of upper jaw or slightly higher, distinctly below lower margin of orbit. Upper lobe of ten closely spaced rays, lower of three rays, one to two rudimentary fin rays present only as ray bases in notch, creating a wide gap between lobes. Upper and lower fin lobes barely connected by membrane or continuation of skin between them. Upper lobe reaching far behind anal fin origin, to about 14th ray; lower lobe rays reaching to about second or third ray. Anteriormost lower lobe ray below posterior margin of orbit. Bases of lower lobe rays well separated by a distance equal to about 1/10 of HL, all three rays free for almost their entire length. Radials four (3+1), large, round, unnotched; ventralmost with a fenestra. Scapula triangular, helve absent; coracoid helve long, lobate, basal notch absent.

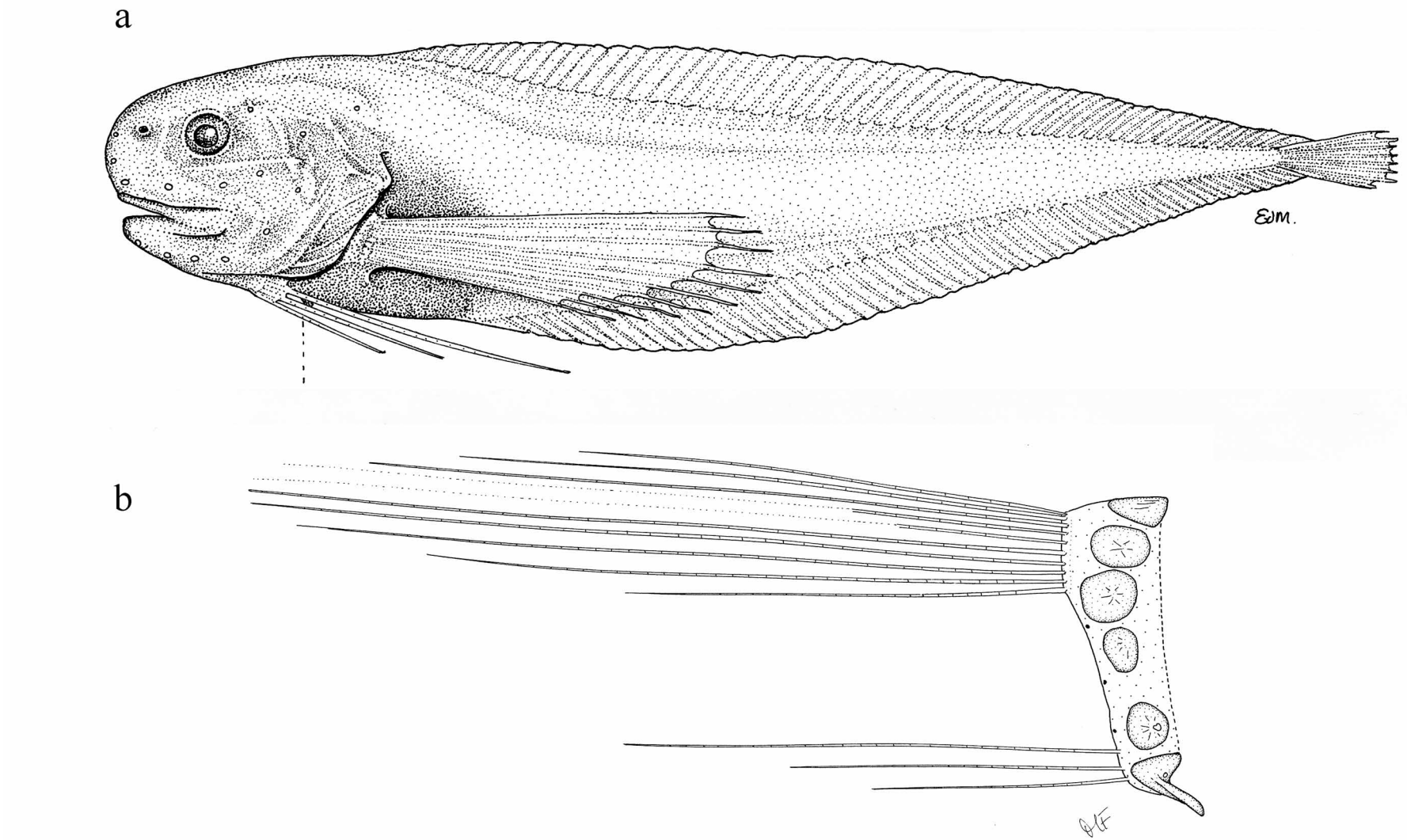

FIGURE 46. *Paraliparis macropterus* n. sp. Holotype, NMNZ P.043716, 177 mm SL; a. lateral view, Erika MacKay; b. pectoral girdle, NMNZ P.038592/1.

FIGURE 47. *Paraliparis macropterus* n. sp. Holotype, NMNZ P.043716, 177 mm SL. Photograph of fresh specimen by P. Marriott.

Body tapering slowly to caudal fin. Dorsal fin insertion between neural spines 4–6, anal fin insertion between vertebrae 10–13. Abdominal part of spine strongly curved dorsally above abdominal cavity but not forming an externally obvious hump. Anus position posterior to pupil by about 2/3 distance between pupil and tip of opercular lobe, completely forward of the latter. A small, black, pointed genital papilla present. Abdominal cavity large, peritoneum visible through body wall and skin. Hypural fused, no slit evident; caudal-fin rays 8–9 (4/4, 4/4+1), a single ventral procurrent ray may be present. Skin thin, translucent, easily damaged.

Color in life uniformly pink (Fig. 47). In alcohol, skin translucent white; oral cavity dusky grayish, branchial cavity blackish. Peritoneum black, stomach pale with black veining.

Distribution. Known from three trawls taken on Iselin Bank and NW Mawson Bank at depths between 1133–1990 m.

Etymology. From the Greek *makros*, long, and *pteron*, fin, to note the unusually long pectoral fin upper lobe.

Comparisons. The new species is so distinct that it cannot easily be confused with others. It has slightly fewer pectoral-fin rays than any other reported Antarctic *Paraliparis* species: *P. gracilis* and *P. thalassobathyalis* Andriashev 1986 have 15–17 (Andriashev 2003), but the former has 67–74 vertebrae (vs 66–67), and the latter (including all subspecies) has 52–59, and neither has the gill opening extending ventrally in front of more than 3 pectoral-fin rays (vs from above the pectoral fin to the base of the lower pectoral-fin lobe). Its gill opening length is also similar to that of *P. antarcticus*, which is strikingly different in its much shorter pectoral fins (66–87 vs 143–154% HL), many more pectoral rays (23–28 vs 14–15), different peritoneum color (pale vs blackish), and other characters. In addition, no other *Paraliparis* has the pectoral fin upper lobe reaching the 14th or 15th anal-fin ray and the lower lobe reaching posterior to the first anal-fin ray. *Paraliparis kreffti* Andriashev 1986 has both pectoral fin lobes reaching posterior to the anal fin, although not as far, but also has more pectoral rays (16–18 vs 14–15) and only two radials (vs 4), a black stomach, and other trenchant differences (Andriashev 2003:295). Several species of *Careproctus* (*C. profundicola*, *C. pseudoprofundicola* Andriashev & Stein 1998, and others) have similarly elongate pectoral fins, but have a well-developed disk and are obviously not *Paraliparis*.

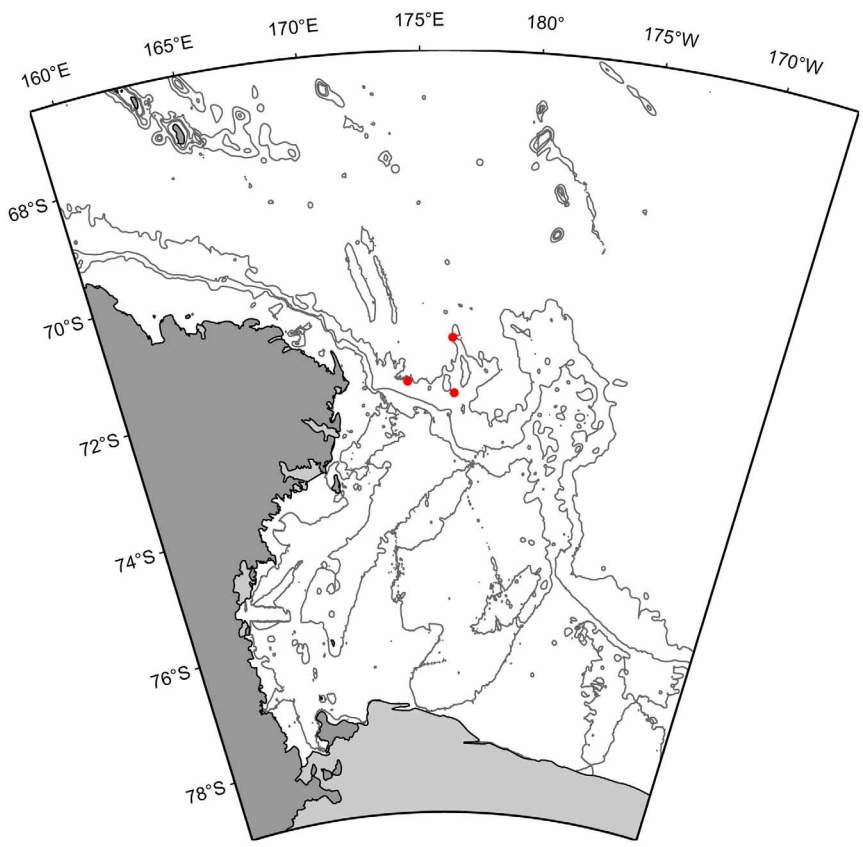

FIGURE 48. Distribution of *Paraliparis macropterus.*

Comments. The four specimens are all males. It is possible that the very long fins are a sexually dimorphic character or represent allometric growth. Similar sex-related differences have not been reported in the family, but

allometric increase in pectoral fin length was reported by Kido (1988:24) for *Careproctus rastrinus* Gilbert & Burke 1912.

***Paraliparis magnoculus* n. sp.**
Figs. 49, 50

Holotype. NMNZ P.038643, ripe? male, TL, SL unknown, 41 mm HL, ~66 mm preA, 72° 21.00′ S, 178°56.10′ W, Iselin Bank, Ross Sea, F/V *Janus*, Stn. OBS 1593A/104, 25 February 2002, 950–1062 m. **Paratype,** NMNZ P.037589, sex unknown, TL unknown, >180 mm SL, 37.2 HL, 72°09.45′ S, 175°19.45′ E, Mawson Bank, Ross Sea, F/V *Sonrisa*, Stn. OBS 1311/083, 26 February 2000, 1368–1413 m, poor condition. NMNZ P.037589/1, cleared and stained right pectoral girdle.

Diagnosis. Snout short, blunt, 19–25% HL, orbit exceptionally large, 36–39% HL, aAf 113% HL. Pectoral fin rays 23–24. Teeth simple, blunt canines, forming bands about four teeth wide. Four large pectoral radials (1+1+1+1), fin almost unnotched, upper ray about horizontal with oral cleft. Haemal spines of posterior four or five abdominal vertebrae present, gradually lengthening posteriorly.

Description. Counts. V >61, D >55, A>50, C ?, P 24 (23), radials 4, pc 6, pore formula unknown. Ratios. In % HL: HW 57.3, sn ~19 (25.0), orbit 38.8 (36.3), io 29.5, uj 42.4 (43.5), go 32.2, preD 93.0, preA 161.0, sna 67.1 (64.5), ma 54.6 (~61.0), aAf 113.2, UPL 73.2 (75.0), LPL 33.4, pabd 124.0.

Head deep, dorsal profile gradually sloping to abrupt, deep snout; snout blunt, flat, rising almost vertically above upper jaw. Nostrils damaged, apparently directly anterior to orbit on horizontal through middle of eye. Mouth terminal, horizontal, short, oral cleft reaching only to below front of orbit, but maxilla extending posterior to mid-orbit; teeth in both jaws stout, simple canines, in about nine long and very oblique rows of up to 10 teeth each, forming a narrow band up to four teeth wide. A wide gap at premaxillary symphysis. Eye and orbit unusually large, prominent; upper edge of orbit entering dorsal profile of head. Gill opening above pectoral fin and extending ventrally in front of 4–5 rays; opercular flap damaged in both specimens, but opercle itself points downward and curves posteriorly, its tip not horizontal. Mandibular symphyseal pores unknown. Pore formula unknown.

Pectoral fin short, its upper ray on about a horizontal with corner of mouth, well below orbit. Upper lobe about 3/4 of head, lower lobe about 1/3, notch moderately deep, rudimentary rays absent. Lower lobe far forward, its most anterior ray below or slightly posterior to a vertical through mid-orbit and posterior corner of upper jaw. Pectoral ray formula 16–18+3–4+3, rays in upper and lower lobes distinctly more closely spaced than rays in notch, which are more widely separated. Paratype with pectoral radials 4 (1+1+1+1), large, rounded; lowest with squared posterior margin. Notches and fenestrae absent. Scapula without helve, roughly hemicircular; coracoid with moderately long helve with dorsal web almost to tip, basal notch absent.

Tails broken off and missing in both specimens; holotype missing at least 18 vertebrae, paratype possibly missing only hypural complex. Body gradually tapering from above posterior of abdominal cavity. Anus located far forward below head, slightly behind a vertical through posterior margin of orbit. Abdominal cavity large, long, deep, its length behind pectoral fin base symphysis about 1 ¼ HL. Predorsal length about greater than HL, first dorsal fin pterygiophore rayless, its insertion between vertebrae 3–4, first dorsal ray insertion between vertebrae 4–5, anal fin insertion between vertebrae 10–12. Abdominal vertebrae 10, caudal vertebrae at least 51, probably not more than 52 or 53 including hypural. Abdominal vertebrae distinctive in having haemal spine gradually increasing in length posteriorly from fifth (NMNZ P.037589) or sixth (NMNZ P.038643) abdominal vertebra. Pyloric caeca large, digitate, blunt, thin-walled.

Color of skin in alcohol unknown, both specimens completely skinned. Oral cavity and tongue dusky, branchial cavity black, peritoneum black, stomach and pyloric caeca pale.

Distribution. Known from two Ross Sea locations: southeast of Iselin Bank at 1368 m, and from Scott Canyon at 950–1413 m.

Etymology. The specific epithet *magnoculus* from the Latin *magnus*, large, and *oculus*, eye, referring to the large orbits of the species.

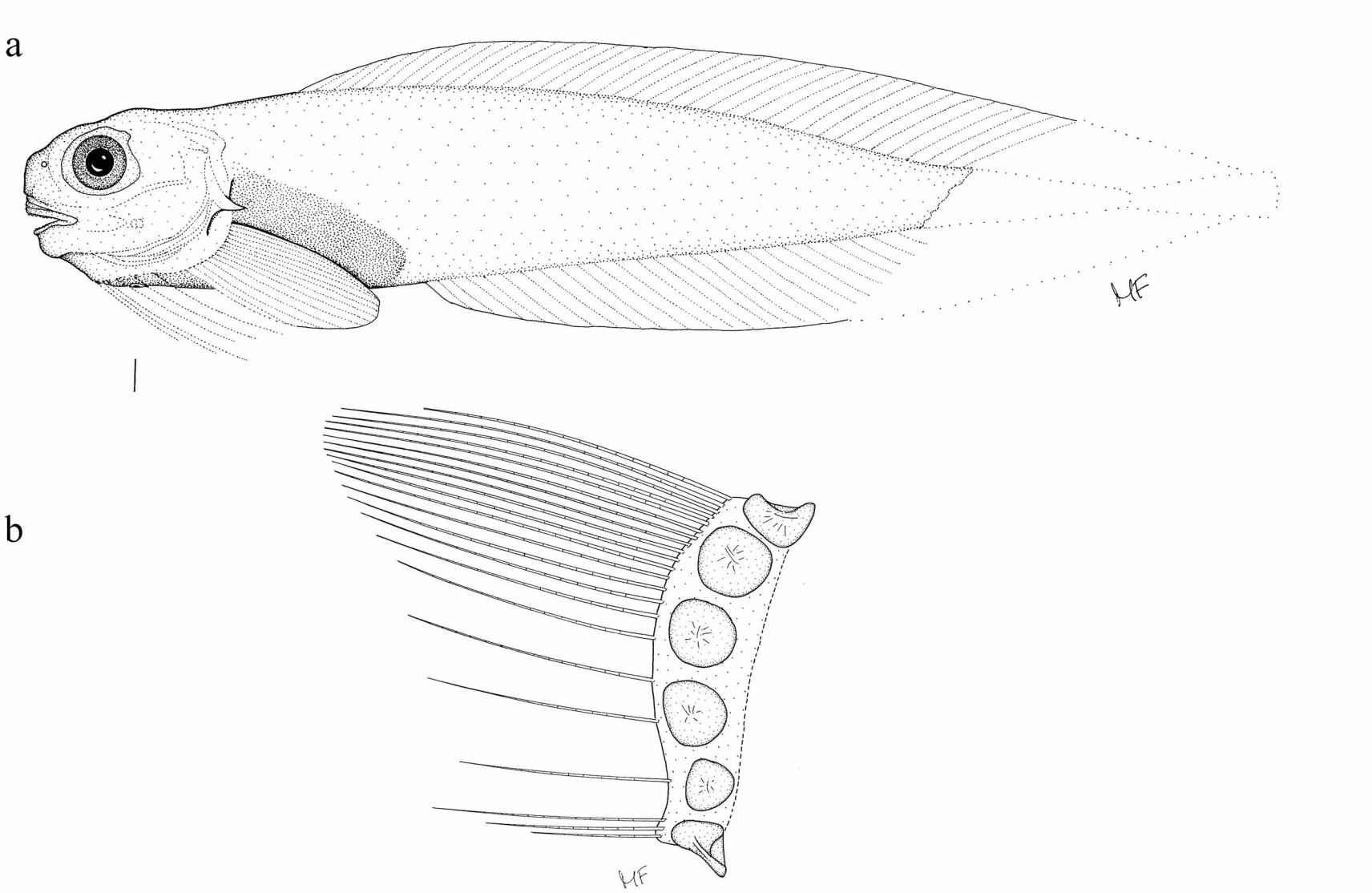

FIGURE 49. *Paraliparis magnoculus* n. sp. Holotype, NMNZ P.038643, SL unknown; a. lateral view; b. pectoral girdle, NMNZ P.037589/1.

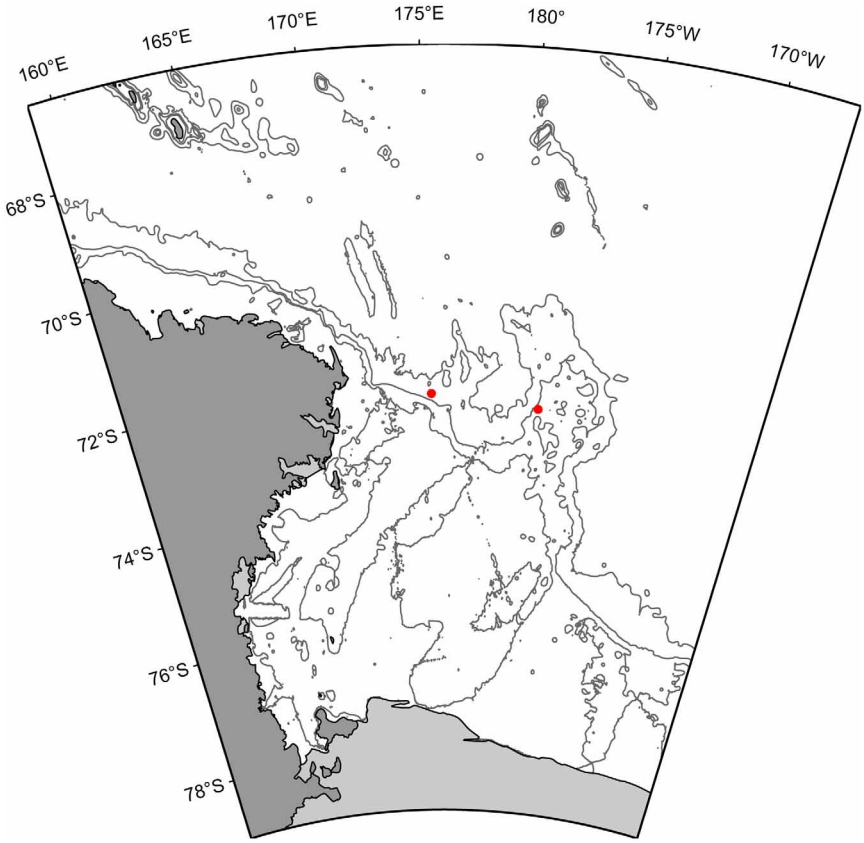

FIGURE 50. Distribution of *Paraliparis magnoculus.*

Comparisons. Despite the poor condition of the holotype and the paratype, *P. magnoculus* is clearly an undescribed species. Even though number of vertebrae, dorsal, and anal fin rays cannot be ascertained owing to damage, it differs from all other possible species in at least one significant character, and in many cases, more than one. For instance, among species with four radials with similar pectoral fin ray numbers, it differs from many in radial spacing (1+1+1+1 vs clearly 3+1); of those remaining, *P. valentinae* Andriashev & Neelov 1984 has a coracoid of entirely different shape (almost rectangular, helve absent vs normal with long helve), scapula with helve (vs without), and broader interorbital space (46–52 vs ~30% HL); *P. hubbsi* Andriashev 1986 has fewer vertebrae (57–60), 12–13 pyloric caeca (vs 6), scapula with helve (vs without), and a black-veined stomach (vs pale); in *P. diploprora* Andriashev 1986 the aAf distance is less than HL (71 vs 113% or more HL), and in *P. operculosus* a scapular helve is present (vs absent), a prominent opercular lobe is present (vs small), the stomach is dark (vs pale), the gill opening is shorter (22 vs 32% HL) and other differences.

***Paraliparis mentikoilon* n. sp.**
Figs. 51, 52

Holotype. NMNZ P.043721, male?, 262 mm TL, 240 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 Feb 2008, 1954–1990 m. NMNZ P.043721/1, cleared and stained right pectoral girdle.

Diagnosis. Chin pores in a clear depression with definite anterior fold. Premaxillary teeth about 30 in outer row, posteriorly uniserial for about 18 teeth, anteriorly forming about 12 irregular oblique rows forming band about three teeth wide; mandibular teeth about 50, uniserial except near symphysis; symphyseal gaps present in both jaws. Gill opening 16% head length. Pectoral fin with 21–22 rays, notch rays rudimentary, girdle with three (2+0+1) round radials. Anus posterior to gill flap and pectoral fin base. Caudal rays seven. Pyloric caeca long, up to about 60% head length.

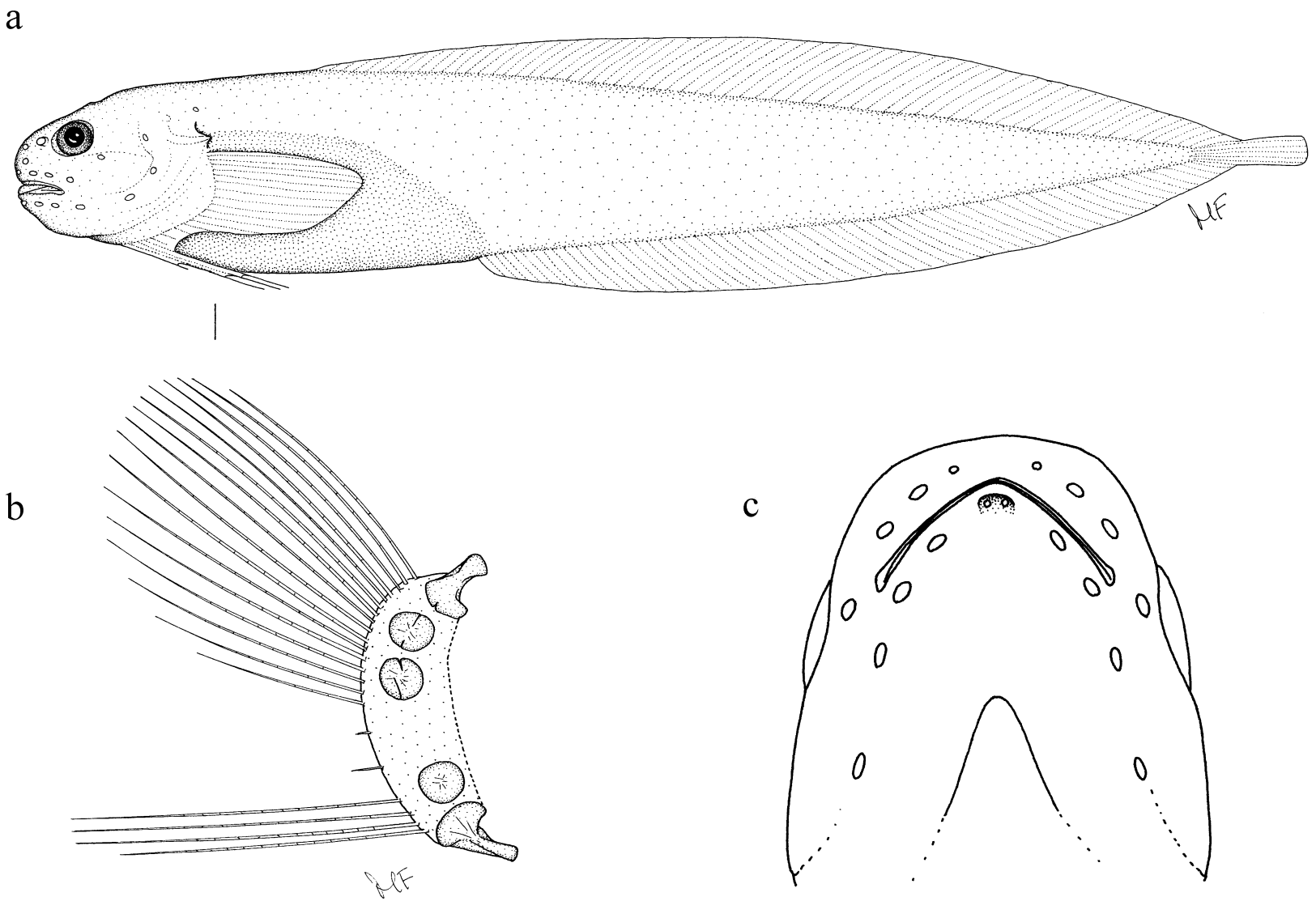

FIGURE 51. *Paraliparis mentikoilon* n. sp. Holotype, NMNZ P.043721, 240 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043721/1; c. chin pores and fold.

Description. Counts. V 71 (13+58), D ~63, A 56, C 7, P 21–22 (14–16+2–3+4), radials 3 (2+0+1), pc 7, pores 2–6?–7–1. Ratios. HL 17.1, HW 13.1, sn 5.3, E 4.2, orbit 5.2, io 7.7, uj 6.8, go 2.7, preD 27.7, preA 44.4, aAf~24 UPL 12.0, LPL 11.6. In % HL: HW 76.3, sn 30.9, E 24.3, orbit 30.4, io 45.0, uj 39.4, go 15.6, preD 161.8, preA 259.4, aAf~140, UPL 70.3, LPL 67.6, cp 2.9, pcl 61.8.

Head short, less than 1/5 SL, low, dorsal profile flat and gradually rising from snout to postorbital region. Snout short, low, bluntly rounded, projecting slightly beyond upper jaw. Nostrils short, tubular, more or less on horizontal through mid-pupil, a short distance anterior to orbit. Mouth horizontal, terminal; lower jaw deep, triangular, slightly included laterally, oral cleft barely reaching to below anterior margin of orbit. Undamaged pores of mandibular series large, chin pores much smaller, about half size of more posterior pores. Chin pores well separated, their distance apart about 3% HL, set in a depression or shallow pit with well defined u-shaped tissue fold anteriorly and possibly a less well defined posterior fold. Teeth simple, sharp, evenly spaced canines, arranged uniserially for more than half of jaw length. Premaxillary teeth posteriorly in a single row of about 18, becoming anteriorly irregularly triserial for another approximately 12 oblique tooth rows forming narrow band about three teeth wide. Mandibular teeth somewhat smaller, uniserial for posterior 40 teeth then another approximately 10 anterior teeth with bi- or tri-serial inner teeth. Symphyseal gaps clearly present in both jaws. Eye prominent with large pupil, orbit diameter about equal to snout, not entering dorsal profile of head, slightly less than 1/3 HL. Gill opening completely above pectoral fin base, not reaching ventrally to upper pectoral fin ray, slightly longer than 15% HL. First arch gill rakers nine. Opercular flap broadly triangular, supported by a shallowly curved crescent opercle, its tip lower than its origin and almost horizontal, barely reaching a point above dorsalmost pectoral fin ray base. Pore formula unknown.

Pectoral fins about 3/4 head length; tip of upper lobe reaching well behind midpoint of abdominal cavity, about 2/3 of distance to anal fin origin. Uppermost ray about even with lower margin of orbit. Upper lobe rounded, of 14–16 rays, reaching to about 2/3 body cavity length. Notch rays 2–3, the cleared and stained right pectoral girdle has two short filamentous rudimentary rays. Lower lobe long, of four rays, reaching about 2/3 distance towards tip of upper lobe; insertion of lowest ray below opercle and orbit. A clear gap present between lower fin lobes. Pectoral girdle with 3 (2+0+1) radials, moderately large, round; R1 and R2 very close, almost touching; scapular blade with a very narrow slit, R1 and R2 with very narrow dorsal and ventral slits; R1 and R2 equal in size, R4 slightly larger. Scapula with a broad blade and a long, deep helve, a small slit in edge of proximal blade. Coracoid helve moderately long and stout, no ventral notch present at its base.

Body behind head dorsoventrally flattened, probably deepest behind head over mid-abdomen. Dorsal fin insertion between vertebrae 6–7, anal fin insertion between vertebrae 13–14. Dorsal and anal fins distinctly deepest about 2/3 of SL posteriorly. Anus posterior to tip of opercular flap and pectoral base. Peritoneum clearly visible through body wall. Body cavity probably deep, dorsally humped above pectoral fin base. Hypural complex fused, slit absent. Caudal fin of seven (3/4) rays, auxiliary rays absent. Pyloric caeca seven, of various lengths, longest more than 60% HL. SECM probably well developed. Skin thick, strong.

Color of body in alcohol grayish-rose, snout and area around mouth blackish. Black peritoneum visible through body wall. Mouth dusky purplish grey, branchial cavity blackish, stomach and pyloric caeca pale except for extensive black remnants of possible blood vessels on stomach.

Distribution. Known only from a single specimen collected off the northwest edge of Mawson Bank, Ross Sea at 1954–1990 m.

Etymology. The specific epithet *mentikoilon*, a noun in apposition, from the Latin *mentos*, chin, and Greek *koilon*, cavity or hollow, to denote the chin pore pair in a pit.

Comparisons. Most similar to *P. neelovi* and likely to be incorrectly identified as that species, *P. mentikoilon* differs clearly in having chin pores in a depression with a clear anterior fold (vs no fold or depression), more caudal fin rays (7 vs 6), slits in R1 and R2 (vs none), a coracoid with a shorter, stouter helve (vs longer and slender), premaxillary teeth uniserial for only slightly more than half of jaw (vs almost all uniserial), fewer mandibular teeth (~50 vs 75–80), anus behind gill flap (vs below gill opening), longer gill opening (~16 vs 10–11% HL), and some other morphometric characters.

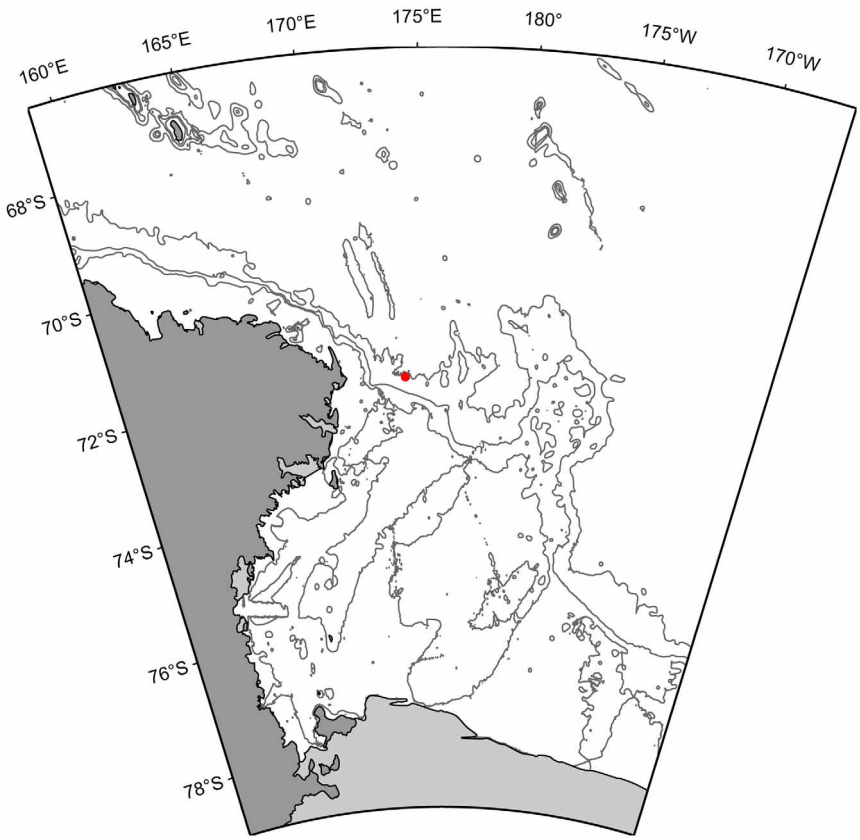

FIGURE 52. Distribution of *Paraliparis mentikoilon*.

Comments. Andriashev (2003:332) mentioned that two of his *P. neelovi* specimens had a filamentous auxiliary caudal fin ray (e.g., seven rays) but this was displaced forward as usual for such rays. In contrast, all seven rays of the new species are well developed and firmly based on the posterior edge of the hypural plate.

Paraliparis neelovi Andriashev 1982

Figs. 53, 54, 55

Paraliparis neelovi Andriashev, 1982a:721, Figs. 1, 2; Andriashev 1986:117, Figs. 51–53; Stein & Andriashev 1990:249, Fig. 27; Duhamel 1992:202, Fig. 5b; Andriashev 2003:330, Figs. 174, 175; Chernova & Duhamel 2003:144, Fig. 4; Duhamel et al. 2005:310, Fig.; Duhamel et al. 2010:326, Fig. 6.

Holotype. ZIN 45819, 250 mm SL, 56°50′ S, 71°06′ E, Banzare Bank, FR/V *Fiolent*, Trawl 34, 2 January 1978, 1420–1390 m.

Material examined. NMNZ P.041414, female, 298 mm TL, 283 mm SL, 70°29.00′ S, 179°07.60′ E, Iselin Seamount, Ross Sea, F/V *San Aspiring*, Stn. OBS 2011/071, 27 January 2005, 1274–1370 m. NMNZ P.041414/1, cleared and stained right pectoral girdle. NMNZ P.042304, female, 305 mm TL, 281 mm SL, 71°33.0′ S, 179°04.5′ W, Iselin Bank, F/V *San Aspiring*, Stn. OBS 2183/035, 13–14 Jan 2006, 1242–1333 m. NMNZ P.042304/1, cleared and stained right pectoral girdle. NMNZ P.042667, female, > ~335 mm TL, ~316 mm SL, 70°29′ S, 179°06.60′ E, off Iselin Seamount, Ross Sea, F/V *Avro Chieftain*, Stn. OBS 2330/045, 14 January 2007, 1301–1422 m. NMNZ P.042667/1, cleared and stained right pectoral girdle.

Diagnosis (modified from Andriashev, 2003 with additional data from his description). V 67–71, P 19–21, C 6 (3/3), P 19–21, radials 3 (2+0+1). Mouth terminal. Teeth mostly uniserial but at symphysis several short rows or scattered irregularly arranged teeth present. Mandibular symphyseal pores closely set. Gill opening short, 1.7–3.4% SL. Opercular flap a small fleshy angle. Head 16–18%, preanal fin length 41–47% SL. Body rosy, blackish around mouth. Peritoneum black, stomach and pyloric caeca pale.

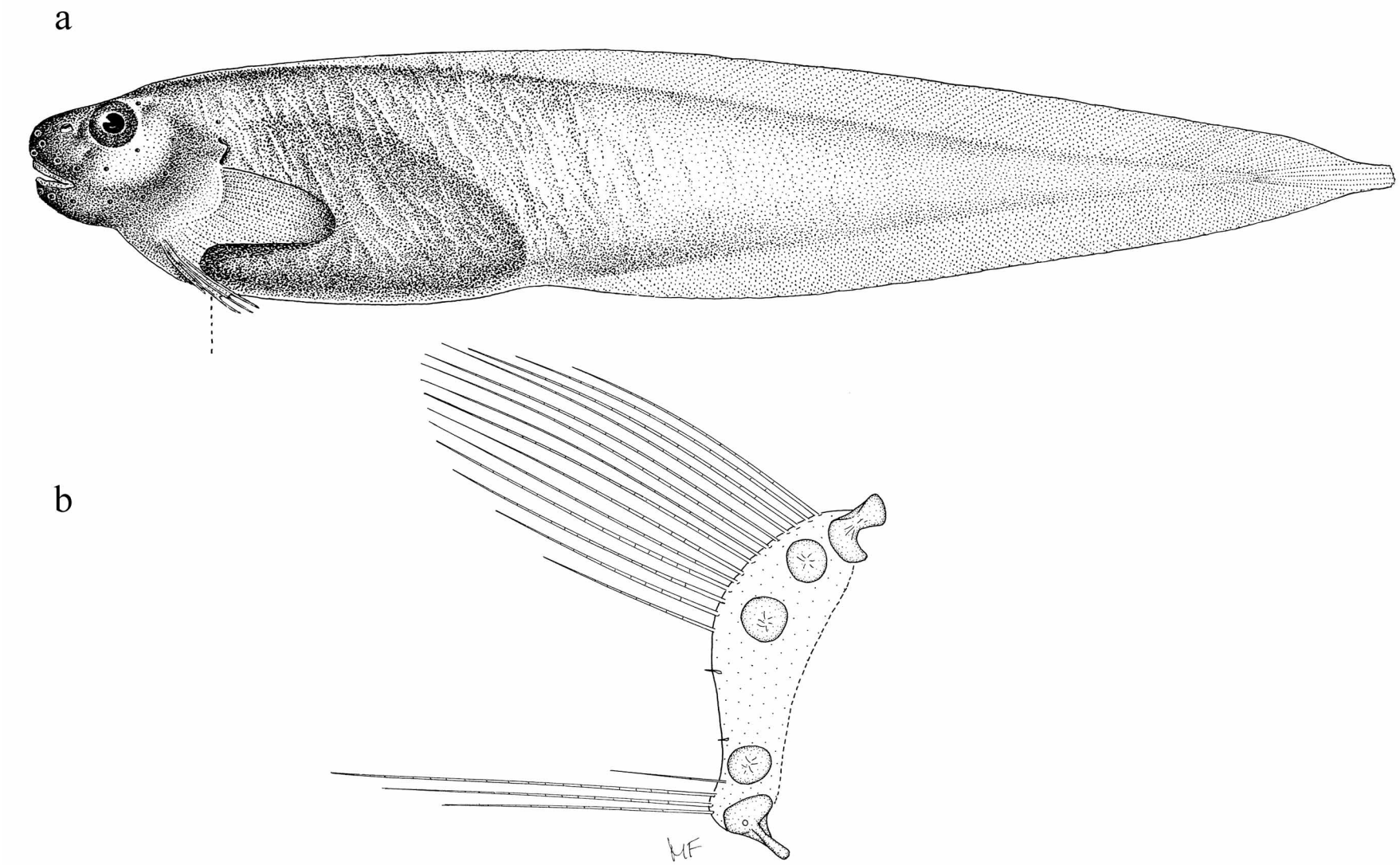

FIGURE 53. *Paraliparis neelovi* Andriashev 1982. Holotype, ZIN 45819, 250 mm SL. From Andriashev, 1986: Figs. 51, 52a; a. lateral view; b. pectoral girdle, NMNZ P.042667/1.

Description. The following counts and ratios include those provided by Andriashev (2003) and those from the new specimens (in brackets). The prose description is of the latter.

Counts. V 67–71(11–13+54–59) [70–71 (12–13+57–59)], D ~61–64 [65–66], A 52–56 [56–57], P 19–21 [19–20], C 6 (3/3) [6 (3/3)], pc 5 [pc 6–8], pores 2–6–7–1. Ratios. HL 16.1–18.2 [16.5–17.2], HW 12.0–14.6 [12.2–15.2], sn ~5.6 [4.9–5.6], E 3.8–4.3 [3.4–3.9], orbit unknown [4.4–5.2], io 7.7–8.6 [6.8–7.0], uj unknown [5.7–6.9], go 1.7–2.1 [~2.0–3.2], bd 18.0–21.7 [20.7], preD 21.2–24.4 [22.9– ~28], preA 41.6–45.4 [41.2–46.8], sna unknown [~19.4–20.5], aAf 24.7–28.6 [22.9– ~31], UPL 10.8–13.4 [~12–13.0], LPL 11.7–15.3 [~12–13.3], pabd unknown [~28] In % HL: HW 72–88 [78.2–90.9], sn ~34 [28.4–33.8], E 22–24 [19.7–23.5], orbit unknown [25.3–30.9], io 46–52 [39.8–41.9], uj unknown [34.0–34.8], go 10–12 [12.1–18.8], bd 108–131 [123.9], preD 128–147 [163–168], preA 251–273 [246.5–272.2], sna unknown [117.2–119.2], aAf unknown [137–180], UPL 66–74 [73.4–77.8], LPL 70–92 [72.4– ~82], LLD unknown [10.5] pabd unknown [168.2] cp unknown [2.7–3.4].

Head small, dorsal profile rounded ventrally to snout. Snout short. Nostrils on a horizontal with pupil. Mouth horizontal, inferior, oral cleft short, not quite reaching anterior margin of orbit. Teeth simple, stout canines, uniserial in both jaws except near symphysis of premaxilla, where irregularly bi- or tri-serial. About 28 teeth in outer row on each premaxilla, posterior 17 uniserial. Mandibular teeth uniserial, about 70 in a row, progressively smaller anteriorly; near symphysis an irregular patch about four teeth wide. Symphyseal gap present in both jaws. Eye prominent, pupil very large, about 2/3 or more of eye diameter. Gill opening completely above pectoral fin base, 1/5–1/6 head; opercular flap clearly developed, not pore-like, supported by dorsally curved opercle. Pore formula unknown, pores damaged, small, easily obscured by skin folds. Chin pores closely set, the distance between them about equal to one pore diameter. Suprabranchial pore single, directly above gill opening.

Pectoral fin short, longest ray of upper lobe reaching to about middle of abdominal cavity. Uppermost ray on horizontal with lower part of orbit or mid-pupil. Upper lobe rounded, of 14 rays, notch rays 2–3, rudimentary; lower lobe of three rays, insertion of lowest ray below opercle and anterior to gill opening, lobe reaching to below middle or posterior end of upper lobe. Pectoral girdle 3 (2+0+1) large unnotched radials, all almost round, R1, R2 larger. Scapula with a large, broad and well-developed helve; coracoid with a fenestra and a long, slender, unnotched helve.

Body thick, deepest behind head. Dorsal fin insertion between vertebrae 4–7, anal fin insertion between vertebrae 13–15. Dorsal and anal fins deepest at about 2/3 of SL posterior. Anus well behind symphysis of lower pectoral fin lobes, below base of upper lobe. Peritoneum visible through white body wall. Hypural complex fused, slit absent. Caudal fin of six (3/3) rays, auxiliary rays absent. SECM well developed. Skin thick, fibrous.

Fresh color white, faint black edging to dorsal, anal, and pectoral fins, slightly dusky on head; black peritoneum clearly visible through body wall (Fig. 54). Color of body in alcohol white, head, distal part of upper pectoral fin lobes, and lower lobe rays brown, anal region blackish-brown. Orobranchial cavity dusky blackish, stomach and pyloric caeca pale.

All three specimens appear to be ripe or almost ripe. Egg diameters range from 2.8–4.2 mm.

Distribution. The new specimens extend the geographic range from Heard Island and East Antarctica to the Ross Sea at similar depths between 1070–2000 m.

Comparisons. *Paraliparis neelovi* is very similar to the Antarctic members of the *P. copei* species group *(P. c. gibbericeps* Andriashev 1982b, *P. c. kerguelensis* Andriashev 1982a, *P. c. wilsoni* Andriashev 1986), and in particular to *P. c. kerguelensis*. It differs from all three in having three (vs four) radials, six (vs eight) caudal rays, gill opening not pore-like (vs pore-like), greater preanal fin length (25–29 vs 19–23% SL), and other characters. Similar to *P. stehmanni* in many counts and proportions, it differs in radial notches (unnotched vs deeply notched), caudal rays (six vs seven), radials (three vs four), and other characters. It is also externally similar to *P. alius*, *P. epacrognathus*, *P. mentikoilon*, *P. nullansa*, *P. parviradialis*, *P. plicatus*, and *P. voroninorum*; their differences are described under their descriptions.

Comments. These specimens fit the description of *P. neelovi* well enough to be considered conspecific. However, there are differences that can be considered the result of geographic separation, such as notch ray development, anal fin insertion (13–15 vs 16–17) (Andriashev 2003:332), and longer gill opening (~3 vs 1–2% SL). Considering their soft tissues, concomitant flexibility, and damage to the specimens, such variations are not unexpected.

FIGURE 54. *Paraliparis neelovi* Andriashev 1982. NMNZ P.042304, 281 mm SL. Photograph of fresh specimen by Carl Struthers, NMNZ.

Andriashev (2003:331, Fig. 174) shows the pectoral fin notch rays as being well developed and segmented, but examination of specimens in the ZIN collection (pers. comm. N. Chernova, 18 November 2010, 4 July 2011) shows that the notch rays are highly variable in number (1–3) and length (3.4–38% of the upper pectoral fin lobe length), all are unsegmented and often the two halves are unfused. Thus all are rudimentary and the figure, which shows well segmented notch rays, is in error (See Fig. 53b, this paper and compare with Andriashev 2003:Fig. 174b). The types have longer notch rays than the Ross Sea specimens, which could be a result of different populations.

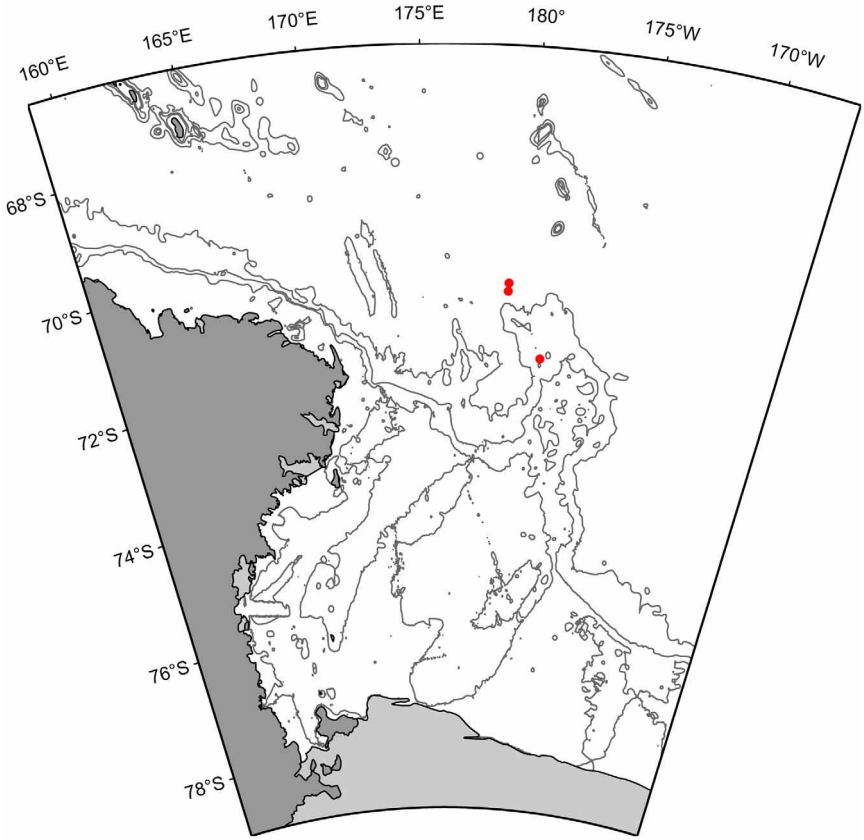

FIGURE 55. Distribution of *Paraliparis neelovi* in the Ross Sea.

***Paraliparis nigrolineatus* n. sp.**
Figs. 56, 57

Holotype. NMNZ P.043723, female, 107 mm TL, 97 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.043723/1, cleared and stained right pectoral girdle. **Paratype,** NMNZ P.046424, male, 73 mm TL, 67 mm SL, collected with holotype. Data in parentheses.

Diagnosis. V 74 (75), D 68 (~68), A 62 (~61), C 7 (7), pectoral radials 3, round, unnotched. Scapula with narrow helve, coracoid deeply notched at base. Pectoral rays 20–21, none rudimentary. Mouth horizontal, teeth stumpy canines in 11–12 oblique rows forming bands in both jaws, premaxillary bands wider. Chin pore pair close together but easily distinguishable, in a shallow depression with surrounding skin fold. Mid-ventral longitudinal abdominal dark line present. Preanal length 30–33% SL.

Description. Counts. V 74 (75) 10+64 (65), D 68 (~68), A 62 (~61), C 7, (6?), P 20 (21), radials 3 (2+0+1), pc 6, pore formula unknown. Ratios. HL 17.2 (17.3), HW 12.2 (9.8), sn 4.5 (5.5), E ~3.9 (4.0), orbit 5.7 (5.7), io 5.0 (6.3), uj 7.9 (9.2), go 3.5 (3.0), bd ~15.5 (15.2), preD 21.8 (21.6), preA 29.8 (33.1), sna 17.2 (16.1), ma 14.9 (14.5), aAf 16.3 (17.8), UPL 16.2 (14.0), LPL 14.3 (12.2). In % HL: HW 70.6 (56.9), sn 26.3 (31.9), E ~22.8 (23.3), orbit 32.9 (32.7), io 29.3 (36.2), uj 46.1 (53.4), go 20.4 (17.2), ma 86.8 (83.6), bd ~89.8 (87.9), preD 126.9 (125.0), preA 173.0 (191.4), sna 100.0 (93.1), aAf 94.6 (102.6), UPL 94.0 (81.0), LPL 83.2 (70.7), LLD about zero.

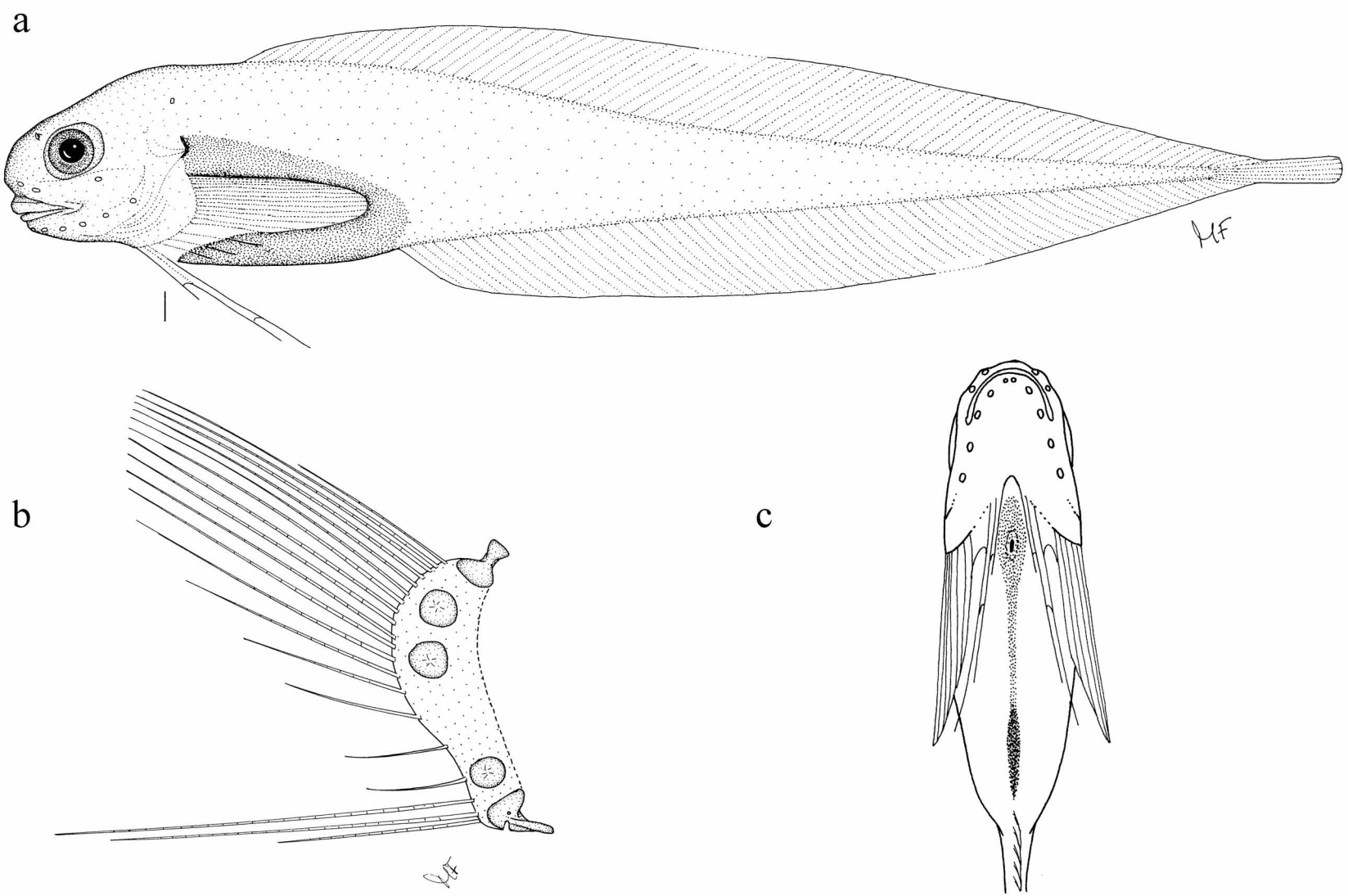

FIGURE 56. *Paraliparis nigrolineatus* n. sp. Holotype, NMNZ P.043723, 97 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043723/1; c. chin pores and belly stripe.

Head short, slightly longer than body depth, dorsal profile rising evenly from snout to occiput. Snout short, high, blunt, rising abruptly from above upper lip to about mid-pupil. Nostrils small, distinctly anterior to orbit and on horizontal through dorsal half of orbit. Mouth horizontal, subterminal; lower jaw included, oral cleft reaching below front of orbit. Teeth simple, blunt canines, in premaxillary in about 11 oblique rows of up to eight teeth each, forming moderately wide band of increasing width anteriorly. Mandibular teeth forming much narrower bands. Symphyseal gap present in both jaws. Eye prominent, orbit large but not entering profile of head, slightly less than 1/4 HL. Gill opening completely above pectoral fin base, its length about 1/5 HL; opercular flap short, supported by crescent-shaped opercle. Chin pores paired, interpore space equal to about half pore diameter; in holotype a possible fragile skin fold anteriorly; in paratype, clear fold surrounding the pair, strongest anteriorly, not appearing as a pit or a single pore. Suprabranchial pore single.

Pectoral fin slightly shorter than head; longest ray of upper lobe almost reaching posterior end of abdominal cavity, not to anal fin origin. Uppermost ray on horizontal between lower margin of orbit and mid-orbit, about even with suborbital stay. Pectoral fins of 20–21 rays each (13–14+3–4+3–4). Upper lobe distinct, its dorsal rays somewhat shorter ventrally; notch moderately deep, its rays much shorter, none rudimentary. Lower lobe about equal to upper, of four rays, insertion of lowest ray below rear of pupil or orbit. No gap present between lower pectoral fin lobes. Pectoral girdle with 3 (2+0+1) round radials lacking notches or slits. Scapula with helve. Coracoid with a long slender helve and deep basal notch.

Body dorsoventrally compressed, deepest behind orbit. Dorsal fin insertion between vertebrae 4–6; anal fin insertion in between vertebrae 11–12. Dorsal and anal fin rays not buried in SECM or beneath thick skin, visible without dissection, rays longest at about half body length. Anus below opercle and lowest upper lobe ray bases. Peritoneum clearly visible through whitish body wall; a clear, densely black strip present on midventral line of posterior third of body cavity. Hypural complex fused, slit absent. Caudal fin of holotype seven (3/4) rays, lowest ray possibly an auxiliary; caudal of paratype damaged, apparently six. Pyloric caeca fat, relatively large, pointed and of various sizes. SECM apparently not well developed. Remnants of skin thin, easily damaged.

Color of body unknown, almost completely skinned; shreds of remaining skin pale transparent brown with many melanophores, suggesting color was brownish. Mouth pale or dusky, lips black, branchial cavity dusky, peritoneum black, stomach pale, pyloric caeca pale. Ventral stripe dividing two lateral halves of peritoneum, gray anteriorly, its posterior third dense black.

Distribution. Known only from the holotype and the paratype, collected in the same tow from the northwest edge of Mawson Bank, Ross Sea, at 1954–1990 m.

Etymology. The name *nigrolineatus* from the Latin *niger*, black, and *lineatus*, line, denoting the black strip on the posterior ventral abdominal midline.

Comparisons. The new species is distinguished from most *Paraliparis* in having a high number of vertebrae. It falls within Andriashev's (2003) group of high vertebral count species from the Southern Ocean, but differs from all of them in its combination of two chin pores, 74 or 75 vertebrae, and 20 or 21 pectoral fin rays, none rudimentary. It is most similar to *P. devriesi* and *P. monoporus*, but in addition to the number of pectoral fin rays (20–21 vs 22–25), differs from the former in dorsal and anal fin ray counts (68 and 62 vs 61–65 and 55–59), anal fin insertion (between vertebrae 11–12 vs 14–15), interorbital width (29–36 vs 40–45% HL), presence of the ventral black streak, and many proportions. It differs from the latter in having paired chin pores although in a pit or depression (vs clearly single), shorter preanal length (30–33% vs 42–43% SL), dorsal fin insertion (between vertebra 4–6 vs 7–8), and other characters. It could also be confused with *P. haploporus*, which has a single chin pore, because it has similar numbers of vertebrae and dorsal, anal, and pectoral fin rays and similar proportions. However, it differs from that species not only in having two chin pores in a pit (vs a single pore), but also in having a larger eye (4 vs ~3% SL and ~23 vs 16% HL), longer gill opening (17–20 vs 12% HL), and greater mandible-anus distance (84–87 vs 76% HL).

Comments. The smaller specimen is designated as a paratype because it is the same as the holotype in almost all counts and proportions, was collected with it, and has a similar black belly streak. However, it may in differ in two characters. Its chin pores are clearly paired in a depression formed by a surrounding skin fold which was probably (but not certainly) damaged in the holotype, which has an anterior skin fold only. The difference could also be the result of sexual dimorphism (the larger specimen is a female, the smaller a male). The head of the paratype has been obliquely flattened, with the result that the left side of the mouth appears to be at a shallow angle, whereas that on the right is horizontal. Nevertheless, the two are so similar that I designate both as types.

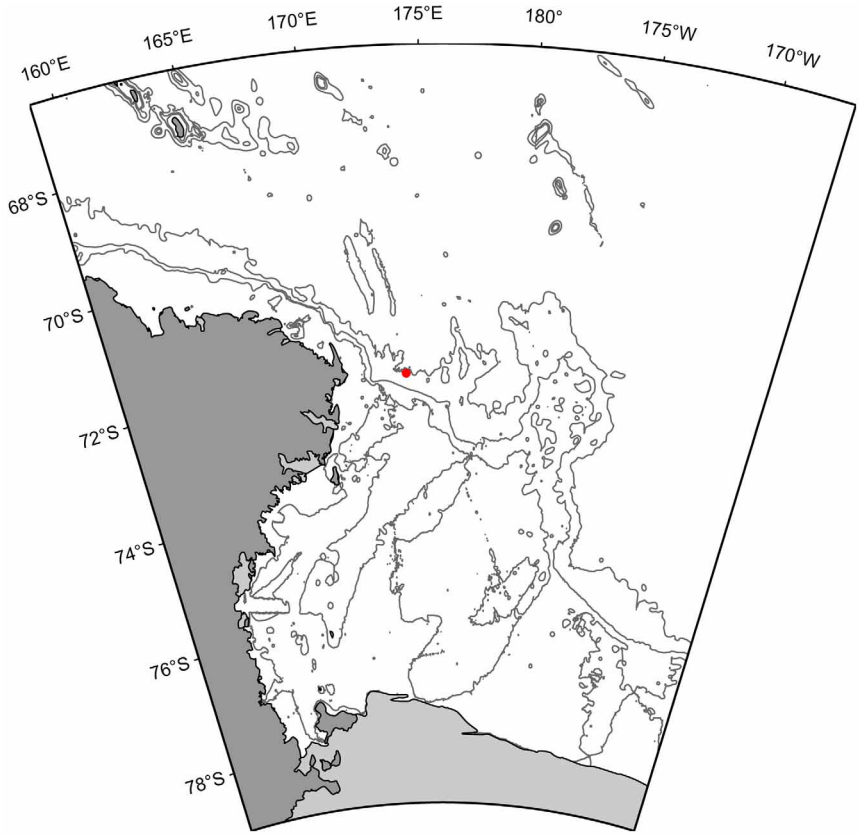

FIGURE 57. Distribution of *Paraliparis nigrolineatus.*

***Paraliparis nullansa* n. sp.**
Figs. 58, 59, 60

Holotype. NMNZ P.043718, ripe female, 298 mm TL, 276 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.043718/1, cleared and stained right pectoral girdle.

Diagnosis. V 71, D 60, A 54, C 7, P 21, notch rays rudimentary. Scapula lacking helve; radials 3 (2+0+1), R2 notched, coracoid with basal notch. Teeth small canines, almost entirely uniserial in each jaw; premaxillary teeth about 40, not reaching posteriorly to end of jaw; anteriormost teeth tiny, difficult to see. Gill opening about 15% HL, entirely above pectoral fin; gill flap absent.

Description. Counts. V 71 (15+56), D 60, A 54, C 7, P 21 (15+2+4), radials 3 (2+0+1), pc 6?, pores 2–6–?–1. Ratios. HL 18.8, HW 14.8, sn 6.0, E 3.3, orbit 5.5, io 7.4, uj 6.6, go 2.9, bd 24.2, preD 32.5, preA 45.6, sna 18.0, ma 15.0, aAf 28.6, UPL 13.3, LPL 14.5, LLD 4.7% SL. In % HL: HW 78.6, sn 32.0, E 17.3, orbit 29.3, io 39.1, uj 35.1, go 15.4, bd 128.7, preD 173.0, preA 242.4, sna 95.8, ma 80.0, aAf 152.4, UPL 70.5, LPL 77.1, LLD 25.2, cp 3.3.

Head short, less than 1/5 SL, low, dorsal profile flat and gradually rising from snout to postorbital region. Snout short, bluntly rounded, projecting slightly beyond upper jaw. Nostrils a short tube or thick raised rim, on horizontal through mid-pupil about half eye diameter anterior to orbit. Mouth horizontal, subterminal; lower jaw broadly rounded, included, oral cleft extending to below anterior half of orbit. Teeth simple, sharp, evenly spaced canines, arranged uniserially for almost entire jaw length. Premaxillary teeth in a single row of about 37 extending to symphysis, a few scattered irregular extra teeth inside them near symphysis; teeth becoming gradually smaller anteriorly, posterior teeth stout, sharp, anterior teeth tiny. Posterior tooth row not reaching to end of oral cleft. Mandibular teeth distinctly smaller than premaxillary teeth, more closely spaced and more numerous, about 60 teeth forming a single row with a few scattered teeth near symphysis. Symphyseal gaps wide in both jaws. Eye prominent with large pupil, orbit diameter slightly less than snout, not entering dorsal profile of head but near it, less than 1/3 HL. Gill opening completely above pectoral fin base, barely reaching to upper pectoral fin ray, about 15% HL.

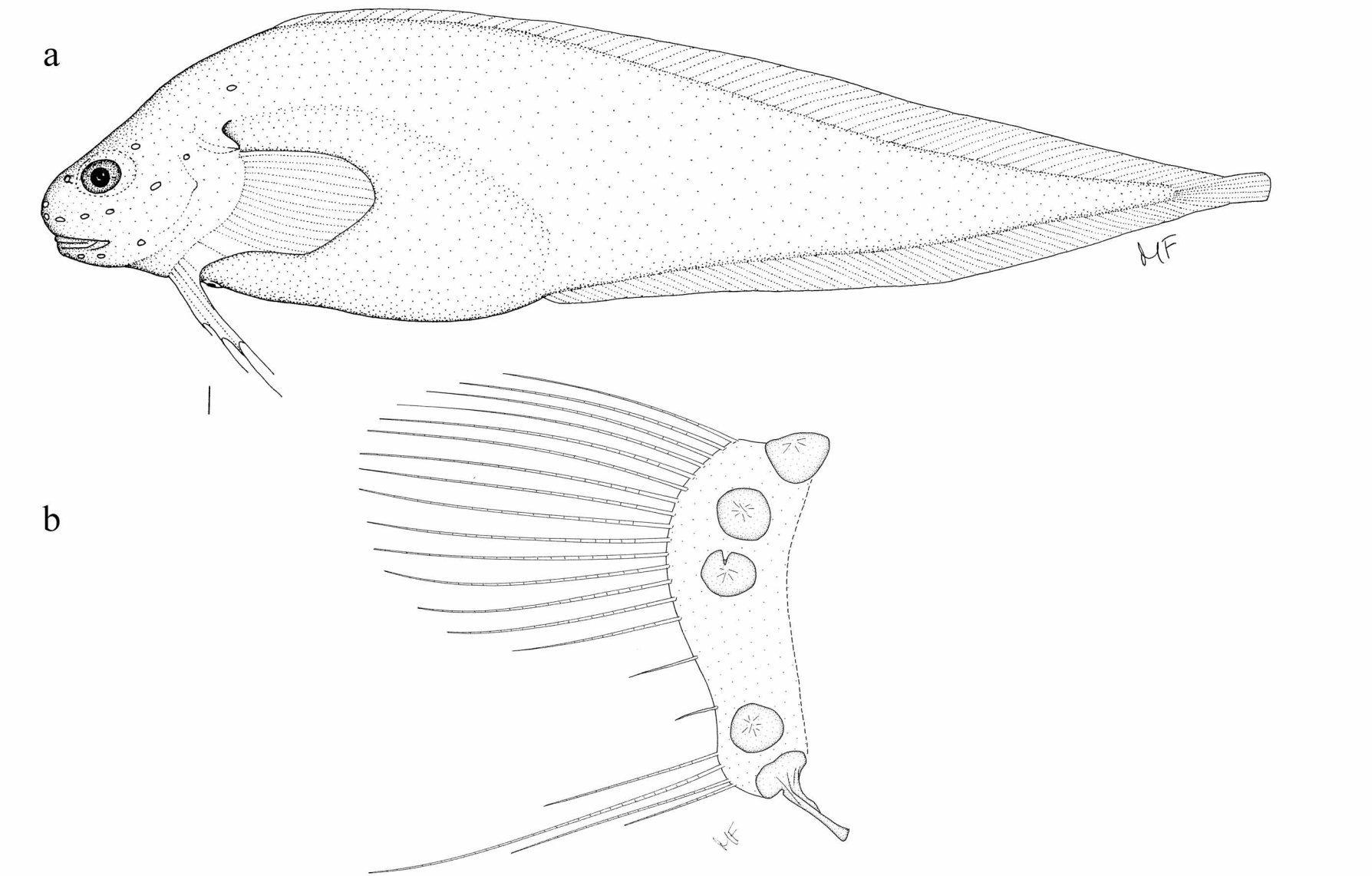

FIGURE 58. *Paraliparis nullansa* n. sp. Holotype, NMNZ P.043718, 276 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043718/1.

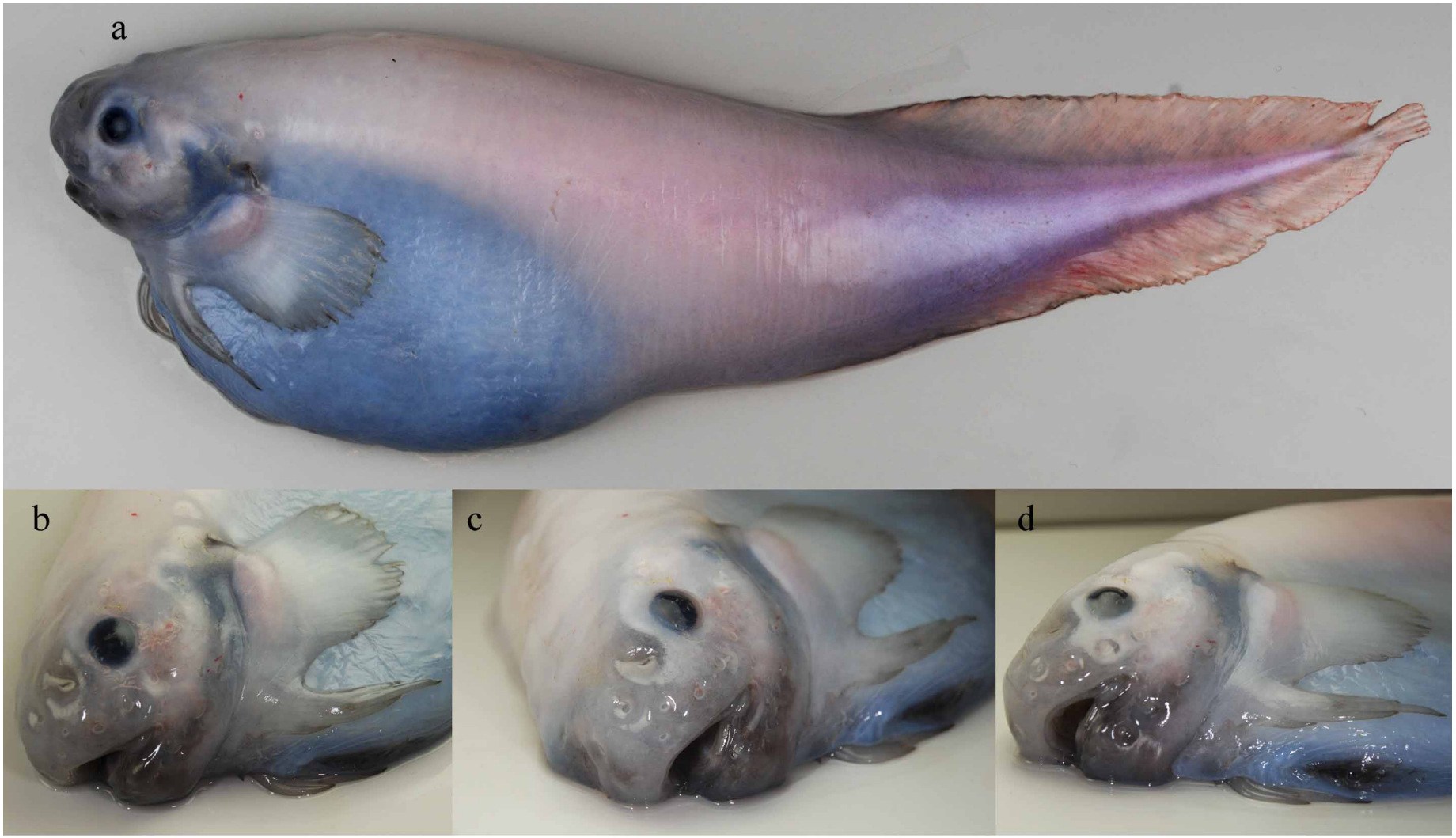

FIGURE 59. *Paraliparis nullansa* n. sp. Holotype, NMNZ P.043718, 276 mm SL; a. lateral view, b., c., d., cephalic pores. Photograph of fresh specimen by P. Marriott.

Opercular flap absent, opercle narrow, its tip reaching to bottom of gill opening. Pore formula 2–6–?–1. Pores of infraorbital series larger and more prominent than those of mandible (Fig. 59 a, b, c). Chin pores distinctly smaller than more posterior pores, well separated, their distance apart about 3% HL. Suprabranchial pore well above gill opening.

Pectoral fins about 3/4 head length; upper lobe reaching to about midpoint of abdominal cavity. Uppermost ray about even with middle of orbit. Upper lobe rounded, of 15 rays. Notch rays two, well separated short, filamentous, rudimentary. Lower lobe long, of four rays, reaching to below posterior tip of upper lobe; insertion of lowest ray below cheek. A clear gap present between lower fin lobes, its distance equal to about 1/4 HL. Right pectoral girdle with 3 (2+0+1) moderately large round or rounded radials of similar diameter; R1 and R2 very close. R2 with small dorsal notch. Scapula large, more or less hemicircular, its dorsal edge slightly convex, helve completely absent. Coracoid T-shaped, helve long, slender, ventral notch present at its base.

Body behind head much deeper, almost hump-backed, laterally compressed, deepest over mid-abdomen. Dorsal fin insertion between vertebrae 9–10, anal fin insertion between vertebrae 15–16. Dorsal and anal fins low anteriorly, gradually increasing in depth posteriorly, deepest caudally at about 80% of SL. Anus below tip of opercle, approximately below middle of pectoral fin base. Peritoneum clearly visible through body wall. Body cavity deep, long, dorsally humped above pectoral fin base. Hypural complex fused, slit absent. Caudal fin of seven (3/4) rays, auxiliary rays absent. Pyloric caeca about six, of various lengths. SECM probably well developed. Skin thick, strong.

Fresh color rosy, pinker caudally. Head and pectoral fin dusky gray, dorsal and anal fins anteriorly dark (Fig. 59). Color of body in alcohol pale rose, snout and area around mouth darker grayish, lower pectoral fin lobes and anal area blackish. Mouth dusky purplish grey, tongue pale with dotted melanophores. Branchial cavity blackish. Black peritoneum visible through body wall. Stomach and pyloric caeca pale except for black remnants of possible blood vessels on stomach.

The holotype has eggs up to 4.2 mm diameter.

Distribution. Known only from the holotype, taken at 1954–1990 m off the NW edge of Mawson Bank, Ross Sea.

Etymology. *Nullansa* from the Latin *null*, none, and *ansa*, helve, to denote the absence of a scapular helve in this species.

Comparisons. *Paraliparis nullansa* is very similar to, but distinct from, *Paraliparis neelovi* and *Paraliparis voroninorum (*see below for comparison with the latter). It differs from the former in having fewer dorsal fin rays (60 vs 61–66), more posterior dorsal fin insertion (between vertebrae 9–10 vs between 4–7), more caudal fin rays (7 vs 6), shorter snout to anus distance (97 vs 117–119% HL), no scapular helve (vs well developed), a notched R2 (vs none notched) and a basal coracoid notch (vs absent). It also similar to *P. camilarus* in counts and many proportions, but differs in number of vertebrae (71 vs 68), eye size (17 vs 22% HL), interorbital width (39 vs 50% HL), gill opening (3 vs 2% SL, 15 vs 10% HL), preanal length (242 vs 271% HL), and anus to anal fin distance (152 vs 180% HL).

***Paraliparis orbitalis* n. sp.**

Figs. 61, 62

Holotype. NMNZ P.045678, ripe female, 215 mm TL, 200 mm SL, 71°18.30′ S, 172°03.00′ E, Off Cape Adare, Antarctica, F/V *Antarctic Chieftain*, Stn. OBS 2729/053, 17 January 2009, 1110–1210 m. NMNZ P.045678/1, cleared and stained right pectoral girdle.

Diagnosis. V 65 (9+56). Lower jaw included. Teeth stout, simple canines forming wide bands anteriorly in both jaws, symphyseal gaps absent. Pectoral fin rays 22–24, caudal 9 (4/5), radials 4 (3+1), scapula and coracoid with well-developed helves. Snout-anus distance 20% (about equal to HL), anus-anal fin 18% SL; snout short ~20% head length, eye 33, orbit 38% HL. Black pigment on body visible under, above and below pale gill flap.

Description. Counts. V 65 (9+56), D 57, A 51, C 9, P 22–24 (17–19+2+3), radials 4 (3+1), pc ≥6, pore formula unknown. Ratios. HL 20.8, HW 12.1, sn 4.2, E 7.0, orbit 7.9, io 7.5, uj 6.8, go 2.5, bd ~21, preD 23.6, preA 36.6, sna 20.0, ma 15.9, aAf 17.7, UPL 14.8, LPL 12.0, pabd 25.6. In % HL: HW 58.1, sn 20.5, E 33.5, orbit 38.1, io 30.1, uj 36.1, go 22.9, bd ~103, preD 114.0, preA 176.4, sna 96.6, ma 76.6, aAf 85.3, UPL 71.1, LPL 57.8, pabd 123.6, cp 2.6.

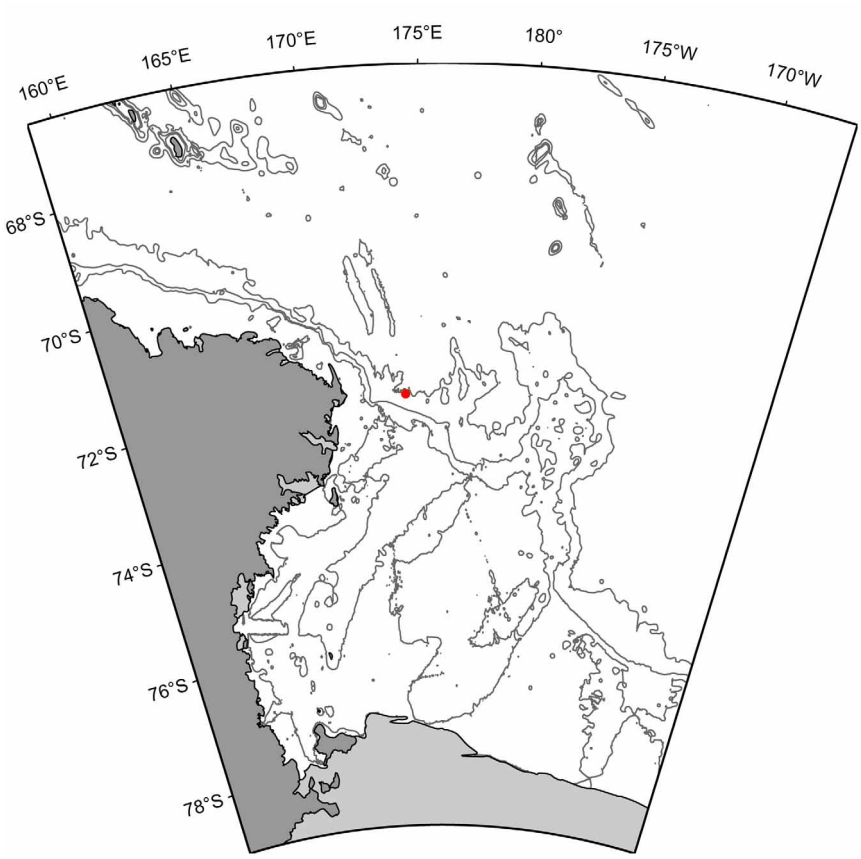

FIGURE 60. Distribution of *Paraliparis nullansa.*

Head short, shallower than body, dorsal profile rising steeply through flat interorbital region. Snout short, bluntly rounded, not projecting much beyond upper jaw. Nostrils tiny, difficult to find, immediately anterior to orbit, on a horizontal through lower half of pupil. Anterior ends of suborbitals protruding as blunt knobs (possibly an artifact of preservation). Mouth horizontal, inferior; lower jaw included, oral cleft reaching below anterior of pupil. Teeth simple, blunt, stout, well-spaced canines, forming wide bands near symphysis, on premaxillary arranged in about 7–8 oblique rows of up to about 13 teeth; mandibular teeth similar to those of premaxilla but possibly a little smaller and one or two more rows present. Viewed from front of head, anterior tooth bands visible with mouth slightly open. Symphyseal gaps absent in both jaws. Eye prominent; orbit unusually large with a cartilaginous thickened rim entering dorsal profile of head, distinctly more than 1/3 HL. Gill opening above pectoral fin base and extending ventrally over about 6 rays to below orbit but well above oral cleft; its length less than1/4 head. Opercular flap well developed, supported by dorsally curved opercle, its tip almost horizontal and reaching distinctly behind pectoral fin base. Blackish lining of branchial cavity extending on body beyond gill opening, visible both above and below margin of opercular flap. Pore formula unknown. Chin pores paired, with thickened rims, smaller than remaining mandibular pores but not tiny; distance between them slightly greater than their diameter.

Pectoral fin shorter than head, longest ray of upper lobe reaching behind midpoint of abdominal cavity but not to its end; barely reaching or not quite reaching anal fin origin. Uppermost ray on horizontal below lower margin of orbit but above mouth. Upper lobe rounded, of 22–24 rays, notch rays two, not rudimentary, notch moderately shallow. Lower lobe short, of three (1+2) rays, the uppermost ray distinctly more distant from the next lower ray than that ray is to the ventralmost; insertion of lowest ray below rear of orbit and eye, reaching not much farther posteriorly than upper lobe base. No obvious gap present between lower pectoral fin lobes. Right pectoral girdle with 4 (3+1) large, unnotched closely spaced radials, upper three radials of similar size, R1 and R2 round, R3 rounded but irregular, R4 smaller and almost square. Top two radials almost touching. Scapula double headed, its blade larger, but helve also very well developed; coracoid with a moderately long strong helve, basal notch absent.

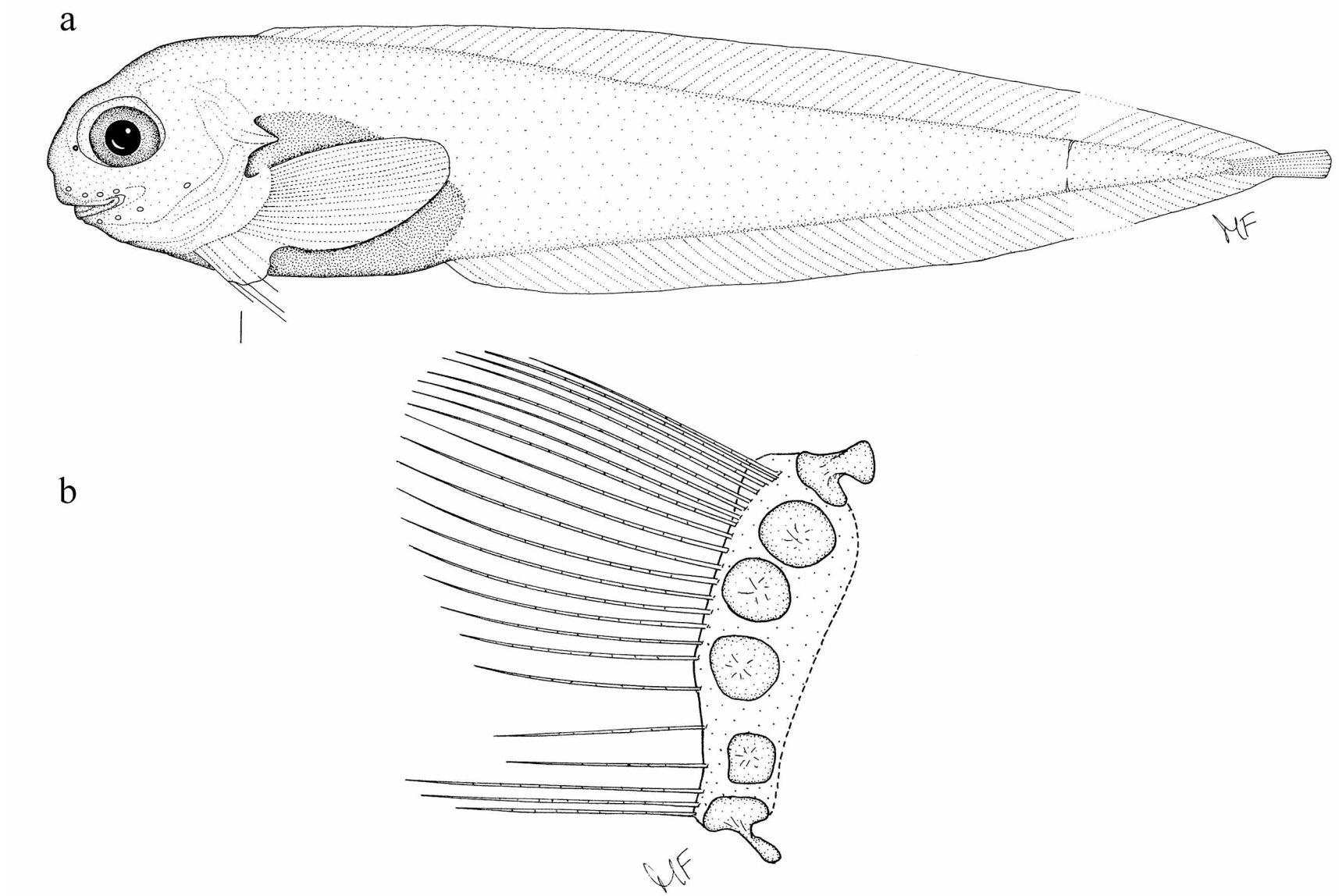

FIGURE 61. *Paraliparis orbitalis* n. sp**.** Holotype, NMNZ P.045678, 200 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.045678/1.

Body laterally flattened, deepest behind head. Dorsal fin insertion between vertebrae 4–5, anal fin insertion between vertebrae 10–11. Dorsal and anal fins not abruptly deeper at any point. Anus between lower pectoral fin lobe rays, below gill opening. Peritoneum clearly visible through body wall, abdominal cavity relatively short. Hypural complex fused, slit absent. Caudal fin of nine (4/5) rays, auxiliary rays absent. Pyloric caeca of various lengths from short to moderately long, fat, digitate. SECM apparently not well developed. Skin thin, easily damaged.

Color of body unknown; remaining skin on anterior white, remainder on tail increasingly purplish posteriorly. Mouth purplish, most teeth brown, branchial cavity dark brown, peritoneum black, stomach and pyloric caeca pale.

The holotype has eggs up to about 4 mm diameter.

Distribution. Known only from the type, collected at 1110–1210 m off Cape Adare, Ross Sea, Antarctica.

Etymology. The specific epithet *orbitalis* from the large prominent orbits and eyes that dominate the front of the head.

Comparisons. This species is most similar to *P. magnoculus* in its large orbits and pectoral fin ray counts (owing to damage, dorsal, anal and vertebral counts are unavailable for *P. magnoculus*). However, *P. orbitalis* differs distinctly in its more posterior anus position (sna 97 vs 65–67% HL; anus below opercular flap vs below posterior of orbit) and consequently shorter distance from anus to anal fin (85 vs 113% HL), the more dorsal position of the pectoral fin (about even with lower margin of orbit vs even with corner of mouth), lack of symphyseal tooth gaps (vs wide, present in both jaws), position of anteriormost lower lobe ray (below rear of orbit vs below mid-orbit) and other characters. It is similar in general counts and proportions to *P. somovi* from the South Shetland Islands, but differs in having more vertebrae (65 vs 60–63 counted from 30 specimens), lower pectoral fin lobe of three (vs four) rays, anal fin insertion more posterior (between vertebrae 10–11 vs 8–9), a shorter snout (20 vs 27–35% HL), shorter gill opening (23 vs 27–33% HL), and other characters. It could be confused with *P. fuscolingua*, which also has large eyes, but differs in having larger eyes (7 vs 4–6% SL; 34 vs 22–30% HL), and shorter dorsal and anal fins (57 vs 61–63 and 51 vs 54–57 rays). *Paraliparis trunovi* Andriashev 1986 also has relatively large eyes (25–29% HL), but differs in having only two radials, completely black color, eight caudal rays, rudimentary pectoral notch rays, and many other characters. The new species is also very similar to *P. diploprora* from

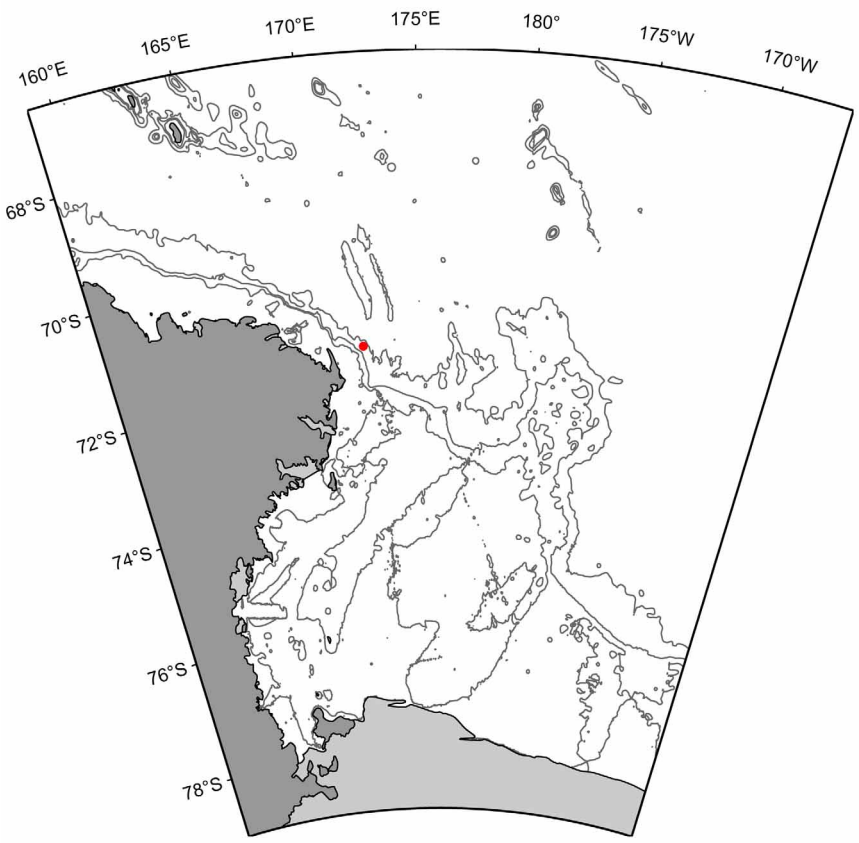

FIGURE 62. Distribution of *Paraliparis orbitalis.*

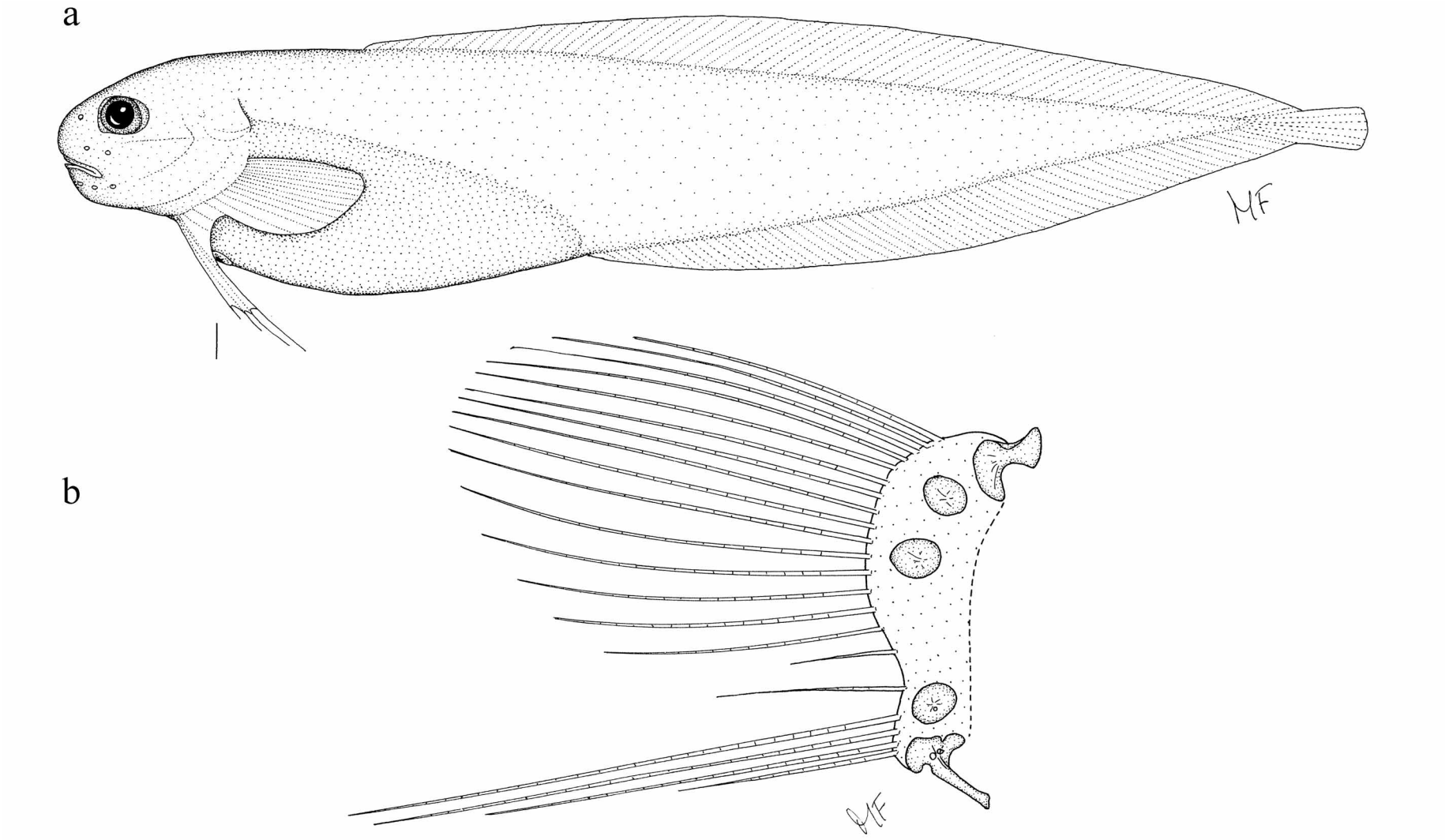

FIGURE 63. *Paraliparis parviradialis* n. sp. Holotype, NMNZ P.043720, 261 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043720/1.

2600 m in the Scotia Sea in pectoral fin structure, pectoral ray number and position, but differs in number of vertebrae (65 vs 60), length of gill opening (23 vs 36–38% HL, in front of 6 vs 7–10 rays), and absence of the two soft snout protuberances.

***Paraliparis parviradialis* n. sp.**
Figs. 63, 64

Holotype. NMNZ P.043720, ripe? female, 282 mm TL, 261 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.043720/1, cleared and stained right pectoral girdle.

Diagnosis. V 68, D probably 60, A 54, C 7. Teeth uniserial. Pectoral fin rays 21–22, notch moderately deep, notch rays rudimentary or normal but shortened, about 1/3 upper lobe length. Pectoral girdle with three (2+0+1) small oval radials; R2 largest; radials without notches, fenestrae absent. Scapula with broad blade, short broad helve. Coracoid with broad blade with dorsal slit and two fenestrae, large hemispherical basal notch, and long, slender helve. Abdomen length greater than twice head length.

Description. Counts. V 68 (13+55), D 60 (possibly 61, see below), A 54, C 7, P 21–22 (14+4+4, 15+2+4), radials 3 (2+0+1), pc 8, pore formula unknown. Ratios. HL 16.5, HW na, sn 5.0, E 4.5, orbit 4.7, io 6.2, uj 7.0, go 2.4, preD 26.1, preA 46.9, sna 17.6, ma 15.6, aAf 32.7, UPL 10.2, LPL 13.3, pabd 35.8. In % HL: HW na, sn 30.4, E 27.4, orbit 28.5, io 37.6, uj 42.2, go 14.8, preD 158.2, preA 284.0, sna 106.7, ma 94.4, aAf 198.4, UPL 61.9, LPL 80.3, pabd 216.9, cp 3.0.

Head small, dorsal profile rounded evenly from snout to occiput. Snout short, blunt. Nostrils on a horizontal through mid-orbit. Mouth horizontal, subterminal, oral cleft short, not quite reaching anterior margin of orbit. Lower jaw deep, heavy. Teeth simple, stout, sharp canines, decreasing in size anteriorly; uniserial in both jaws except near symphysis of premaxilla, where irregularly bi- or tri-serial. About 25 teeth in a row on one side of premaxilla. Premaxillary teeth about 50 on each side. Symphyseal gaps wide in both jaws. Eye prominent, pupil very large, about 2/3 or more of eye diameter. Gill opening completely above pectoral fin base, 1/6–1/7 HL, its ventral end distinctly above level of dorsal pectoral fin ray; opercular flap small, supported by crescent-shaped opercle. Pore formula unknown, damaged, small, pale in contrast with dark skin. Chin pores smaller than remaining pores, paired, not in a pit and lacking any skin fold, the distance separating them about equal to diameter of one pore.

Pectoral fin short, longest ray of upper lobe not reaching to middle of abdomen. Uppermost ray probably on horizontal with lower part of orbit. Upper lobe rounded, of 14–15 rays, notch rays 2–4 in a deep notch, some, but not all, rudimentary; lower lobe of four rays, insertion of lowest ray about midway between orbit and opercle tip, its longest ray reaching to below tip end of upper lobe. Pectoral girdle with 3 (2+0+1) small more or less horizontally oval unnotched radials, R2 largest, R1 and R3 of similar size. Scapula base broad, helve smaller, broad and well developed. Coracoid head with a dorsal slit, two fenestrae, and broad deep basal notch at base of long slender helve.

Body thick, deepest behind head. Dorsal fin insertion between vertebrae 6–7, anal fin insertion between vertebrae 13–14. Penultimate vertebra three supports two dorsal rays (an anomaly) only one included in ray count of 60; if extra ray is normal, dorsal fin ray count would be 61. Dorsal and anal fins deepest at about 2/3 of SL posterior. Anus below tip of opercle, well behind symphysis of lower pectoral fin lobes, below bases of ventral upper lobe rays. Peritoneum visible through body wall. Hypural complex fused, slit absent. Caudal fin of 7 (3/4) rays, auxiliary rays absent. Pyloric caeca eight, of different lengths, long and digitate, not matted or flattened. SECM well developed. Skin thick, fibrous.

Color of body in alcohol rosy purple, head, dorsal, and anal fins darker, remaining skin on snout and head blackish, distal part of upper pectoral fin lobes, and lower lobe rays brown, anal region blackish. Orobranchial cavity blackish, peritoneum black, stomach and pyloric caeca pale.

The specimen has eggs of about 3 mm.

Distribution. Known only from the holotype, collected from the northwest edge of Mawson Bank in 1954–1990 m.

Etymology. The name *parviradialis* from the Latin *parvus*, small, and *radial*, denoting the small size of the pectoral radials.

Comparisons. The new species is externally most similar to *Paraliparis neelovi* and can easily be confused with it. Positive identification requires examination of pectoral girdle structure to see the small oval radials (vs large, round radials) and notched coracoid (vs no slits or notch, shorter helve). External differences include more caudal fin rays (7 vs 6), narrower interorbital space (38 vs 46–52% HL), pectoral fin notch depth (moderate vs deep), greater anus to anal fin distance (about 33 vs 25–29% SL), and its location below the base of the pectoral fin notch (vs below the middle of lower lobe rays), longer abdomen (about 217 vs 167% SL), and darker head and body color. Its general appearance and uniserial teeth also make it similar to *P. copei*, from which it differs in having 3 (vs 4) radials, a longer gill opening (vs pore-like) presence of a gill flap (vs absent) and other counts and ratios. It is also similar to *P. mentikoilon*, but differs in not having the chin pores in a pit (vs in a pit with anterior fold), fewer vertebrae (68 vs 71), shorter upper pectoral fin lobe (62 vs 70% HL), longer lower lobe (80 vs 68% HL), smaller radials (vs normally large), notch rays more closely spaced and better developed (vs widely separated and reduced to bases), and a coracoid with a longer helve and large basal notch (vs shorter, stout, and absent).

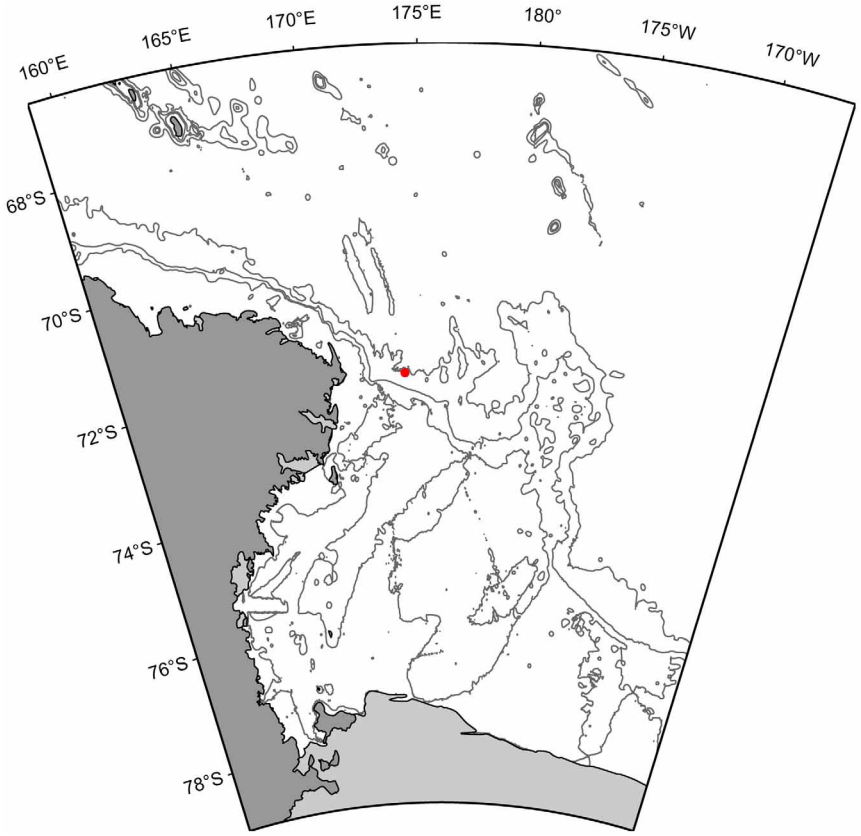

FIGURE 64. Distribution of *Paraliparis parviradialis.*

***Paraliparis plicatus* n. sp.**
Figs. 65, 66

Holotype. NMNZ P.043689, female, 286 mm TL, 263 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m. NMNZ P.043689/1, cleared and stained right pectoral girdle.

Diagnosis. Chin pores closely paired with an anterior crescent-shaped tissue fold. Teeth uniserial in premaxilla except near symphysis, where irregularly bi-or tri-serial for 9–10 teeth; mandibular teeth uniserial, gradually smaller anteriorly. V 66, P 21, C 7. Radials 4 (3+1), unnotched; scapula with strong helve, coracoid with a narrow dorsal slit. HL 16% SL, upper jaw about 36, anus-anal fin origin 177, chin pore interspace 2–3% HL. Body color purplish.

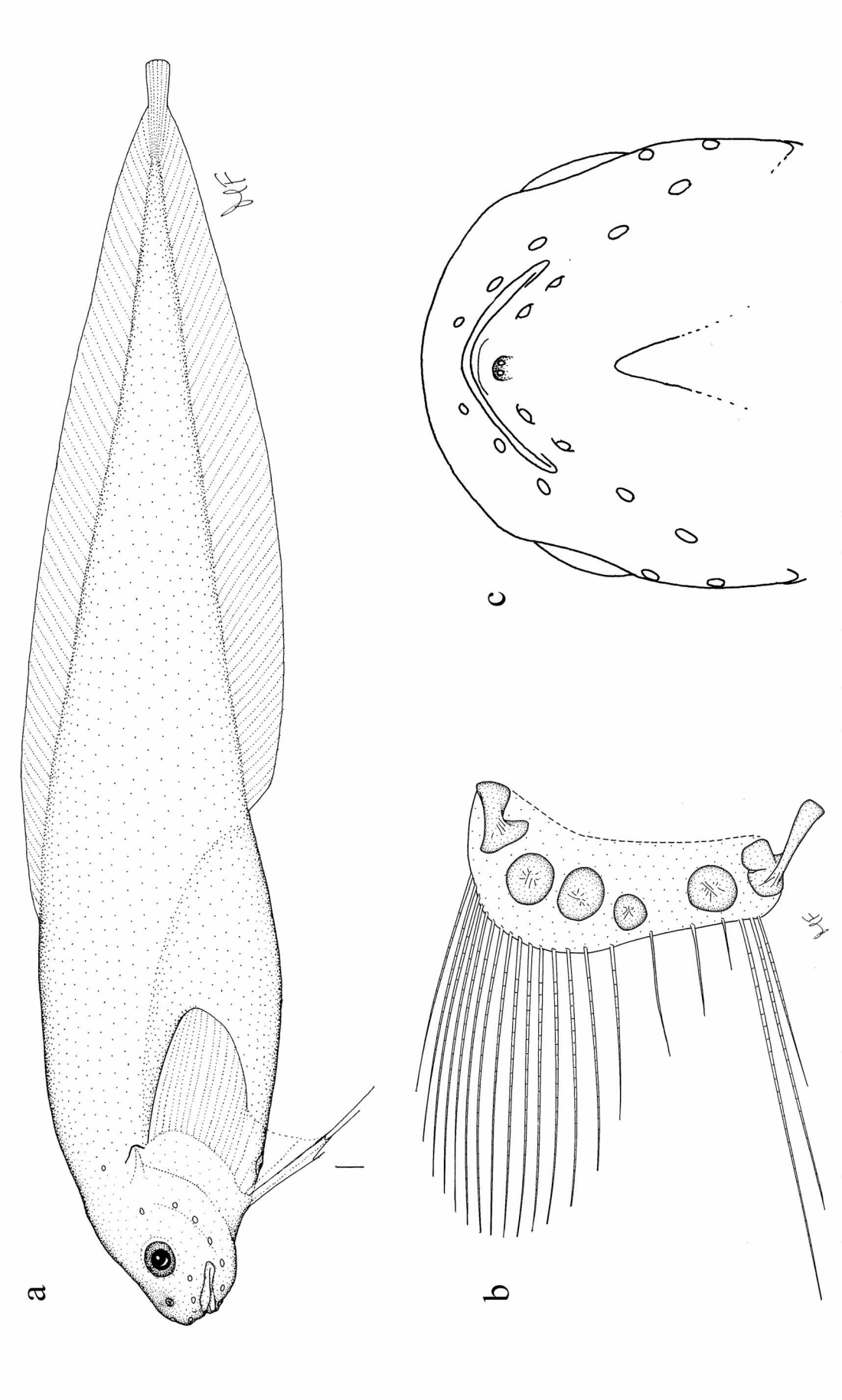

FIGURE 65. *Paraliparis plicatus* n. sp. Holotype, NMNZ P.043689, 263 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043689/1; c. chin pores.

Description. Counts. V 66 (14+52), D 56, A 51, C 7, P 21 (15+3+3), radials 4 (3+1), pc 6?, pores 2–?–7–1. Ratios. HL 16.0, HW <14.6, sn 3.9, E 3.5, orbit 4.7, io 7.6, uj 5.8, go 2.5, bd 19.8, preD 31.4, preA 45.1, aAf 28.5, UPL 12.7, LPL 14.1. In % HL: HW <91.2, sn 24.2, E 22.1, orbit 29.2, io 47.5, uj 36.5, go 15.4, bd 124.0, preD 196.2, preA 281.7, sna 91.4, aAf 176.9, UPL 79.1, LPL 88.4, cp 2.4, LLD 28.0.

Head short and deep, dorsal profile rising steeply through flat interorbital region. Snout short. Nostrils with raised rim, larger than nasal pores; anterior to orbit by about 1/2 eye diameter, on a horizontal with lower margin of orbit. Mouth horizontal, inferior, oral cleft reaching below anterior margin of orbit. Teeth simple, sharp, canines, uniserial in both jaws except anteriorly. About 25 uniserial premaxillary teeth, another 9–10 irregularly bi- or triserial near symphysis. Mandibular teeth about 50, uniserial, becoming smaller anteriorly, extending distinctly farther posteriorly than premaxillary teeth. Symphyseal gap present in both jaws. Eye prominent, pupil very large, almost equal to eye diameter. Interorbital space about half head width. Gill opening completely above pectoral fin base and slightly anterior to it, extending to level of upper pectoral ray, less than1/6 head; a small opercular flap clearly developed, supported by dorsally curved opercle. Chin pores closely set, smaller than those more posterior, not in a shallow pit but with anterior skin fold, the distance separating them greater than one pore diameter. Suprabranchial pore single with raised rim, directly above postero-dorsal end of gill opening.

Pectoral fin short, upper lobe about 80% HL, its longest ray not reaching midpoint of abdominal cavity; lower lobe longer than upper but not as long as head. Uppermost ray on horizontal with middle of eye. Upper lobe rounded, of 15 rays; notch moderately deep, notch rays three, gradually shorter ventrally, poorly developed (rudimentary, unsegmented, filamentous); lower lobe of three rays, insertion of lowest ray below preopercle, reaching posteriorly just past tip of upper lobe or slightly farther. A wide gap less than 1/3 HL present between lower pectoral fin lobes. Right pectoral girdle with four (3+1) radials, R1 and R2 large, oval, about equal in size; R3 much smaller, R4 round, similar in size to R1 and R2 but much larger than R3. Notches and foramina absent. Scapular helve well developed, scapular blade larger and broader. Coracoid head slit dorsally, helve long, slender, basal notch absent.

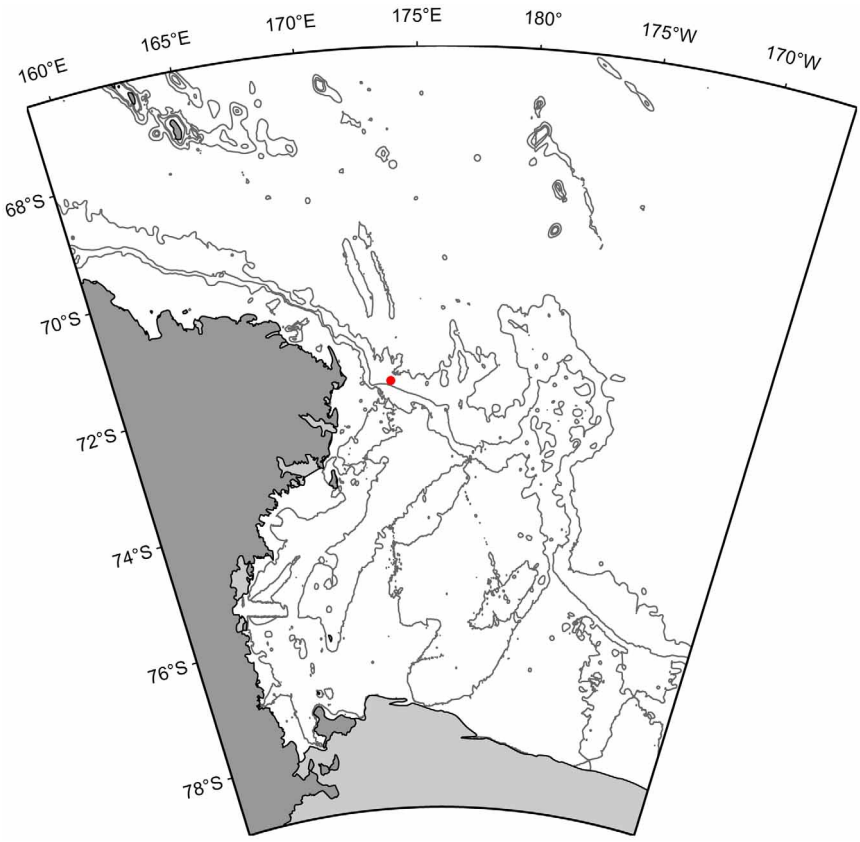

FIGURE 66. Distribution of *Paraliparis plicatus.*

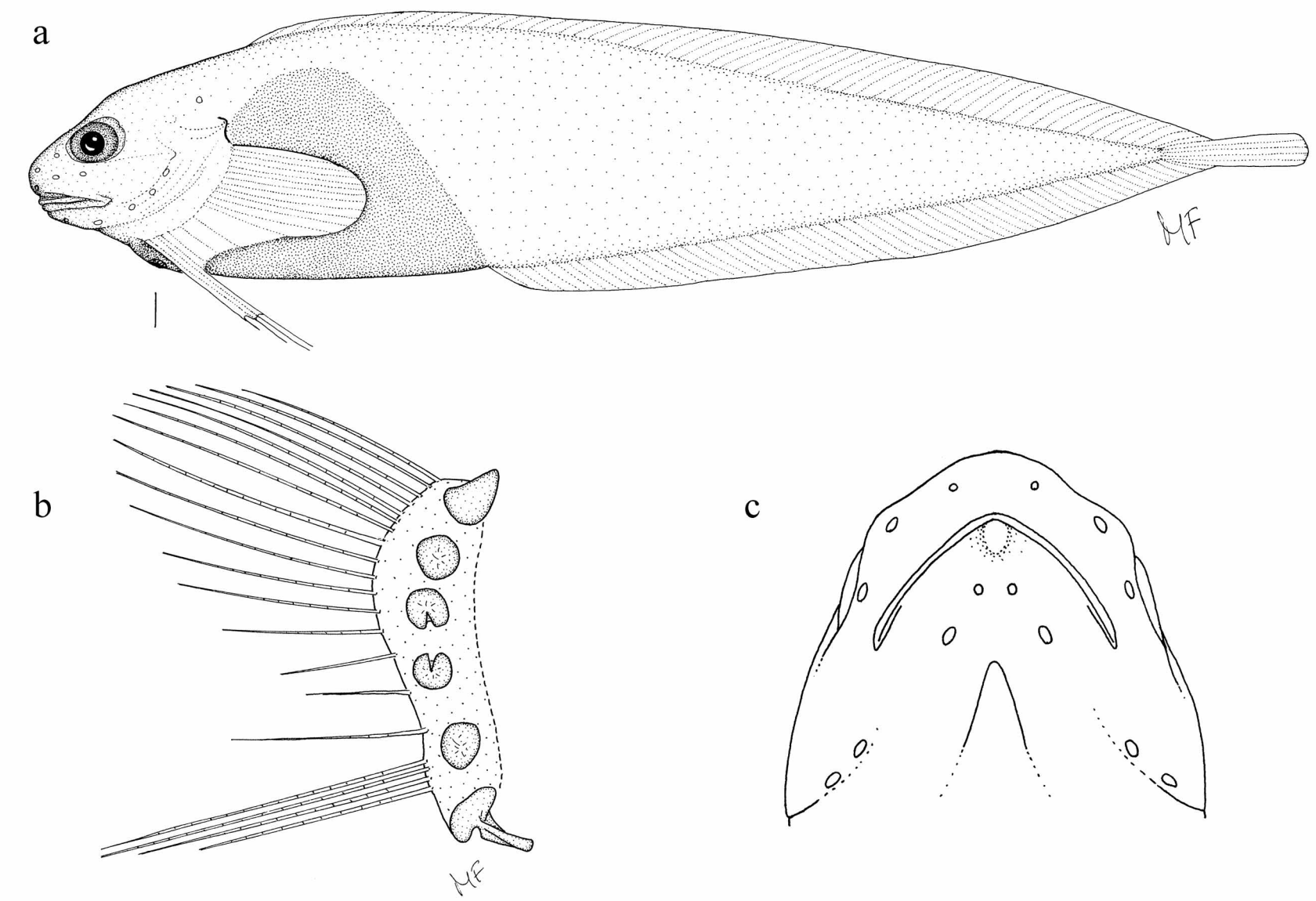

FIGURE 67. *Paraliparis posteroporus* n. sp. Holotype, NMNZ P.043692, 219 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043692/1; c. chin pores.

Body thick, deepest behind head. Dorsal fin insertion between vertebrae 9–10, anal fin insertion between vertebrae 14–15. Dorsal and anal fins deepest at about 4/5 of SL towards tail. Anus well behind bases of lower pectoral fin lobes, below middle of upper lobe base and below gill flap. Peritoneum visible through body wall. Pyloric caeca about six, short, digitate. Hypural complex fused, slit absent. Caudal fin of seven rays (3/4), auxiliary rays absent. SECM apparently not well developed. Skin thick, fibrous.

Color of body in alcohol purplish, head, distal part of upper pectoral fin lobes, and lower lobe rays brownish, anal region blackish-brown. Orobranchial cavity dusky-blackish. Peritoneum black, stomach and pyloric caeca pale.

Distribution. Known only from the type, collected between 1431–1658 m on the northwest edge of Mawson Bank.

Etymology. From the Latin *plico*, fold, indicating the skin fold in front of the chin pore pair.

Comparisons. *Paraliparis plicatus* is most similar to *P. neelovi*, but differs in having a chin pore fold (vs absent), four (vs three) radials, seven caudal rays (vs six), and many proportions slightly outside the range of variability for *P. neelovi*. It is also similar to *P. longicaecus* but differs in the chin fold (vs absent), shorter distance between chin pores (2 vs 4% HL), gill opening location (anterior to a vertical through pectoral fin base vs directly above), and shape (lobate shape vs a right angle), pectoral girdle structure (R1 and R3 and coracoid unnotched vs notched), longer anus-anal fin origin (177 vs 137% HL), shorter upper jaw length (36 vs 43% HL), and fewer vertebrae (66 vs 69). It could be confused with *P. epacrognathus* also, but differs notably in having three rudimentary but long pectoral notch rays (vs reduced to bases only), chin pore fold (vs absent), longer gill opening of about 15% HL (vs 11%), longer snout to anus distance of about 91% HL (vs 80%), and other differences.

***Paraliparis posteroporus* n. sp.**
Figs. 67, 68

Holotype. NMNZ P.043692, male, 240 mm TL, 219 mm SL, 71°55.80′ S, 173°18.08′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/144, 23 February 2008, 1431–1658 m, NMNZ P.043692/1, cleared and stained right pectoral girdle.

Diagnosis. V 69, D 60, A 54, P 20, notch rays long, some rudimentary. Mandibular pores set well back from symphysis and edges of lower jaw, chin pore pair not in a pit, close together, posterior to symphyseal knob of lower jaw. Teeth almost entirely uniserial except near symphysis. Pectoral fin lower lobe much longer than upper lobe. Radials 4, round, R2 and R3 notched opposite to each other, other radials unnotched. Scapular helve absent, coracoid with deep basal notch.

Description. Counts V 69 (13+56), D 60, A 54, C 6?, P 20 (13+3+4), radials 4 (1+1+1+1), pc ≥6, pore formula unknown. Ratios. HL 18.2, HW 13.6, sn 4.2, E 4.0, orbit 5.6, io ~5.3, uj 6.9, go 2.1, bd ~21, preD 29.0, preA 40.7, sna 13.9, aAf 24.6, UPL 12.1, LPL 15.6, pabd 28.3. In % HL: HW 74.9, sn 23.4, E 22.1, orbit 30.9, io <30.6, uj 38.2, go 11.6, bd ~116, preD 159.8, preA 223.9, sna 76.6, aAf 135.2, UPL 66.3, LPL 89.3, pabd 155.5, cp 4.3, pcl 35.9.

Head less than 1/5 SL, low and compressed, dorsal profile rising evenly from snout through flat interorbital region. Snout short, low, bluntly rounded, projecting slightly beyond upper jaw. Anterior ends of suborbital stays projecting as a prominent strong knob on each side, probably more obvious as a result of damaged snout. Nostrils damaged, apparently close to anterior margin of orbit. Mouth horizontal, subterminal; lower jaw slightly included, oral cleft reaching below anterior half of orbit. Teeth simple, sharp, evenly spaced canines, arranged uniserially for most of jaw length. About 30 premaxillary teeth in a single row, gradually smaller anteriorly before some irregularly bi- or tri- serial teeth near symphysis. Symphyseal gaps present in both jaws; in upper jaw, wide, with a clear notch anteriorly; in lower jaw, narrow, with well-developed symphyseal knob. Eye prominent, orbit large, entering dorsal profile of head, slightly less than 1/3 HL. Gill opening above pectoral fin base and possibly extending over one fin ray, slightly longer than 10% HL; opercular flap a weakly developed shallowly curved lobe, supported by dorsally curved opercle, its tip higher than its proximal end and reaching slightly behind dorsalmost end of pectoral base. Pore formula unknown. Remaining pores of mandibular series normal in size but unusual in arrangement. Chin pores paired, their distance apart about 4% HL, located on mandibular undersurface distinctly posterior to symphyseal knob and well behind tip of jaw. Other mandibular pores located distinctly and unusually close to ventral midline. Suprabranchial pore single, well above gill opening.

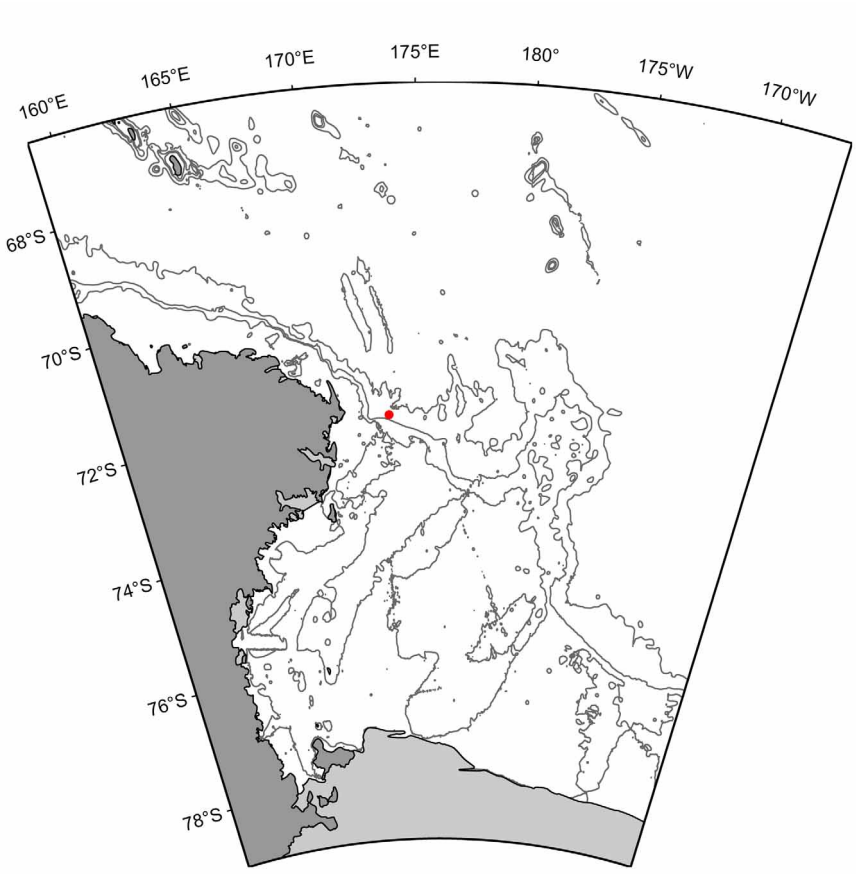

FIGURE 68. Distribution of *Paraliparis posteroporus.*

Pectoral fins damaged, upper lobe reaching behind midpoint of abdominal cavity, about 2/3 of distance to anal fin origin. Uppermost ray even with or higher than mid-orbit. Upper lobe rounded, of 13 rays, reaching to 1/2–2/3 body cavity length. Notch rays three, right pectoral girdle with two rudimentary and one fully developed ray, all relatively long. Lower lobe long, of three or four rays, the dorsal two filamentous for slightly less than half their length, reaching to below tip of upper lobe and possibly farther; insertion of lowest ray below middle of opercle. No obvious gap present between lower pectoral fin lobes. Right pectoral girdle with 4 (1+1+1+1) moderately large, round, closely and evenly spaced radials of similar size; R1, R4 unnotched, but narrow opposed V notches in R2, R3. Scapular helve absent; coracoid helve long, slender; a deep ventral notch present at base of helve.

Body behind head dorso-ventrally flattened, deepest behind head over mid-abdomen. Dorsal fin insertion between vertebrae 7–8, anal fin insertion between vertebrae 13–14. Dorsal and anal fins gradually deeper posteriorly. Anus anterior, about between bases of lowest pectoral fin lobe rays, anterior to gill opening. Peritoneum clearly visible through body wall. Body cavity short, unusually deep, its dorsal outline humped behind pectoral fin base. Hypural complex fused, slit absent. Caudal fin possibly damaged, apparently of six (3/3) rays, auxiliary rays absent. Pyloric caeca about six, stout, thick walled, of different lengths but none exceptionally long. SECM apparently not well developed. Skin thin, easily damaged.

In alcohol, body dark, head blackish, snout and lower jaw black, blackish brown skin thin and translucent, blackish over ventral surface of body cavity (in addition to black peritoneum visible through body wall); in life, probably completely black from anal fin forward. Pectoral fin lower lobe filamentous rays black. Mouth black, branchial cavity dusky, stomach and pyloric caeca pale except for black remnants of possible blood vessels.

Distribution. Known only from the holotype, collected between 1431–1658 m on the northwest edge of Mawson Bank.

Etymology. The name *posteroporus* from the Latin *postero-*, rear, and the Greek *porus*, hole, denoting the unusual posterior position of the chin pore pair well behind the mandibular symphysis.

Comparisons. The new species is most similar to *P. stehmanni* but is clearly distinct from it. Although the counts and most of the ratios are similar to *P. stehmanni*, *P. posteroporus* differs in pectoral structure, color, chin

pore characteristics and depth of body cavity. Its pectoral girdle has four radials, but it has no notches between R1 and R2 (vs notches present), other radial notches small and narrow (vs large and broad), notch rays are well developed and relatively long (vs rudimentary and very short), and the number of notch rays is three or four (vs two). Its body color is solid black anteriorly and dark brown on the tail (vs uniform pinkish violet). In *P. posteroporus* the chin pores are unusually far posterior on the lower jaw (well behind mandibular symphysis vs near the lower lip) and not in a shallow depression (vs shallow depression in small individuals). Finally, the dorsal outline of the body cavity as expressed by the peritoneum, which is visible through the body wall, is strongly curved ("humped"), making the body cavity very deep (vs shallowly curved). *Paraliparis diploprora* Andriashev 1986 has very prominent protrusions on the snout, but they are soft tubercles not supported by the suborbitals, and in other regards *P. diploprora* also does not resemble *P. posteroporus*.

Paraliparis rossi Chernova & Eastman 2001

Figs. 69, 70

Paraliparis rossi Chernova & Eastman 2001:98, Figs. 4b–6; Andriashev 2003:341, Figs. 180, 181.

Holotype. USNM 361867, female, 124 mm TL, 110 mm SL, 74°16.54′ S, 171°58.08′ E, R/V *N.B. Palmer* Cruise 97–9 Stn. 46, 30 December 1997, 465–466 m.

Material examined. None

Expanded diagnosis (modified from Chernova & Eastman, 2001). Counts. V 54–56 (9+45–47), D 49–50, A 44, C 9 (4/5), P 20–22 (15–16+2+2–4), radials 3 (2+0+1), pc 7, pores 2–6–7–1. Ratios. HL 25.5–27.8, HW 18.6–19.6, sn 10.4–10.9, E 5.4–5.5, io 13.6–17.1, uj 11.8–12.9, go 6.8–7.5, bd 22.7–24.5, preD 27.3–28.4, preA 34.5–35.5, aAf 18.6–22.3, UPL 17.5–18.2, LPL 18.2–19.4, pcl 6.4% SL. In % HL: HW 70–76, sn 37.4–43, E 19.2–21.8, io 54–63, go 25.2–29.6, uj 46.3–49.3, go 25.2–29.6, bd 88–89, UPL 63–70.

Head large and low, its depth equal to its width. Snout gelatinous, projecting anteriorly, broadly rounded. Nostril tubular, its length almost 1/3 eye. Eye moderately large, not touching dorsal profile of head. Mouth horizontal, subterminal, oral cleft reaching to below anterior margin of eye. Teeth lanceolate, sharp, with weakly developed shoulders, arranged in about nine oblique rows forming bands in both jaws; symphyseal gaps absent. Symphyseal pores not closely set. Interorbital space wide, about 1/2 head length. Gill opening above pectoral fin and extending ventrally in front of 2–3 pectoral rays; gill flap large, rounded. Cephalic pores small, all about similar diameter. Pectoral fin dorsal ray below lower margin of orbit, upper lobe almost reaching anal fin origin; notch moderately deep, rudimentary rays absent; lower lobe rays elongated, fleshy, not reaching to below tip of upper lobe, ventralmost ray below posterior margin of eye. Anus anterior to vertical through gill opening, about mid-way between mandibular symphysis and anal fin origin. Dorsal and anal fins overlap caudal by about 50% its length. Pyloric caeca thick, short, tips rounded, of unequal length. Dorsal fin insertion between V 4–6. Color in life pink, in alcohol body uniformly pale, mouth gray, inside of upper lip pigmented. Gill cavity and peritoneum black, stomach pale. Snout, chin, lower surface of head, and anterior halves of dorsal and anal fins gelatinous.

Distribution. The four known specimens were collected southwest of Mawson Bank at 465–466 m.

Comparisons. Most similar to *P. macrocephalus* Chernova & Eastman 2001 but differs in tooth characteristics (teeth larger, lanceolate with weak shoulders vs simple), small circumoral pore diameter (vs large and contoured), proportions, and color (pale vs grayish, darker caudally).

Comments. Chernova and Eastman (2001) present conflicting information regarding snout and eye lengths in *P. rossi* and *P. macrocephalus*. The description of *P. rossi* states (p. 99) that "in lateral view distance between vertical through tip [of snout] and anterior margin of eye about equal", and this is reflected in the figure of *P. rossi*. However, the comparative notes (p. 101) for *P. rossi* state explicitly that it differs from *P. macrocephalus* in having a "much shorter snout (about equal to eye v. much larger, almost two eye diameters" but the proportions given for *P. rossi* are "snout 10.9 (10.4, 10.7), eye 5.5 (5.4, 5.5)" % SL, and "snout 43 (37.4, 41.5), eye 21.8 (19.2, 21.1)" % HL. Therefore, I conclude that both species have the snout about twice the eye diameter and the latter statement in the comparative notes is an error.

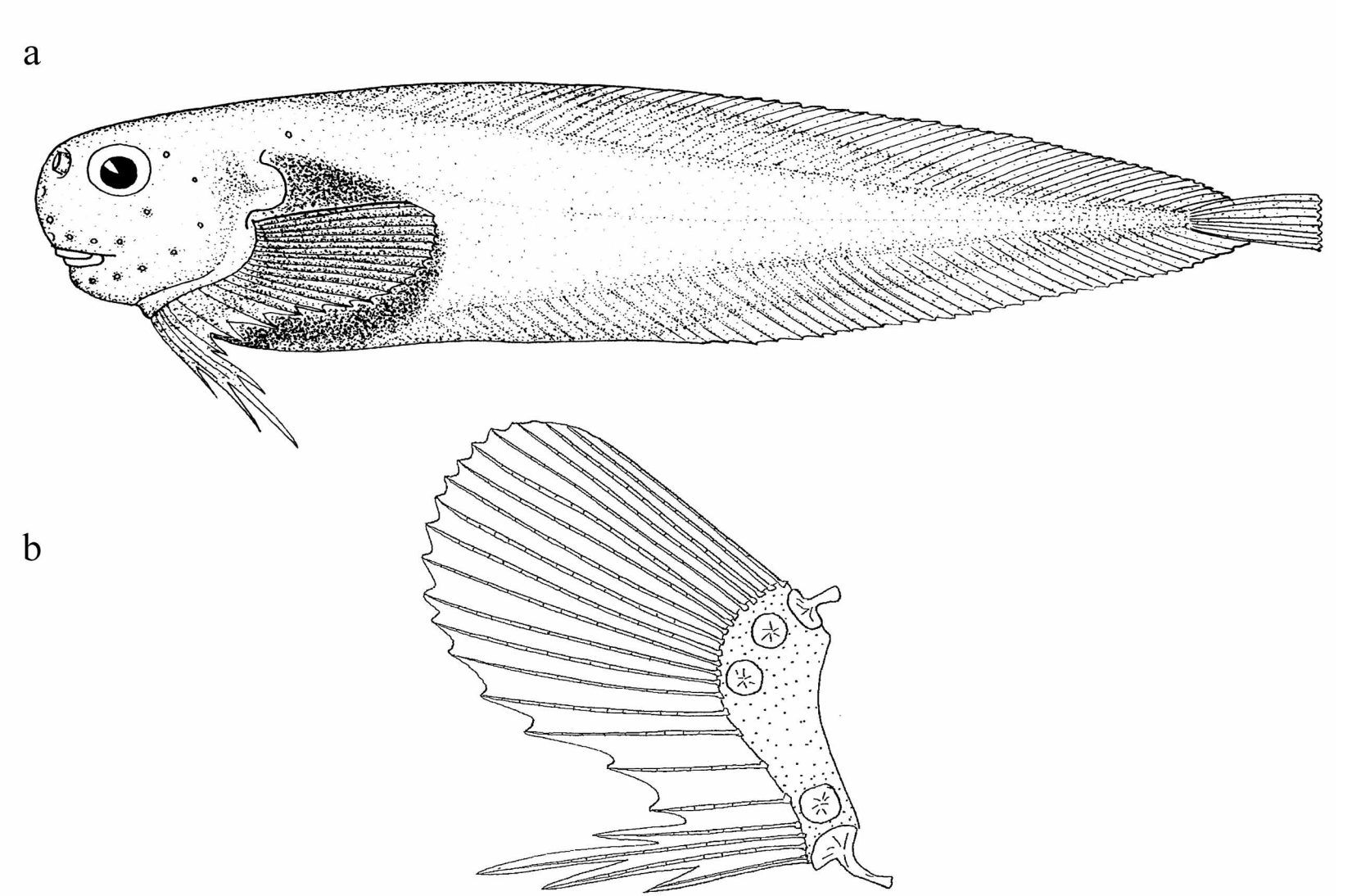

FIGURE 69. *Paraliparis rossi* Chernova & Eastman 2001. Holotype, USNM 361867, 110 mm SL. From Chernova & Eastman, 2001: Figs. 5, 6; a. lateral view; b. pectoral girdle, USNM 361867.

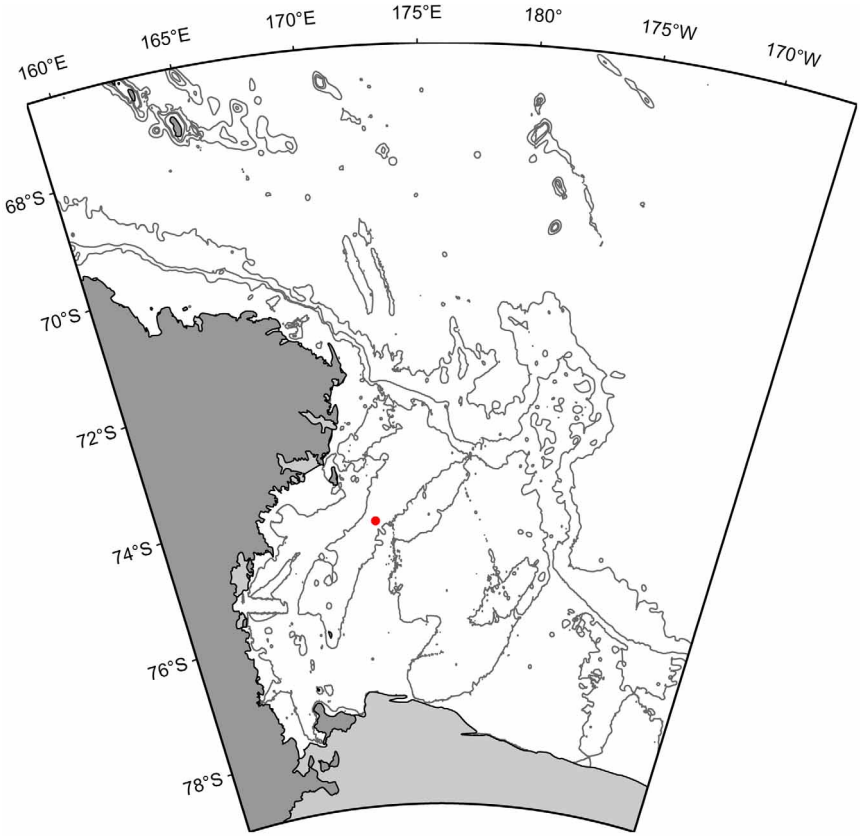

FIGURE 70. Distribution of *Paraliparis rossi.*

Paraliparis stehmanni Andriashev 1986

Figs. 71, 72

Paraliparis stehmanni Andriashev 1986:131, Figs. 57, 58, 70; Stein & Tompkins 1989:7; Stein & Andriashev 1990:251, Fig. 30; Andriashev 2003:347, Figs. 184, 185.

Holotype. ISH 404/76, male?, 216 mm TL, 195 mm SL, 54°12′ S, 40°02′ W, FR/V *Walther Herwig*, 3 January 1976, ~2600 m.

Material examined. NMNZ P.043719, ripe female, 332 mm TL, 307 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.043719/1, cleared and stained right pectoral girdle. LACM 10784–1, male, 98 mm SL, 61°55′ S, 55°50′ W, USNS *Eltanin* Stn. 995, 14 March 1964, 2119–2562 m.

Expanded diagnosis (modified from Andriashev 2003 to include NMNZ P.043719). V 67–71, C 7, P 20–21, pc 6 [7]. Radials 4 (3+1), R1, R2, R3 deeply and regularly notched. Teeth simple, mostly uniserial except near symphysis. Mandibular symphyseal pores distinctly separated, in smaller individuals in a shallow pit. Gill opening short, completely above pectoral base. Small rounded gill flap present. Pectoral notch rays rudimentary. Head 17–21% SL, preanal length 40–45. Gill cavity blackish, peritoneum black.

Abbreviated description. Number before brackets from NMNZ P.043719, numbers in brackets given by or calculated from Andriashev 2003. Counts. V 67 [69–71 (11–12+58–59)], D 60 [63], A 53 [55–56], C 7 [7], P 20–21 [20–21], radials 4 (3+1) but see below, pc 6, pores 2–6–7?–1. Ratios. HL 17.0 [18.4–20.7], HW 13.2 [11.8–12.1], sn 4.5, E 3.3 [3.8–3.9], orbit 4.8, io 6.7, uj 7.6, go 2.6 [3.1–3.2], bd 22.7 [21.6–23.6], preD 27.9 [26.6–28.9], preA 45.5 [40.5–44.0], aAf 30.1 [21.6–27.7], UPL 11.1 [13.7–13.9], pcl 10.9. In % HL: HW 77.4 [59.0-65.8], sn 26.6, E 19.5 [19–21], orbit 28.2, io 39.3, uj 45.0, go 15.3 [15–17], bd 133.7 [117–118], preD 164.0 [133–157], preA 267.6 [220], aAf 177.4 [108–150], UPL 65.5 [69–74], LPL 82.8 [77–80], LLD 23.7, cp 5.2, pcl 64.0.

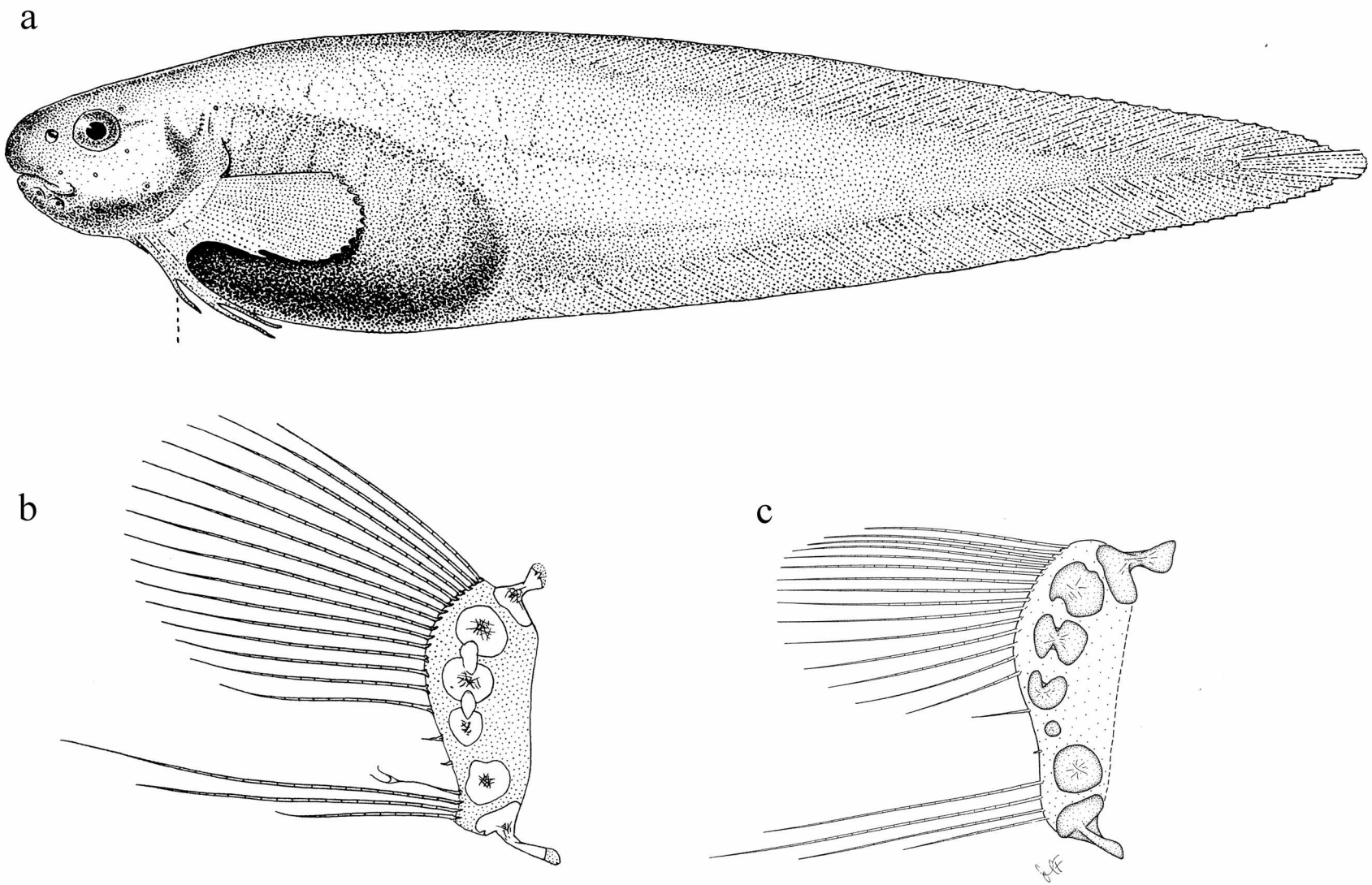

FIGURE 71. *Paraliparis stehmanni* Andriashev 1986. Holotype, ISH 404/76, 195 mm SL. Figs. a, b, from Andriashev 1986: Figs. 57, 58; a. lateral view; b. pectoral girdle, ZIN 46836; c. pectoral girdle, NMNZ P.043719/1.

TABLE 3. Comparison of *P. stehmanni* Andriashev, NMNZ P.043719 from the Ross Sea, with the holotype and paratype from the northern Scotia Sea. Data for types from Andriashev 1986, 2003.

Character	NMNZ P.043719	Holotype ISH 404/76	Paratype ZIN 46836	Character	NMNZ P.043719	Holotype ISH 404/76	Paratype ZIN 46836
SL (mm)	307	195	190				
Sex	female	male?	female				
V	67 (13+54)						
D	60	63	63				
A	53	56	55				
C	7 (3/4)	7	7				
P	21/20 (14/15+2+4)	20 (14+2+4)	21(15+2+4)				
In % SL				In % HL			
Head length	17.0	20.7	18.4				
Head width	13.2	11.8	12.1	Head width	77.4		
Head depth	~14.8			Head depth	87.0		
Body depth	22.7	23.6	21.6	Body depth	133.7		
Eye diameter	3.3	3.9	3.8	Eye diameter	19.5	19	21
Orbit width	4.8			Orbit width	28.2		
Interorbital	6.7			Interorbital	39.3		
Snout	4.5			Snout	26.6		
Upper jaw	7.6			Upper jaw	45.0		
Gill opening	2.6	3.1	3.2	Gill opening	15.3	15	17
Mandible-anus	15.7			Mandible-anus	92.1		
Snout-anus	18.2	15.4	17.4	Snout-anus	107.3		
Upper P lobe	11.1	13.9	13.7	Upper P lobe	65.5		
Lower P lobe	14.1	15.4	14.7	Lower P lobe	82.8		
Predorsal length	27.9	26.6	28.9	Predorsal length	164.0	133	157
Preanal length	45.5	44.0	40.5	Preanal length	267.6	220	220
Anus-anal fin	30.1	21.6	27.7	Anus-anal fin	177.4	108	150
Pyloric caeca length	10.9			Pyloric caeca length	64.0		
Chin pore spacing				Chin pore spacing	5.2		
Lower lobe distance	4.0			Lower lobe distance	23.7		

Premaxillary teeth uniserial for posterior 21 teeth, irregularly biserial for another anterior 20 teeth. Posterior teeth larger, stouter, not as sharp as those anterior. Symphyseal gap present, with deep anterior notch. Mandibular teeth much smaller than premaxillary teeth, uniserial for approximately 60 teeth, then an irregular band of tiny teeth near symphysis. Posterior mandibular teeth extend well behind posterior end of premaxillary tooth row. Chin pores paired, widely separated, interpore distance equal to about 5% HL, shallow pore pit not evident. Gill opening above pectoral fin upper ray, extending well below opercle tip. Gill flap a small rounded lobe near ventral end of gill opening, divided by opercle.

Right pectoral girdle with 15+2+4 rays, left fin with 14+2+4, notch rays both rudimentary, dorsal ray of the two filamentous, apparently much longer than the ventral, which is reduced to base only; lower lobe of four rays,

the dorsalmost slightly more distant from remaining three than they are from each other. Radials abnormal; five (3+1+1) radials, R4 very small; normal arrangement would be 4 (3+1). Radials R1 and R2 round, large, R3 somewhat smaller, located at edge of girdle but not D-shaped, R4 very small, round, near edge of girdle but not touching it, R5 rounded, about equal in size to R1, 2, and 3. In the holotype and paratype, fenestrae present between R1-R2, R2-R3; R1, R2, and R3 very deeply notched, R2 almost divided in half. In NMNZ P.043719, no fenestrae evident. Scapula with broad proximal head, distal head narrow; coracoid with long, slender helve, no basal notch present.

Pyloric caeca large, fat, not tapered to tips, of various lengths. Skin smooth, thick. Color in alcohol: snout dark, body posteriorly purplish, mouth blackish, branchial cavity dusky, peritoneum black. purplish posteriorly, upper pectoral fin lobe black edged. Stomach and caeca pale.

The NMNZ specimen has eggs up to 3.9 mm diameter.

Distribution. Capture in the Ross Sea greatly extends the range of the species from the previous records near the northern tip of the Antarctic Peninsula, and also greatly broadens the species depth range to shallower water (previous specimens were from 2119–2600 m, this one from 1431–1990 m).

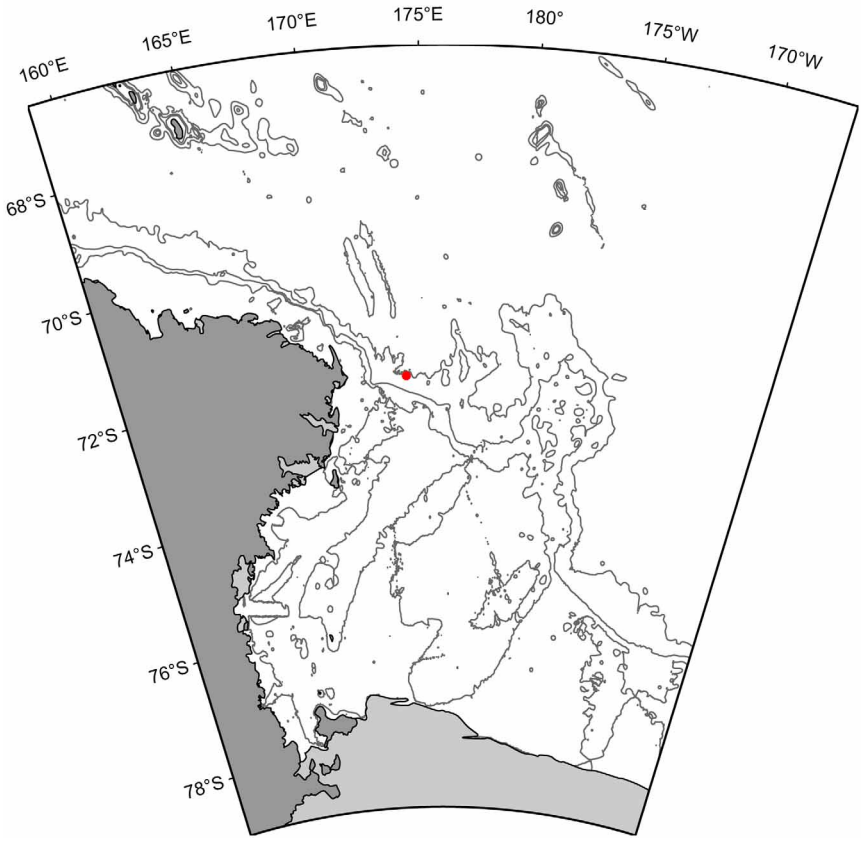

FIGURE 72. Distribution of *Paraliparis stehmanni* in the Ross Sea.

Comparisons. *Paraliparis stehmanni* differs from all other Southern Ocean *Paraliparis* species in having the combination of deeply notched radials and two interradial fenestrae in the cartilaginous plate of the pectoral girdle (but see below). Few other Southern Ocean *Paraliparis* species have fenestrae: *P. hureaui* and *P. camilarus*, and in both the fenestrae are abnormal. Several of the new species described herein also have notched radials (*P. camilarus*, *P. epacrognathus*, *P. longicaecus*, *P. nullansa*, *P. posteroporus*), but none like those of *P. stehmanni*. Aside from these characters, *P. stehmanni* could be mistaken for almost any of the species with paired chin pores lacking an anterior fold, rudimentary pectoral fin rays, seven caudal fin rays, primarily uniserial teeth and similar counts, such as *P. epacrognathus* (see description) and *P. parviradialis*. This is especially true of damaged specimens; unfortunately, undamaged specimens are uncommon. Based on the few known specimens, only examination of the pectoral girdle structure can provide positive identification.

Comments. The individual described here differs in some regards from the types of *P. stehmanni* (Table 3). Possibly significant morphometric differences could be the predorsal (164 vs 133–157% HL), preanal (268 vs 220), and anus-anal fin (177 vs 108–150) distances, which are much greater in NMNZ P.043719. It also differs in

having the chin pores widely separated (more than 5% HL apart vs "closely set"). Many other proportions are just outside the previously known limits: head length (17.0 vs 18.4–20.7), head width (13.2 vs 11.8–12.1), eye (3.3 vs 3.8–3.9), gill opening (2.6 vs 3.1–3.2), upper pectoral fin lobe (11.1 vs 13.7–13.9), lower pectoral lobe (14.1 vs 14.7–15.4), preanal fin length (45.5 vs 40.5–44.0) and anus to anal fin distance (30.1 vs 21.6–27.7). These can possibly be explained by allometry resulting from the much greater size of this individual than the other two known specimens (307 vs 98–195 mm SL).

There are four qualitative differences between this specimen and the types: the apparently greater distance between the chin pores (more than 5% HL apart), the absence of a "common shallow transversely oval pit" for the chin pores (Andriashev 1986), absence of fenestrae between R1-R2 and R2-R3, and the abnormal R4. The chin pores of the other specimens should be compared with those of this specimen. Presence of the pit cannot be determined in this individual owing to damage. Significance of the absence of the fenestrae is problematic; only three other specimens of *P. stehmanni* are known, and one of them is less than 100mm SL; variability of this character is not known. The "extra" radial (R4) is almost certainly anomalous because more than four radials are abnormal, R4 is small, and rest of the radials are identical to those of the types. The presence in NMNZ P.043719 of deeply notched radials in combination with similar meristic and morphometric characters, despite the "extra" R4, supports identification of this specimen as *P. stehmanni*. Future captures of additional specimens will clarify its identification.

***Paraliparis tangaroa* n. sp.**
Figs. 73, 74

Holotype. NMNZ P.045475, ripe female, TL, SL unknown; 49 mm HL, 133 mm preA, Iselin Seamount, Ross Sea, 71°00.0′ S, 179°30.0′ W, F/V *San Aotea II*, Stn. OBS 2731/077, 20 January 2009, 966–1153 m. Last part of tail missing. NMNZ P.045475/1, cleared and stained right pectoral girdle.

Diagnosis. Teeth uniserial for more than posterior half of premaxilla, and almost all of mandible. V 14+?, P 20, C ? Dorsal fin with two rayless anterior pterygiophores, the first between V 4–5, first ray between V 6–7. Chin pores unusually closely paired, their distance about 1% HL; anterior crescent-shaped tissue fold possibly present. Predorsal length about 124% HL. Pectoral fin notch rays rudimentary. Radials 4 (1+1+1+1). Subdermal gelatinous tissue not well developed. Body color white.

Description. Counts. V 14+?, number unknown; D, A, C unknown. P 19?–20 (14+2–3+3–4), radials 4 (1+1+1+1), pc unknown, pore formula unknown. Ratios. In % HL: sn 27.1, E 18.0, orbit 27.8, io 44.9, uj 36.3, go 16.3, preD 123.7, preA 271.8, aAf 194.7, UPL 64.9, LPL 68.8, cp 1.0.

Head short and deep, dorsal profile rising in an even curve through flattened interorbital region to deepest part of body over mid-abdomen. Snout short, about 1/4 head. Nostrils porelike, immediately anterior to orbit by less than 25% orbit diameter, on a horizontal about through center of pupil. Mouth horizontal, subterminal, oral cleft reaching below anterior half of orbit. Teeth simple, blunt, stout canines, uniserial in posterior 1/2–2/3 of upper jaw. Premaxillary teeth uniserial posteriorly for about 17 teeth, then forming about 11 gradually longer oblique curved rows of up to four teeth each near symphysis. Mandibular teeth smaller, uniserial for about 50 teeth, then anteriorly about 10 oblique rows of up to five teeth each near symphysis. In both jaws, teeth gradually smaller towards symphysis. Symphyseal gap present in both jaws, wide in upper jaw, narrower but clear in mandible. Eye prominent, pupil very large, almost equal to eye diameter. Gill opening completely above pectoral fin base, almost 1/6 head;

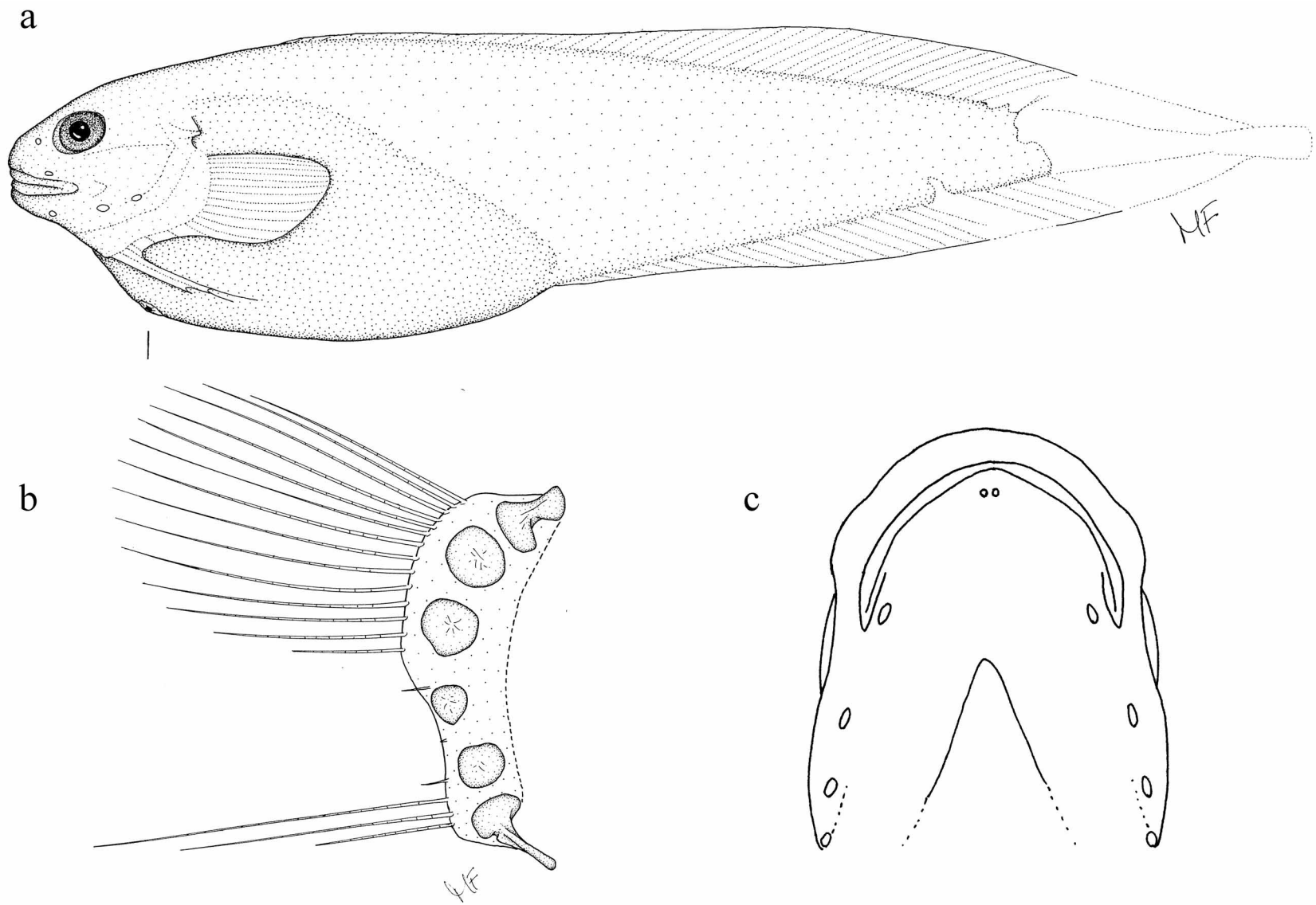

FIGURE 73. *Paraliparis tangaroa* n. sp. Holotype, NMNZ P.045475, SL unknown; a. lateral view; b. pectoral girdle, NMNZ P.045475/1; c. chin pores.

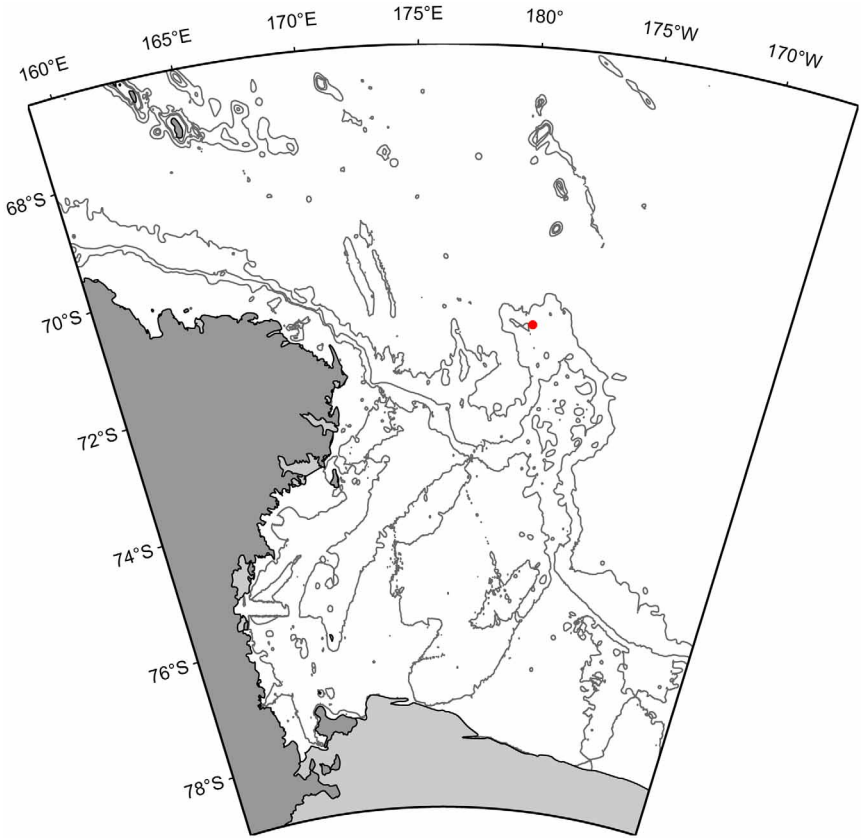

FIGURE 74. Distribution of *Paraliparis tangaroa.*

opercular flap clearly developed, its tip triangular, supported by broad, horizontal but dorsally curved opercle. Chin pores not in a pit, anterior tissue fold possibly present; distance separating them narrow, pores almost touching, inter-pore distance about 1% HL, not more than one pore diameter apart. Pore formula unknown, remaining pores moderately large, clearly visible.

Pectoral fins short, about 2/3 HL, longest ray of upper lobe not reaching midpoint of abdominal cavity. Uppermost ray on horizontal with lower margin of orbit. Upper lobe rounded, of 14 rays, notch rays two or three, rudimentary, short, damaged but probably filamentous. Lower lobe of three rays, insertion of lowest ray below cheek, distinctly anterior to gill opening; lower lobe rays reaching posteriorly to below middle of upper lobe or slightly farther. A wide gap present between lower pectoral fin lobes. Right pectoral girdle with 4 (1+1+1+1) almost round unnotched radials, R1, R2 larger, R3 smallest, R4 intermediate in size between R1-2 and R3. Fenestrae and notches absent. Distance between R1 and R2 noticeably less than that between R2–R3 and R3–R4. Scapula like a double bladed axe, the basal plate larger and broader than the helve. Coracoid with a long, slender helve, basal notch present.

Body thick, deepest well behind head. Dorsal fin anteriormost ray insertion between vertebrae 6–7; two anterior rudiments present, insertion of the first between vertebrae 4–5. Anal fin insertion between vertebrae 14–15. Dorsal and anal fins deepest at about 4/5 of SL posterior. Anus slightly posterior to bases of lower pectoral fin lobe rays, below end of suborbital stay. Peritoneum visible through white body wall but not strongly black in outside view. Pyloric caeca partially deteriorated, but remaining caeca large, very flat, easily damaged. Hypural complex fused, slit absent. Caudal fin unknown. SECM apparently not well developed. Skin thick, fibrous.

Color of body in alcohol white, head pale brownish. Mouth gray, tongue paler; branchial cavity blackish, peritoneum black, stomach and pyloric caeca pale.

The specimen is a ripe female with eggs up to 3.8 mm diameter.

Distribution. Known only from a single specimen collected on Iselin Seamount in the Ross Sea at 966–1153 m depth.

Etymology. Named after the Maori god of the sea, *Tangaroa*, responsible for all sea creatures. To be treated as a noun in apposition.

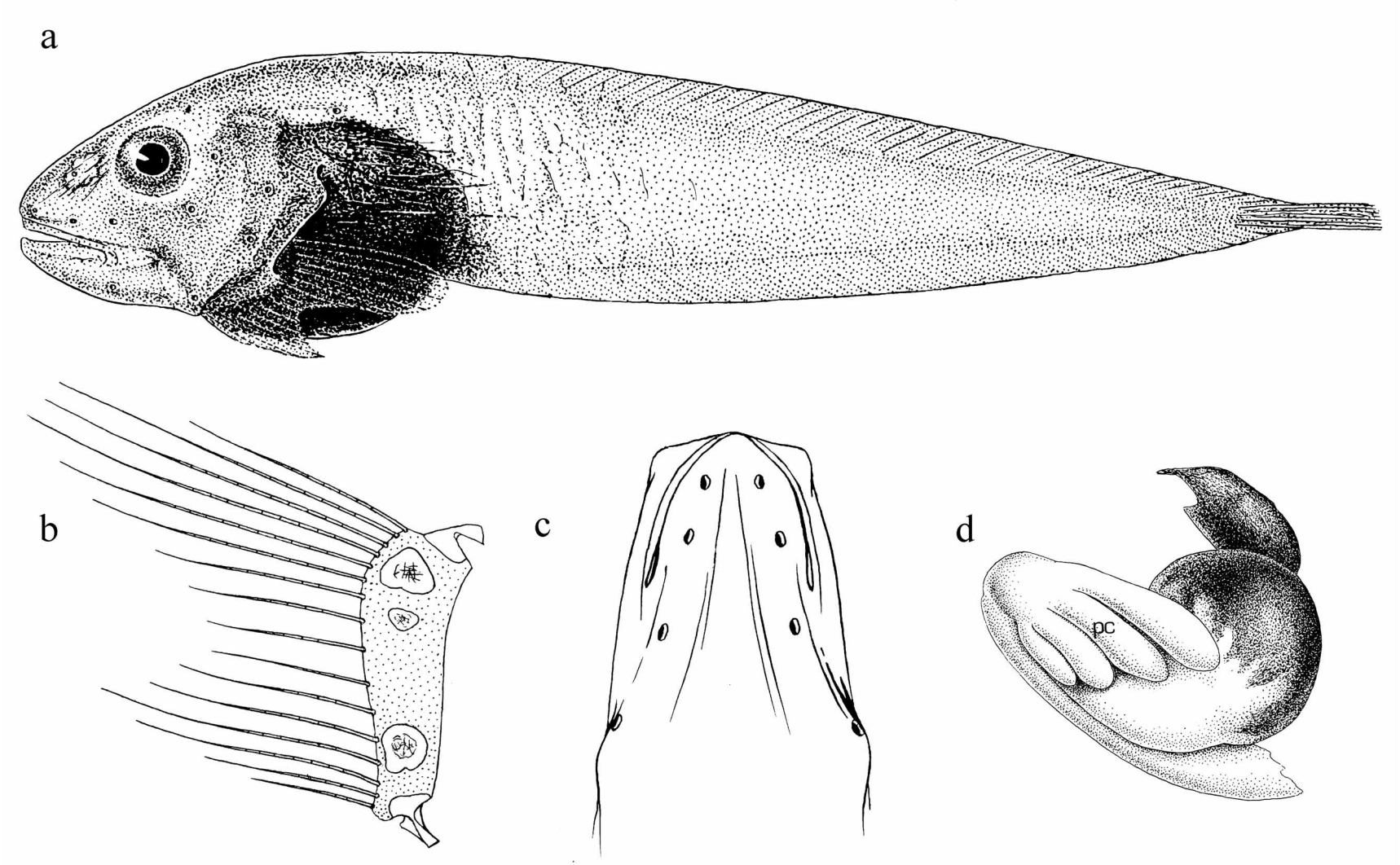

FIGURE 75. *Paraliparis terraenovae* Regan 1916. ISH 266–81, 68 mm SL. From Andriashev, 1986: Fig. 29, as *Paraliparis edentatus* n. sp.; a. lateral view; b. chin pores; c. pectoral girdle, ZIN 46830; d. stomach and pyloric caeca.

Comparisons. This specimen is similar to *P. plicatus* in most of its proportions, and in the few counts that can be made. However, it differs significantly in the dorsal fin insertion (between V 4–5 if the two anterior fin rudiments are included, between V 6–7 if not, vs between V 9–10), the associated shorter predorsal length (123 vs 196% HL), the greater anus-anal fin distance (195 vs 178% HL), shorter snout to anus distance (85 vs > 91% HL), much closer chin pores (almost touching, distance between them 1 vs 2% HL), and smaller eye (18 vs 22% HL). Its pectoral girdle differs from that of *P. plicatus* in having different radial spacing (1+1+1+1 vs 3+1), somewhat larger radials, and a clear basal notch in the coracoid (vs a dorsal slit). In addition, it was collected at a shallower depth (<1153 vs 1431–1990 m). Although some differences in morphometric characters (not those above) might be explained by its poor condition, the anterior dorsal fin origin and the characters given above cannot be. It similarly could be mistaken for *P. alius*, but differs in number of abdominal vertebrae (14 vs 11), anal fin insertion (vertebrae 14–15 vs 12–13), radial arrangement (1+1+1+1 vs 3+1), basally notched coracoid (vs unnotched), upper pectoral fin lobe length (65 vs 74% HL), shorter predorsal fin length (124 vs 174% HL), anus-anal fin length (195 vs 174% HL), distance between chin pores (1 vs 3% HL), and presence of anterior pterygiophores lacking dorsal fin rays (vs none). All three species are represented by females of similar size (*P. tangaroa*: 49, *P. alius*: 48, *P. plicatus*: 42 mm HL), so sexual dimorphism and allometric growth are unlikely. Therefore, the species is described as new.

Paraliparis terraenovae Regan 1916

Figs. 75, 76

Paraliparis terraenovae Regan 1916: 129, Pl. 1, Fig. 6; Stein & Tompkins 1989:7; Stein & Andriashev 1990:252, Fig. 31; Duhamel et al. 2010:339, Figs. 23, 24.
Paraliparis edentatus Andriashev 1986: 69, Figs. 29, 30 A–D
Edentoliparis terraenovae Andriashev 1990c:181, Figs. 1–2; Andriashev 2003:381, Figs. 203, 204; Duhamel 1992:195.

Holotype. BMNH 1916.3.20.29, 35 mm TL, 77°15′ S, 166°00′ E, McMurdo Sound, R/V *Terra Nova*, Stn. 332, 16 January 1912, 0–550 m.

Material examined. NMNZ P.043482, ripe female, 69 mm TL, 61 mm SL, 76°46.02′ S, 167°49.75′ E, S. of Franklin Is., Ross Sea, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/070, 15 February 2008, 724–754 m.

Diagnosis. (Slightly modified from Andriashev, 2003). V 51–55 (8–9+43–46), P 12–16, radials 2 (1+0+0+1). No teeth in either jaw; pharyngeal teeth absent. All gill rakers black speckled. Orobranchial cavity dark (blackish speckled), peritoneum and anterior part of stomach black. Head 24–26%, preanal length 36–40% SL.

Distribution. Circumantarctic at depths from 5–850 m.

Comparisons. This species is unique among all other known Southern Ocean species in its lack of dentition. If this is noted in examination, it cannot be mistaken for any other known species. In addition, Andriashev (2003:381) noted that its pattern of radial arrangement is not that of a *Paraliparis* (2+0+1), but rather of a *Careproctus* (1+0+0+1); this, in combination with the absence of a ventral sucking disk, is also uniquely diagnostic. However, the figure of the pectoral girdle (Fig. 75 herein) included by Andriashev (op. cit.) shows three radials; R3 is small and not mentioned in the figure legend (Fig. 203). In the text (2003:382) Andriashev states that pectoral girdles of ten specimens were studied, and of those, three were anomalous, and the girdle illustrated, from paratype ZIN 46830, is one of those. In the original description of *P. edentatus* it was incorrectly thought to be normal and thus included in the figure (Andriashev, 1986:Fig. 30). Duhamel et al. (2010) synonymized *Edentoliparis* with *Paraliparis* on the basis of genetic data.

Paraliparis voroninorum n. sp.

Figs. 77, 78

Holotype. NMNZ P.043717, female, 318 mm TL, 295 mm SL, 71°52.37′ S, 174°04.29′ E, NW edge of Mawson Bank, R/V *Tangaroa*, Stn. IPY/CAML TAN 0802/167, 25 February 2008, 1954–1990 m. NMNZ P.043717/1, cleared and stained right pectoral girdle.

Diagnosis. V 69, D 62, A 56, C 6, P 20, notch rays 3, rudimentary. Radials 3 (2+0+1) or 4 (3+1) if R2 normal; scapular helve almost absent. Eye 18% HL, upper jaw 42% HL. Premaxillary teeth about 20 in outer row on each

side, uniserial for posterior 9–10, mostly triserial for anterior 10 rows; lower jaw teeth almost entirely uniserial, distinctly smaller than upper jaw teeth, extending posteriorly much farther, easily visible near symphysis. Opercular flap clearly present. Pectoral fin short, 66% head length.

Description. Counts. V 69 (12+57), D 62, A 56, C 6, P 20 (14+3+3), radials 3 (but see below), pc 6, pore formula unknown. Ratios. HL 16.4, HW na, sn 4.8, E 3.0, orbit 4.7, io 7.2, uj 6.8, go 2.0, preD 26.1, preA 46.0, sna 17.0, ma 14.7, aAf 30.4, UPL 10.8, LPL 10.2. In % HL: HW na, sn 29.1, E 18.4, orbit 28.7, io 43.6, uj 41.7, go 12.2, ma 89.7, preD 159.5, preA 280.4, sna 103.5, aAf 185.5, UPL 66.1, LPL 62.2, LLD ~20, cp 2.7.

Head short, less than 1/6 SL, low, dorsal profile flat and gradually rising from snout to postorbital region. Snout short, bluntly rounded, projecting slightly beyond upper jaw. Nostrils short tubular, more or less on horizontal through mid-pupil, about 1/2 eye diameter anterior to orbit. Mouth horizontal, subterminal, lower jaw inferior, broadly rounded, included; oral cleft extending to below anterior half of orbit. Teeth simple, sharp, evenly spaced canines, arranged uniserially for most of jaw length. Premaxillary teeth about 20; in a single row of about nine, then becoming irregularly triserial towards symphysis, becoming gradually smaller anteriorly; posterior teeth stout, sharp, anterior teeth small but easily visible at 25x magnification. Mandibular teeth extending notably farther posteriorly, distinctly smaller, more closely spaced and more numerous than premaxillary teeth, about 60 teeth forming a single row with a few scattered teeth near symphysis. Symphyseal gaps wide in both jaws. Eye prominent with large pupil, orbit diameter about equal to snout, not entering dorsal profile of head but approaching it, less than 1/3 HL. Gill opening completely above pectoral fin base, barely reaching to upper pectoral fin ray, about 12% HL. Opercular flap present, small but distinct; opercle broad, its tip supporting flap. Pore formula unknown. Chin pores distinctly smaller than more posterior pores, well separated, their distance apart less than 3% HL. Suprabranchial pore single.

Pectoral fins about 2/3 head length; upper lobe reaching to about midpoint of abdominal cavity. Uppermost ray about even with lower margin of orbit. Upper lobe rounded, of 14 rays. Notch rays rudimentary, three, well separated, increasingly short ventrally; lowest ray reduced to base only. Lower lobe long, of three rays, reaching to below middle of upper lobe; insertion of lowest ray below posterior of orbit. A clear gap present between lower fin lobes, distance equal to about 1/5 HL. Right pectoral girdle with 4 (3+1) moderately large round or rounded radials;

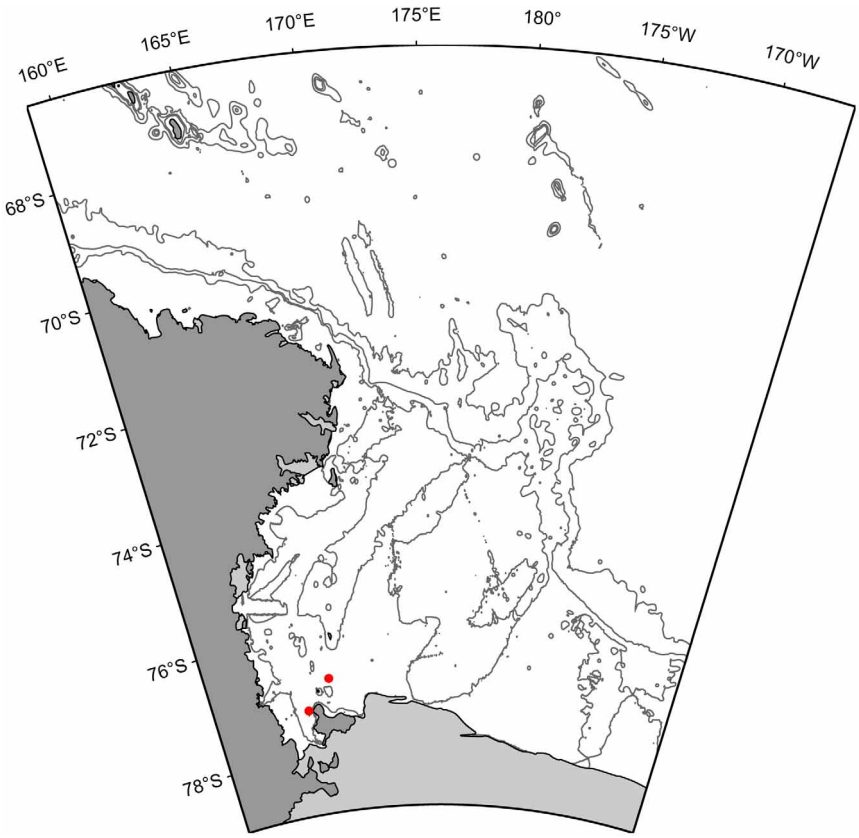

FIGURE 76. Distribution of *Paraliparis terraenovae* in the Ross Sea.

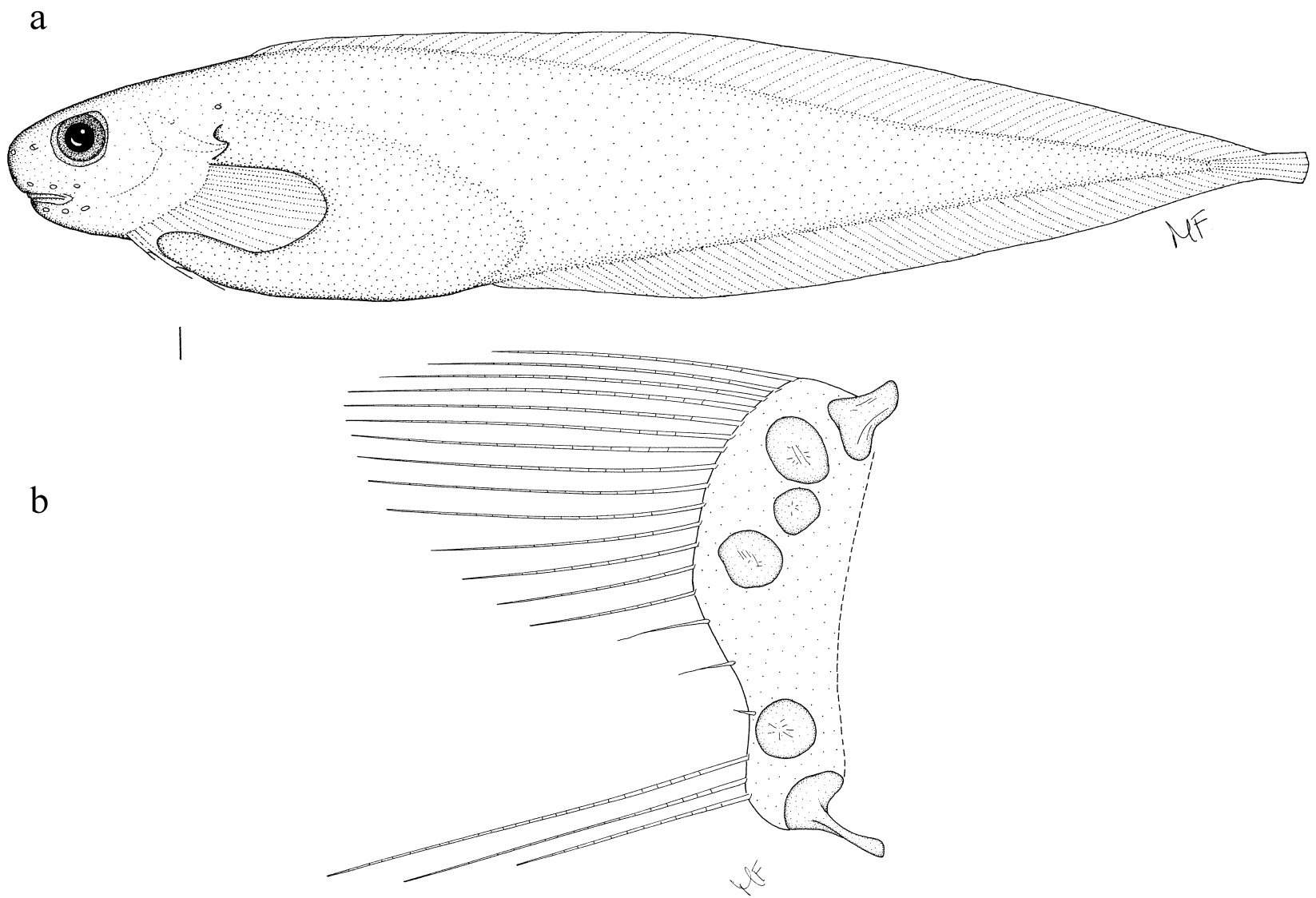

FIGURE 77. *Paraliparis voroninorum* n. sp. Holotype, NMNZ P.043717, 295 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.043717/1.

R2 much smaller than other three, almost certainly abnormal, located between and anterior to R1 and R3 and very close to them. If R2 abnormal, radial formula would be 3 (2+0+1). No radial notches present. Scapula large, more or less triangular, its dorsal edge clearly concave, helve almost completely absent, its ventral edge with a broad, shallow concavity. Coracoid T-shaped, helve long, slender, ventral basal notch absent.

Body behind head dorsoventrally flattened, deepest behind head over mid-abdomen. Dorsal fin insertion between vertebrae 5–6, anal fin insertion between vertebrae 12–13. Dorsal and anal fins low anteriorly, gradually increasing in depth posteriorly, deepest caudally at about 2/3 of SL. Anus below gill flap, approximately below middle of pectoral fin base. Peritoneum dimly visible through body wall. Body cavity deep, long, dorsally humped above pectoral fin base. Hypural complex fused, slit absent. Caudal fin of six (3/3) rays, auxiliary rays absent. Pyloric caeca six, matted and firmly attached to each other, very long, up to 3/4 HL. SECM probably well developed. Skin thick, strong.

Color of body in alcohol white, snout and area around mouth apparently grayish brown; posterior half of dorsal and anal fins edged with brown. Mouth blackish, tongue dusky with closely dotted melanophores. Branchial cavity blackish. Black peritoneum barely visible through body wall. Stomach and pyloric caeca pale.

Distribution. Known only from the holotype, taken at 1954–1990 m off the NW edge of Mawson Bank, Ross Sea.

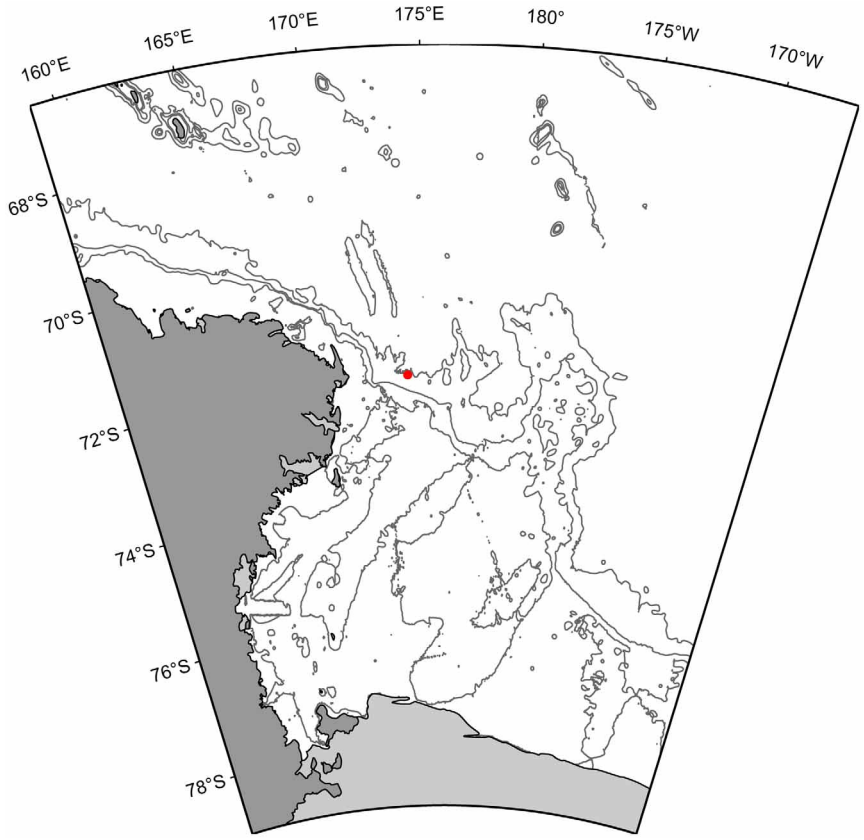

FIGURE 78. Distribution of *Paraliparis voroninorum.*

Etymology. *Paraliparis voroninorum* is named in honor of Elena Voronina and Vladimir Voronin, who by their kindness, generosity, and hospitality over many years helped support my snailfish research at the Zoological Institute of the Russian Academy of Sciences, St. Petersburg.

Comparisons. *Paraliparis voroninorum* is very similar to, but distinct from, *P. nullansa* and *P. neelovi*. It could easily be confused with the former on the basis of most counts and proportions, its 3 (2+0+1) radials, and its scapula lacking a helve. However, *P. voroninorum* differs distinctly from it externally in having a small opercular flap (vs absent) with a broad opercle (vs narrow), paler color (white vs darker, rosy), small (but not tiny) premaxillary teeth anteriorly (vs tiny anterior teeth), and 6 (vs 7) caudal fin rays. Internally it differs in having the dorsal fin insertion between vertebrae 5–6 (vs 9–10) and anal fin insertion between vertebrae 12–13 (vs between 15–16), radials R1 and R2 much farther apart, unnotched R2 (vs dorsally notched), and coracoid without basal notch (vs

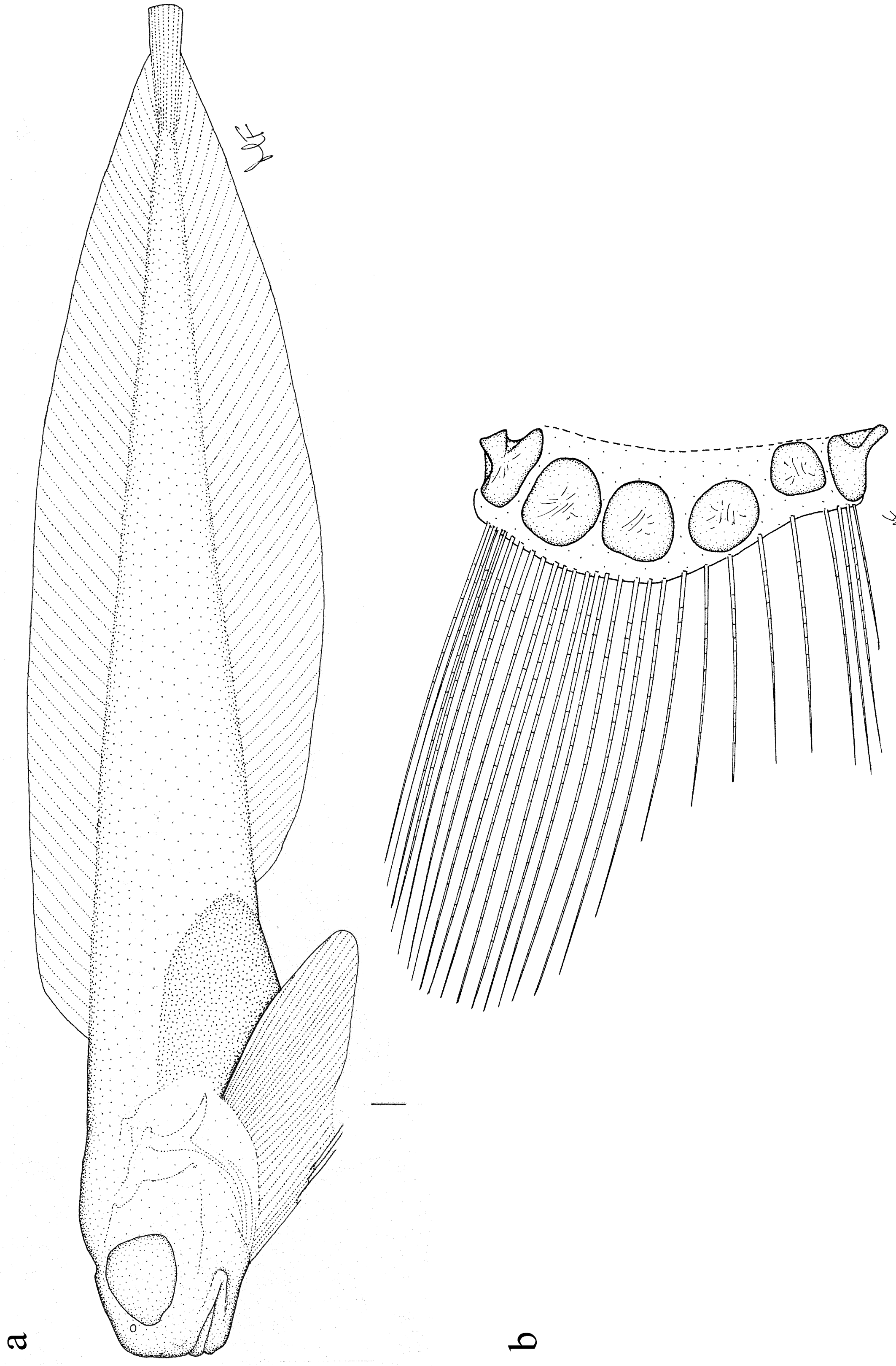

FIGURE 79. *Paraliparis* sp. NMNZ P.046250, 162 mm SL; a. lateral view; b. pectoral girdle, NMNZ P.046250/1.

with). Although very similar to the latter, *P. voroninorum* differs from it in lacking a scapular helve (vs well developed), fewer lower lobe rays (3 vs 4), a smaller eye (18.4 vs about 20–24% HL), longer upper jaw (42 vs ~35% HL), shorter snout to anus distance (103.5 vs 117–120% HL), and anus anterior to gill opening (vs below it).

Comments. The arrangement of pectoral radials in the right pectoral girdle of this specimen is unusual and anomalous. Normally, all radials are on a gently curved line, and not misaligned like R2, which appears to be "extra." Fortunately, other characters define this species as new. As described and discussed above, some other recently described Southern Ocean species also have odd radial patterns (*P. hureaui*, *P. charcoti*, *P. kocki*, *P. stehmanni*). If R2 is anomalous, *P. voroninorum* would normally have 3 (2+0+1) radials.

***Paraliparis* sp.**
Figs. 79, 80

Material examined. NMNZ P.046250, sex unknown, 178 mm TL, 162 mm SL, 72°34.50′ S, 178°27.60′ E, Scott Canyon, Ross Sea, F/V *Janus*, Stn. OBS 2732/033, 11 January 2009, 1106–1117 m. Poor condition. NMNZ P.046250/1, cleared and stained right pectoral girdle.

Description. Counts. V 61 (9+52), D 55, A 48, C 9 (4/5), P 25–27 (19–20+2–4+3–4), radials 4 (1+1+1+1), pc unknown, pore formula unknown. *Ratios.* HL 23.9, orbit 7.8, uj 10.1, lj 9.1, go ≤6.5. In % HL: orbit 32.6. uj 42.1, lj 38.2, go ≤ 27.4. Head about 1/4 SL, orbit very large, almost 1/3 HL.

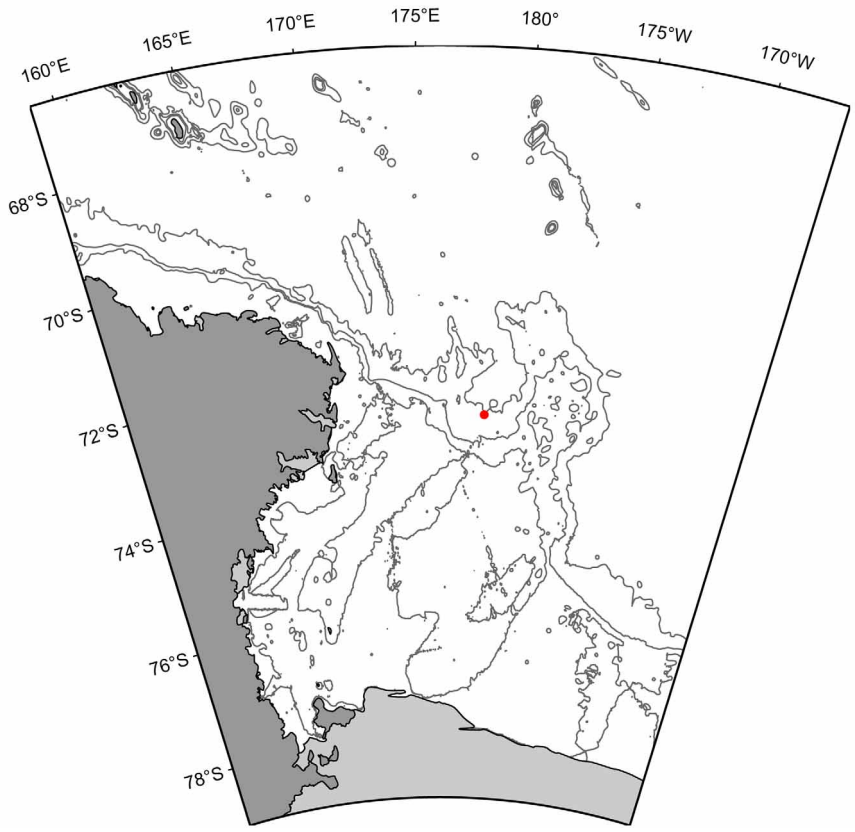

FIGURE 80. Distribution of *Paraliparis* sp.

Mouth horizontal, probably subterminal. Snout blunt, high. Outer teeth short, stout, blunt canines; innermost anterior teeth with pronounced shoulders or lateral cusps, some almost trilobed; arranged in about seven long oblique rows of up to 13 teeth each, forming a moderately wide band. Mandibular teeth similar. Symphyseal gap absent in both jaws. Gill openings damaged, but apparently extending ventrally in front of 5–6 or fewer rays. Pectoral fin upper ray level apparently lower than orbit, fin ray spacing noticeably wider in notch, rudimentary rays absent. Appears to have a gular tissue fold between and anterior to lowest pectoral fin lobes. Radials 4 (1+1+1+1), irregularly round, notches and fenestrae absent, gradually smaller ventrally. Scapula with a broad base and short stout helve; coracoid broadly based, with long helve braced by strong triangular dorsal plate, basal notch absent.

Body color unknown but possibly white or broadly speckled. Orobranchial cavity blackish, tongue pale. Peritoneum black, stomach and caeca pale.

Comments. Although NMNZ P.046250 is severely damaged, the available characters suggest it is not a described species. In particular, the combination of 61 vertebrae and 25–27 pectoral fin rays has not been reported from any known Antarctic *Paraliparis*. In addition, the tooth characteristics should be diagnostic. However, owing to the specimen's poor condition, I do not describe it as a new species.

Discussion

Observations on character utility and significance

Liparid species are often difficult to distinguish from one another, and many of the new species are no exception. For example, a probably artificial Ross Sea group composed of 14 *Paraliparis* species (Table 4) can be defined by generally single-rowed teeth in both jaws and similar proportions and counts. In this group in particular, pectoral girdle radial number, size, shape, and presence or absence of fenestrae and notches must be determined for positive identification of most species; chin pore characters are also important: distance between the pores, whether they are single or double, in a pit, with or without an anterior tissue fold, and proximity to the tip of the jaw.

Paraliparis species can be divided into two general groups based on tooth patterns: banded with teeth in oblique rows, and teeth generally uniserial. Whether these represent phylogenetic relationships is not known, but seems possible at least for those species with uniserial teeth, given the similarity in counts, proportions, general appearance and habitat. Within the species group with uniserial teeth, similar body shape, and appearance, there appear to be three, possibly four, geographically widely separated smaller groups, each consisting of similar species differing in characters such as pectoral girdle structure, chin pore configuration, and gill opening size. One is in the northeastern Pacific and consists of *P. rosaceus* Gilbert 1890, *P. nassarum* Stein & Fitch 1984, *P. attenuatus* Garman 1899, and possibly *P. paucidens* Stein 1978. The second, in the North and South Atlantic, consists of *P. copei* and its three subspecies, *P. c. copei* Goode & Bean 1896, *P. c. kerguelensis*, *P. c. wilsoni*, and *P. c. gibbericeps*. The third is among southeast Australian species described by Stein et al. (2001). The discovery of the Ross Sea group (the fourth) suggests that uniserial teeth may have arisen repeatedly, and thus might not be a reliable indicator of relationship.

Specimens of previously described *Paraliparis* species identified from the NZNM collection usually differ somewhat from their original and later descriptions in at least some, and in a few cases many, characters. This is not too surprising given the few known individuals of these species. In particular, *P. andriashevi* differs slightly in pectoral girdle structure and some proportions, *P. neelovi* differs in proportions and some counts, and *P. devriesi* and *P. antarcticus* differ in some proportions. The *P. stehmanni* specimen lacks the shallow chin pore pit and two interradial fenestrae described by Andriashev (1986). Some of these differences (those not related to measurements) can be considered the result of the low number of specimens available to determine intraspecific variability, others as perhaps the result of allometric growth. In addition, in specimens with such soft tissues and weak bones, proportional measurements can vary (sometimes widely) as a result of specimen condition and even the person making the measurements. In this paper, I have tried to take a conservative approach to describing new taxa and only done so when I could not defend identification of a specimen as a described species.

Zoogeography and evolution of Ross Sea liparids

Antarctic biodiversity. The Antarctic marine environment is physically different from any other on earth in its exceptionally low temperature and its geological history and characteristics. The Southern Ocean occupies 10% of the world's ocean (Laws, 1985), but only includes about 322 species or about 1% of the world's fauna (Gon and Heemstra, 1990, updated by Eastman, 2005). Near the continent, diversity is even lower. Excluding the pelagic fauna, 221 species from 19 benthic families constitute the major part of the Antarctic continental shelf and upper slope fish fauna (Andriashev, 1987; Eastman, 2005). Two perciform groups, the Nothenioidei (notothens, including icefishes), the Zoarcids (eelpouts), and the scorpaeniform family Liparidae (snailfishes) account for about 88% of those (Eastman, *ibid*.).

TABLE 4. Ross Sea *Paraliparis* species with mostly to entirely uniserial teeth, showing meristic and pectoral girdle characters. A blank space indicates character absence. An asterisk indicates an anomalous character.

Species	Vertebrae	Dorsal fin rays	Anal fin rays	C rays	Pectoral fin rays	Pyloric Caeca	Radials	Radial notches present	Scapular helve	Coracoid notches present	Chin pores
P. alius	71 (11+60)	63	57	6	20 (14+2/3+3/4)	6	4 (3+1)		Present		Normal
P. camilarus	68 (13+55)	61	53	7	21 (15+2+4)	5	4 (3+1)	R1, R2, R3, R4	Present	Present	Normal
P. ekaporus	67 (15+52)	60	54	7	20 (14+3+3)	na	4 (3+1)	R3		Present	Single, oval
P. epacrognathus	67 (13+54)	60	51	7	21 (14+3+4)	5	4 (3+1)	R2, R3	Present	Present	Far anterior
P. longicaecus	69 (14+55)	59	52	7	21 (14+3+4)	7	4 (3+1)	R1, R3	Present	Present	Fold?
P. mentikoilon	71 (13+58)	~63	56	7	21/22 (14/16+2/3+4)	7	3 (2+0+1)	R2	Present		Fold, pit
P. neelovi	70–71 (12/13+57/59)	65–66	55–58	6	19/20 (14+2+3/4)	6–8	3 (2+0+1)		Present		Normal
P. nullansa	71 (15+56)	60	54	7	21 (15+2+4)	6?	3 (2+0+1)	R2		Present	Normal
P. parviradialis	68 (13+55)	61	54	7	21/22 (14/15+2/4+4)	8	3 (2+0+1)		Present	Present	Normal
P. plicatus	66 (14+52)	56	51	7	21 (15+3+3)	6?	4 (3+1)		Present	Present	Fold
P. posteroporus	69 (13+56)	60	54	6?	20 (13+3+4)	>6	4 (1+1+1+1)	R2, R3		Present	Far posterior
P. stehmanni	67 (13+54)	60	53	7	20/21 (14/15+2+4)	6	4 (3+1) *5	R1, R2, R3	Present		Normal, pit?
P. tangaroa	na (14+?)	na	na	na	20 (14+3+3)	na	4 (1+1+1+1)		Present	Present	Normal?
P. voroninorum	69 (12+57)	62	56	6	20 (14+3+3)	6	3 (2+0+1)				Normal

Antarctic benthic fishes can be divided into two evolutionary groups: primary and secondary (Andriashev, 1965). Primary fishes evolved there, are endemic (e.g., the notothenioids), and constitute most of its fish biomass (Eastman, *op. cit*.). Secondary fishes arose elsewhere and are not Antarctic endemics at the family or generic level (e.g., liparids, zoarcids, and rajids). In the Southern Ocean the latter species, particularly the liparids, outnumber the former (Andriashev and Stein, 1998; Eastman, 2005) although their biomass and abundances are low. Primary fishes are abundant in shallower depths (above 1500 m) but secondary families dominate deeper waters both in diversity and in biomass (Andriashev and Stein, 1998). Thus, the evolutionary history and taxonomic composition of the fish fauna are depth-related.

Geological characteristics of the basins. The Antarctic continental shelf is unique. Glacial erosion and ice weight on the Antarctic continent depressed what would normally be the continental shelf to bathyal depths, so that inshore areas are deeper than those offshore (Anderson, 1999). Shallow sills or ridges extend seaward, isolating deeper basins between them. These inner-shelf depressions are 1000–1600 m deep trenches eroded by outlet glaciers (Andriashev, 1977a; Anderson, 1999; Chernova & Eastman, 2001), and are novel habitats that are relatively unstable owing to frequent grounding events of the West Antarctic Ice Sheet on the Ross Sea shelf. Some date from the middle Miocene (16–11 Ma) (Chow and Bart, 2003), others are from the Pleistocene (Anderson, 1999).

There are at least eight basins in the Ross Sea; from west to east, they are the Drygalski, Nordenskjold, Joides, Erebus, Glomar Challenger, Little America, Colbeck, and Sulzberger Basins. The first two, along the coast of Victoria Land, are well separated from the rest. The Drygalski Baskin is the largest and, at over 1000 m, the deepest (Andriashev, 1977a; Anderson, 1999).

Periodic glaciations have repeatedly reduced shelf habitat to small pockets (Dayton et al., 1974; Poulin et al., 2002; Brandt, 2005), but periodic expansions of the shelf mediated by ice loss have exposed benthic habitat that has been ice covered for 10,500 years (Domack et al., 2005). Most basins are located inshore at high latitudes, where waters are always close to –1.8 degrees C, suggesting that most oceanic species would be excluded because they normally live in warmer waters. These isolated basins may have endemic benthic faunas (as suggested by Andriashev, 1977a, Chernova & Eastman, 2001, and others), whether they are considered as isolated and persistent habitats that permit evolutionary development of basin-endemic or narrowly distributed faunas, or as transitory habitats with a widespread fauna that persists by moving from basin to basin as available (*sensu* Jackson, 1974). They are thus poorly known potential "hot spots" of biodiversity (Coyne and Orr, 2004).

Faunal characteristics of the Ross Sea and its basins. By 2000, the fish fauna of the Ross Sea shelf was thought to include about 80 species (Eastman and Hubold, 1999: 300), but ten tows caught "four new species, a new colour morph of a known species, and eight rare species ...four new locality records, three second occurrences, three most southerly records and eleven new depth records ..." including two new snailfishes (*Paraliparis macrocephalus* from the Drygalski Basin and *P. rossi* from shallower depths farther offshore). Therefore, Eastman & Hubold (ibid.) concluded that "even in relatively shallow water, knowledge of specific and intraspecific diversity in the Ross Sea is incomplete." Samples from the Drygalski Basin collected by a single 30 min. trawl (in which the net was damaged) and additional data on invertebrates obtained by an ROV (Chernova and Eastman, 2001) seem to show a unique fauna of both fishes and invertebrates. Subsequently, Eastman (2005) estimated 30–60 species remain undiscovered on the Antarctic shelf. For instance, although more than 100 *Paraliparis devriesi* have been collected (Eastman, *Ibid*.), it has only been taken once outside the Erebus Basin (near McMurdo Sound), suggesting it can be considered an endemic restricted to that locality (Eastman, *Ibid*.), notwithstanding its one time collection much further to the north (see above). Thus the Ross Sea ichthyofauna probably consists of poorly known isolated communities living in the basins, which are likely to include more unknown species.

Ross Sea snailfish diversity. Liparid evolutionary history is obscure (Andriashev, 2003; Chernova et al., 2004) at least partially owing to the absence of a fossil record, but snailfishes have long been thought to have evolved in the North Pacific from a cottid-like ancestor (Garman, 1892; Burke, 1930). There has been no treatment of the family as a whole since Burke (1930), and the relationships of genera within the family are problematic (Kido, 1988; Balushkin, 1996; Nelson, 2006) as is the status of many species (Chernova et al., *op. cit*.). Presently about 30 genera are recognized, but most of these are represented by one or two species (Chernova et al., *op. cit*.). In the Antarctic (*sensu stricto*), liparids are represented by three genera (*Careproctus, Paraliparis, Genioliparis*); the former two are known from all oceans at cool and cold temperatures, and constitute a large majority of the more than 360 known species in the family (Chernova et al., *op.cit.*).

Liparid life history strategies (Stein, 1980, Takemura et al. 2010, and others) make them easily isolated and their clear propensity to form closely related species groups (Stein et al., 2001, Andriashev, 2003) suggests that they evolve rapidly. They are relatively small (usually less than 300 mm total length), weakly muscled (e.g., poor swimmers) generally benthic or epibenthic fishes with large eggs and low fecundity (Stein, *op. cit.*). Deep slope and abyssal species that have been studied spawn year-round, have direct development (Stein, *op. cit.*; Stein, unpubl.) and are hypothesized to have reproductive strategies to maximize survival of their few offspring (Stein, *op. cit*). Some species (both shallow and deep water) are commensal or reproductive parasites on specific invertebrate species (Able and Musick, 1976; Zaklan, 2002). Other benthic fishes (Brachionichthyidae, for instance; Last & Gledhill 2009) are known with distributions similarly restricted as a result of life history traits. Thus, liparids are ideal candidates for speciation in the isolated areas of the Ross Sea.

Marine species flocks, as defined by Ribbink (1984) to be "an assemblage of a disproportionately high number, relative to the surrounding areas, of closely related species which apparently evolved rapidly within a narrowly circumscribed area to which all the member species are endemic," are unusual (Janko et al. 2007); in the Antarctic, notothenioids have been so considered (Eastman 2005, Janko et al. *ibid.*, and others). Stein et al. (2001) described 30 new species of snailfishes from Australia, most of which are from Tasmanian waters and meet Ribbink's (*ibid.*) criteria, and suggested that they composed such a group. Similarly, many species of the Ross Sea liparids described here may compose a species flock, depending on whether their similarities are convergent or represent close relationship. An example is the Ross Sea species with generally uniserial teeth (Table 4). Only two of these (*P. neelovi* and *P. stehmanni*) are known from outside the Ross Sea. All are externally similar, have many meristic and proportional characters in common, and are therefore easily confused. However, they also exhibit a variety of pectoral girdle structure including scapulas with and without a helve, three or four notched or unnotched radials in several combinations, a coracoid with and without a basal notch, and a surprising number of structural anomalies. Thus, at least for this group, an important unanswered question is "what characters indicate close relationship?"

These new discoveries increase the number of known Antarctic (south of about 60° S latitude) liparid species from about 70 to 90 in six genera (Table 5), reinforcing Eastman's (2005) statement that the family is the most speciose group of Antarctic fishes, and reinforcing his (*ibid.*) description of Antarctic fishes as "a taxonomically restricted and endemic modern fauna that succeeded a taxonomically diverse and cosmopolitan Eocene fauna". If the count includes species up to 45° S, the total rises to 106 species in six genera (Table 5). Because these deep southern waters have been poorly sampled, I am confident that even more discoveries will be made at these depths in the future.

TABLE 5. Approximate numbers of liparid genera and species below 45° and 60° South latitude. Owing to overlapping distributions, columns are not additive.

Latitude	*Careproctus*	*Paraliparis*	*Notoliparis*	*Genioliparis*	*Praematoliparis*	*Psednos*	Total
45° and south	40	60	2	2	1	1	106
45–60°	26	20	1	–	–	1	48
60° and south	20	46	1	2	–	–	69
Ross Sea	6	27	–	1	–	–	34

Note added in press.

Too late for inclusion in this review, I received a paper (in Russian) describing two new species of liparids from the Ross Sea, *Paraliparis caninus* Chernova & Prut'ko 2011 and *Paraliparis vipera* Chernova & Prut'ko 2011, and new records of *P. andriashevi* and *P. neelovi*. The two species appear to be different from any of those included above. In particular, *P. caninus* appears to be most similar to *P. ekaporus*, but differs most clearly in having chin pores closely spaced but not in a pit, anterior fold absent (vs in a pit with anterior skin fold), its more anterior position of dorsal fin insertion (between vertebrae 4–5 vs 8–9), pectoral fin ray number (17–19 vs 20), head width (69 vs 96% HL), snout length (40 vs 25% HL), predorsal length (19.7 vs 31.6% SL), and other proportions. *Paraliparis vipera* is most similar to *P. mentikoilon*, but differs most in shorter predorsal length (19.2 vs 27.7% SL), longer snout (42 vs 31% HL), narrower interorbital space (33 vs 45% HL), and absence of rudimentary notch rays.

Acknowledgments

Specimens and data were collected by and made available through the New Zealand International Polar Year-Census of Antarctic Marine Life Project. This research was funded by the New Zealand Government under the New Zealand International Polar Year-Census of Antarctic Marine Life Project (Phase 1: So001IPY; Phase 2: IPY2007-01). I gratefully acknowledge project governance by the Ministry of Fisheries Science Team and the Ocean Survey 20/20 CAML Advisory Group (Land Information New Zealand, Ministry of Fisheries, Antarctica New Zealand, Ministry of Foreign Affairs and Trade, and National Institute of Water and Atmosphere Ltd). I thank Andrew Stewart and Clive Roberts (Te Papa) and Stuart Hanchet (NIWA) for inviting me to study these fishes; they and Peter Smith (NIWA) arranged support for that purpose. Their outstanding cooperation, hospitality, and help made this work possible. Michelle Freeborn drew all the fish figures not otherwise credited. Carl Struthers prepared the figures for publication except for the distribution maps, which were prepared at NIWA. Natalia Chernova (ZIN) checked specimens in ZIN for me. Jay Orr (NMFS) provided statistical help. Joe Eastman (OU) provided the photograph of *P. macrocephalus*. Finally, I thank my colleague and friend Anatoly Andriashev (posthumously) for his 2003 review of Southern Ocean snailfishes, without which this work would have been infinitely more difficult:

> *"We are like dwarfs on the shoulders of giants, so that we can see more than they, and things at a greater distance, not by virtue of any sharpness of sight on our part, or any physical distinction, but because we are carried high and raised up by their giant size" (Bernard of Chartres, 12thc.).*

References

Able, K.W. & Musick, J.A. (1976) Life history, ecology, and behavior of *Liparis inquilinus* (Pisces: Cyclopteridae) associated with the sea scallop, *Placopecten magellanicus*. *Fishery Bulletin*, 74 (2), 409–421.

Anderson, J. B. (1999) *Antarctic Marine Geology.* Cambridge University Press, Cambridge, U.K., 289 pp.

Andriashev, A.P. (1965) A general review of the Antarctic fish fauna. *In:* Van Oye, P. & Van Mieghem, J. (Eds.), Biogeography and ecology in Antarctica. *Monographicae Biologicae*, 15, pp. 491–550.

Andriashev, A.P. (1977a) Some additions to schemes of the vertical zonation of marine bottom fauna. *In:* Llano, G.A. (Ed.), *Adaptation within Antarctic ecosystems*. Washington, DC., pp. 351–360.

Andriashev, A.P. (1977b) On the method of studying the morphology and systematics of snailfishes (Liparidae). *Zoologicheskii Zhurnal*, 56 (1), 141–147. In Russian, English summary.

Andriashev, A.P. (1980) A new liparid fish in McMurdo Sound. *Antarctic Journal of the United States*, 15 (5), 150, Fig.

Andriashev, A.P. (1982a) A review of fishes of the genus *Paraliparis* Collett (Liparidae) from the Kerguelen area, subantarctic. *Zoologicheskii Zhurnal*, 61 (5), 716–725. In Russian, English summary.

Andriashev, A.P. (1982b) New species of the genus *Paraliparis* (Liparidae) from the western Antarctic. Report 2. *Voprosy Ikhtiologii*, 22 (2), 179–186. In Russian. English version in *Journal of Ichthyology*, 22 (2), 1–9.

Andriashev, A.P. (1982c) A review of fishes of the genus *Paraliparis* (Liparidae) of the eastern Antarctic. *Voprosy Ikhtiologii*, 22 (4), 531–542. In Russian. English version in *Journal of Ichthyology*, 22 (4), 1–12.

Andriashev, A.P. (1986) *Review of the snailfish genus Paraliparis (Scorpaeniformes: Liparididae) of the Southern Ocean.* Theses Zoologicae 7. Koeltz, Koenigstein, 204 pp.

Andriashev, A.P. (1987) A general review of the Antarctic bottom fish fauna. *In: Proceedings of the Fifth Congress of European Ichthyologists*, Stockholm, 1985, pp. 357–372.

Andriashev, A.P. (1990a) On a probability of transocean (non-Arctic) pathways of some North Pacific secondarily deep-sea fishes into the North Atlantic and Arctic depths (family Liparidae as an example). *Zoologicheskii Zhurnal*, 69, 61–67. In Russian, English summary.

Andriashev, A.P. (1990b) Redescription of the syntypes of "*Liparis antarctica* Putnam n. subsp. (?) *falklandica* Lönnberg" with description of two new species of the genus *Careproctus* from the bathyal depths of Argentina and New Zealand. *Trudy Zoologicheskogo Instituta Akademia Nauk SSSR*, 222, 5–17. In Russian, English summary.

Andriashev, A.P. (1990c) Observations on the taxonomic status of the Antarctic species *Paraliparis edentatus* (Liparididae) and description of a new genus. *Voprosy Ikhtiologii*, 30 (2), 179–184. In Russian. English translation in *Journal of Ichthyology*, 30 (2), 60–66.

Andriashev, A.P. (1991a) Possible pathways of *Paraliparis* (Pisces: Liparididae) and some other North Pacific secondarily deep-sea fishes into North Atlantic and Arctic depths. *Polar Biology*, 11, 213–218.

Andriashev, A.P. (1991b) New species of Patagonian liparid fishes of the genus *Careproctus* (Scorpaeniformes, Liparididae). *Informational Bulletin of the Soviet Antarctic Expeditions*, 116, 10–24. In Russian.

Andriashev, A.P. (1991c) New species of liparidid fishes of the genus *Careproctus* from Patagonia. Second Report. *Voprosy*

Ikhtiologii, 31 (5), 707–716. In Russian. English translation in *Journal of Ichthyology* 1992, 32 (1), 60–66.
Andriashev, A.P. (2003) Liparid fishes (Liparidae, Scorpaeniformes) of the Southern Ocean and adjacent waters. *Biological Results of the Russian Antarctic Expeditions 9. Explorations of the Fauna of the Seas*, (53) 61, 1–476.
Andriashev, A.P. & Chernova, N.V. (2010) Three new snailfishes (Liparidae) from the bathyal depths of the Arctic. *Trudy Zoologicheskogo Instituta RAN*, (4):365–380.
Andriashev, A.P. & Neelov, A.V. (1976) *Genioliparis lindbergi*, gen. et sp. nov. – a new fish of the family of seasnails (Liparidae) from the bathyal depths of the western Antarctic. *In*: Korovina, M. (Ed.) *Zoogeography and systematics of fishes. Akademia Nauk USSR, Zoologicheskii Institut*, Leningrad, 68–77.
Andriashev, A.P. & Neelov, A.V. (1979) New species of the fish genus *Paraliparis* (Liparidae) from the western Antarctic. *Voprosy Ikhtiologii*, 19 (1), 10–19. In Russian. English translation in *Journal of Ichthyology*, 19 (1), 7–15.
Andriashev, A.P. & Neelov, A.V. (1984) *Paraliparis valentinae* sp. n., a new deep-sea snailfish (Scorpaeniformes, Liparididae) from the Antarctic. *UO* Tokyo, (35), 1–6.
Andriashev, A.P. & Prirodina, V.P. (1990) Notes on the first records of liparid fishes of the genus *Careproctus* (Liparididae) from the coasts of the Antarctic continent with descriptions of three new species. *UO* Tokyo, 39, 1–14.
Andriashev, A.P. & Stein, D.L. (1998) Review of the snailfish genus *Careproctus* (Liparidae, Scorpaeniformes) in Antarctic and adjacent waters. *Contributions in Science, Natural History Museum of Los Angeles County*, (470), 1–63.
Andriashev, A.P. & Tokarev, A.K. (1958) List of ichthyological stations with preliminary characteristic of catches. *Trudy kompleksnoi antarkticheskoi ekspeditsii Akademiya Nauk SSSR. Hydrobiology, hydrochemistry, geology, and biological studies R/V Ob', 1955–1956*, 199–204. In Russian.
Barnard, K.L. (1927) Diagnoses of new genera and species of South African marine fishes. *Annals and magazine of Natural History*, 9XX, 66–79.
Balushkin, A. (1996) A new genus and species of liparid fish *Palmoliparis beckeri* from the northern Kurile Islands (Scorpaeniformes, Liparidae) with consideration of phylogeny of the family. *Journal of Ichthyology*, 36 (4), 282–287.
Balushkin, A. & Voskoboinikova, O. (2008) Revision of the genus *Genioliparis* Andriashev et Neelov (Liparidae, Scorpaeniformes) with the description of a new species *G. kafanovi* sp. n. from the Ross Sea (Antarctica). *Journal of Ichthyology*, 48 (3), 201–208.
Brandt, A. (2005) Evolution of Antarctic biodiversity in the context of the past: the importance of the Southern Ocean deep sea. *Antarctic Science*, 17, 509–521.
Burke, C.V. (1930) Revision of the fishes of the Family Liparidae. *Bulletin of the U.S. National Museum*, 150, 1–204.
Chernova, N.V. (2006) New and rare snailfishes (Liparidae, Scorpaeniformes) with the description of four new species from the Southern Hemisphere and tropical east Pacific. *Journal of Ichthyology*, 46, Supplement 1, S1–S14.
Chernova, N.V. & Duhamel, G. (2003) A new species and additional records of *Paraliparis* (Scorpaeniformes: Liparidae) from the Southern Ocean with a provisional field key to juveniles. *Cybium*, 27 (2), 137–151.
Chernova, N.V. & Eastman, J.T. (2001) Two new species of snailfish genus *Paraliparis* (Pisces:Liparidae) from the Ross Sea, Antarctica. *Journal of Fish Biology*, 59, 92–104.
Chernova, N.V. & Prut'ko, V.G. (2011) Two new species of *Paraliparis* (Scorpaeniformes:Liparidae) from the Ross Sea (Antarctica). *Voprosy Ikhtiologii*, 51 (3), 1–10. In Russian.
Chernova, N.V. & Stein, D.L. (2004) A remarkable new species of *Psednos* (Teleostei: Liparidae) from the western North Atlantic Ocean. *Fishery Bulletin*, 102, 245–250.
Chernova, N.V., Stein, D.L. & Andriashev, A.P. (2004) Family Liparidae Scopoli 1777-snailfishes. *California Academy of Sciences Annotated Checklists of Fishes*, 31, 1–72.
Chow, J.M. & Bart, P.J. (2003) West Antarctic Ice Sheet grounding events on the Ross Sea outer continental shelf during the middle Miocene. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 198 (1), 169–186.
Collett, R. (1879) Fiske fra Nordhavs-Expeditionens sidste Togt, Sommeren 1878. *Forhandlinger I Videnskabs-Selskabet i Christiania* (for 1878), 14, 1–106.
Coyne J.A. & Orr H.A. (2004) *Speciation*. Sinauer Associates, Massachusetts, 545 pp.
Dayton, P.K., Robilliard, G.A., Paine, R.T., & Dayton, L.B. (1974) Biological accommodation in the benthic community at McMurdo Sound, Antarctica. *Ecological Monographs*, 44, 105–128.
DeVries, A.L. (1971) Freezing resistance in fishes. *In:* Hoar, W.S. & Randall, D.J. (Eds.), *Fish Physiology*, 6, New York, Academic Press, pp 157–190.
DeVries, A.L., & Lin , Y. (1977) The role of glycoprotein antifreezes in the survival of Antarctic fishes. *In:* Llano, G.A. (Ed.), *Adaptation within Antarctic ecosystems*. Washington, DC., pp. 439–458.
Domack, E., Duran, D., Leventer, A., Ishman, S., Doane, S., McCallum, S., Amblas, D., Ring, J., Gilbert, R. & Prentice, M. (2005) Stability of the Larsen B ice shelf on the Antarctic Peninsula during the Holocene epoch. *Nature*, 436, 681–685 (4 August 2005). doi:10.1038/nature03908.
Duhamel, G. (1992) Descriptions d'espèces nouvelles de *Careproctus* et *Paraliparis* et données nouvelles sur ces genres et le genre *Edentoliparis* de l'océan Austral (Cyclopteridae, Liparinae). *Cybium* 16 (3), 183–207.
Duhamel, G., Gasco, N., & Davaine, P. (2005) Poissons des îles Kerguelen et Crozet. Guide régional de l'océan Austral. Muséum national d'Histoire naturelle, Paris, 419 pp. (Patrimoines naturels, 63).
Duhamel, G., Hautecoeur, M., Dettai, A., Causse, R., Pruvost, P., Busson, F., Couloux, A., Koubbi, P., Williams, R., Ozouf-Costaz, C., & Nowara, G. (2010) Liparids from the eastern sector of Southern Ocean and first information from molecular

studies. *Cybium* 2010, 34 (4), 319–343.
Eastman, J.T. (2005) The nature of the diversity of Antarctic fishes. *Polar Biology*, 28, 93–107.
Eastman, J.T. & Clarke, A. (1998) A comparison of adaptive radiations of Antarctic fish with those of non-Antarctic fish. *In:* di Prisco, G., Pisano, E., & Clarke, A. (Eds.), *Fishes of Antarctica*. A biological overview. *Springer-Verlag*, Milan, pp. 3–26.
Eastman, J.T. & Hubold, G. (1999) The fish fauna of the Ross Sea, Antarctica. *Antarctic Science*, 11 (3), 293–304.
Eastman, J.T., Hikida, R.S., & DeVries, A.L. (1994) Buoyancy studies and microscopy of skin and subdermal extracellular matrix of the Antarctic snailfish, *Paraliparis devriesi*. *Journal of Morphology*, 220, 85–101.
Garman, S. (1892) The Discoboli. *Memoirs of the Museum of Comparative Zoology*, Harvard, 14, 1–96.
Garman, S. (1899) XXVI. The fishes. *In*: Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galapagos Islands, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z.L. Tanner, U.S.N., commanding. *Memoirs of the Museum of Comparative Zoology*, 24, 1–431, Atlas Pls 1–85+A–M.
Gilbert, C.H. (1890) A preliminary report on the fishes collected by the steamer *Albatross* on the Pacific coast of North America during the year 1899, with descriptions of twelve new genera and ninety-two new species. *Proceedings of the U.S. National Museum*, 13 (797), 49–126.
Gilbert, C.H. & Burke, C.V. (1912) Fishes from Bering Sea and Kamchatka. *Bulletin of the Bureau of Fisheries*, 30 (for 1910), 31–96.
Gilchrist, J.D.F. (1902) South African fishes. *Marine Investigations in South Africa*, 2, 101–113.
Gon, O. & Heemstra, P.C. (1990) (Eds.) *Fishes of the Southern Ocean*. J.L.B. Smith Institute of Ichthyology, Grahamstown, 462 pp.
Goode, G.B. & Bean, T.H. (1896) Oceanic Ichthyology, a treatise on the deep-sea and pelagic fishes of the world, based chiefly upon the collections made by the steamers *Blake*, *Albatross*, and *Fish Hawk* in the northwestern Atlantic, with an atlas containing 417 figures. *Special Bulletin of the U.S. National Museum*, 2, i–xxxv+1–26+1–553. Atlas i–xxiii+1–26, 123 pls.
Hanchet, S.M., Mitchell, J., Bowden, D., Clark, M., Hall, J., & O'Driscoll, R. (2008) Ocean Survey 20/20. *NZ IPY-CAML Final Voyage Report. NIWA Client Report: WLG2008-74.* Wellington, 193 pp.
Iwami, T. & Abe, T. (1982) Notes on the fishes collected during the 1980–81 exploratory bottom trawl fishing off South Shetland Islands. *Memoirs of the National Institute of Polar Research, Special Issue*, 23, 55–63.
Jackson, J.B.C. (1974) Biogeographic consequences of eurytopy and stenotopy among marine bivalves and their evolutionary significance. *American Naturalist*, 108, 541–560.
Janko, K., Lecointre, G., DeVries, A., Couloux, A., Cruaud, C., & Marshall, C. (2007) Did glacial advances during the Pleistocene influence differently the demographic histories of benthic and pelagic Antarctic shelf fishes? – Inferences from intraspecific mitochondrial and nuclear DNA sequence diversity. *BMC Evolutionary Biology*, 2007 (7), 220. Published online 2007 November 12. doi: 10.1186/1471–2148–7–220.
Kido, K. (1988) Phylogeny of the family Liparididae, with the taxonomy of the species found around Japan. *Memoirs of the Faculty of Fisheries, Hokkaido University*, 35, 125–256.
Krøyer, H.N. (1862) Nogle Bidrag til Nordisk ichthyologi [with subsections under separate titles]. *Naturhistorisk Tidsskrift Kjøbenhavn* (Ser. 3), 1, 233–310.
Last, P.R & Gledhill, D.C. (2009) A revision of the Australian handfishes (Lophiiformes: Brachionichyidae), with descriptions of three new genera and nine new species. *Zootaxa*, 2252, 1–77.
Laws, R.M. (1985) The ecology of the Southern Ocean. *American Scientist*, 73, 26–40.
Matallanas, J. (1998) Description of *Careproctus guillemi* n. sp. (Pisces: Scorpaeniformes) from the Weddell Sea. *Journal of Fish Biology*, 52, 380–385.
Matallanas, J. (1999) New and rare snailfish genus *Paraliparis* from the Weddell Sea with the description of two new species. *Journal of Fish Biology*, 54, 1017–1028.
Nelson, J.S. (2006*) Fishes of the world*, 4th edition. Wiley, Hoboken, New Jersey, 601 pp.
Norman, J.R. (1930) Oceanic fishes and flatfishes collected in 1925–1927. *Discovery Report*, 2, 261–369, pl. 2.
Norman, J.R. (1937) Fishes. *B.A.N.Z. Antarctic Research Expedition 1929–1931*. *Reports-Series B (Zoology and Botany)*, 1 (2), Adelaide, 88 pp.
Orr, J.W. & Busby, M.S. (2006) Revision of the snailfish genus *Allocareproctus* Pitruk & Fedorov (Teleostei: Liparidae), with descriptions of four new species from the Aleutian Islands. *Zootaxa*, 1173, 1–37.
Orr, J.W. & Maslenikov, K.P. (2007) Two new variegated snailfishes of the genus *Careproctus* (Teleostei: Scorpaeniformes: Liparidae) from the Aleutian Islands, Alaska. *Copeia*, 2007 (3), 699–710.
Poulin, E., Palma, A.T., & Féral, J-P. (2002) Evolutionary versus ecological success in Antarctic benthic invertebrates. *Trends in Ecology and Evolution*, 17 (5), 218–222.
Regan, C.T. (1914a) (for January) Diagnoses of new marine fishes collected by the British Antarctic ("Terra Nova") expedition. *Annals and magazine of Natural History* (Ser. 8), 13 (73), 11–17.
Regan, C.T. (1914b) Fishes. *British Antarctic ("Terra Nova") Expedition 1910. Natural History Report. Zoology*, 1 (1), 1–54.
Regan, C.T. (1916) Antarctic and subantarctic fishes. *Annals and magazine of Natural History*, 8 (18), 377–379.
Ribbink, A.J. (1984) Is the species flock concept tenable? *In:* Echelle, A.A. and Kornfield, I. (Eds.), *Evolution of fish species flocks*. University of Maine Orono Press, Orono, pp. 21–25.
Sabaj Pérez, M.H. (2010) (Ed.). Standard symbolic codes for institutional resource collections in herpetology and ichthyology:

an Online Reference. Version 2.0 (8 November 2010). Electronically accessible at *http://www.asih.org/, American Society of Ichthyologists and Herpetologists, Washington, DC.*

Saruwatari, T., Lopez, J.A. & Pietsch, T.W. (1997) Cyanine Blue: a versatile and harmless stain for specimen observation. *Copeia*, 1997 (4), 840–841.

Stein, D.L. (1978) A review of the deepwater Liparidae (Pisces) from the coast of Oregon and adjacent waters. *Occasional Papers of the California Academy of Sciences*, 127, 1–55.

Stein, D.L. (1980) Aspects of reproduction of liparid fishes from the continental slope and abyssal plain off Oregon, with notes on growth. *Copeia* 1980 (4), 687–699.

Stein, D.L. (2005) Descriptions of four new species, redescription of *Paraliparis membranaceus*, and additional data on fishes of the fish family Liparidae (Pisces, Scorpaeniformes) from the west coast of South America and the Indian Ocean. *Zootaxa*, 1019, 1–25.

Stein, D.L. (2006) New and rare species of snailfishes (Scorpaeniformes: Liparidae) collected during the ICEFISH cruise of 2004. *Polar Biology*, 29, 705–712.

Stein, D.L. & Chernova, N.V. (2002) First records of snailfishes (Pisces:Liparidae) from the Galapagos Islands, with descriptions of two new species. *Proceedings of the California Academy of Sciences*, 53 (11), 151–160.

Stein, D.L. & Fitch, J.E. (1984) *Paraliparis nassarum* n. sp. (Pisces, Liparidae) from off Southern California with description of its otoliths and others from north-east Pacific liparidids. *Bulletin of the Southern California Academy of Sciences*, 83 (pt. 2), 76–83.

Stein, D.L. & Tompkins, L. (1989) New species and new records of rare Antarctic *Paraliparis* fishes (Scorpaeniformes: Liparididae). *Ichthyological Bulletin of the J.L.B. Smith Institute of Ichthyology*, 53, 1–8.

Stein, D.L., Chernova, N.V., & Andriashev, A.P. (2001) Snailfishes (Pisces:Liparidae) of Australia, including descriptions of thirty new species. *Records of the Australian Museum*, 53, 341–406.

Takemura, A. Tamotsu, S., Miwa, T., & Yamamoto, H. (2010) Preliminary results on the reproduction of a deep-sea snailfish *Careproctus rhodomelas* around the active hydrothermal vent on the Hotana Knoll, Okinawa, Japan. *Journal of Fish Biology*, 77, 1709–1715.

Taylor, W.R. (1967a) An enzyme method of clearing and staining small vertebrates. *Proceedings of the U.S. National Museum*, 122 (3596), 1–17.

Taylor, W.R. (1967b) Outline of a method of clearing tissues with pancreatic enzymes and staining bones of small vertebrates. *Turtox News*, 45, 308–309.

Tokranov, A.M. (2000) Specific composition and spatially-bathymetric distribution of snailfish (Liparidae) in the Pacific waters of southeastern Kamchatka and the northern Kuril Islands. *Voprosy Ikhtiologii*, 40, 176–186. In Russian. English translation in *Journal of Ichthyology*, 40, 139–149.

Waite, E.R. (1916) Fishes. In: Australian Antarctic Expedition 1911–1914. Scientific Report, Series C. - Zoology and Botany. Adelaide. *Scientific Reports of the Australian Antarctic Expedition*, 3 (pt. 1), 1–92. Plates 1–5, 2 maps.

Zaklan, S.D. (2002) Review of the Family Lithodidae (Crustacea: Anomura: Paguroidea): Distribution, biology, and fisheries. *In:* Paul, A.J., Dawe, E.G., Elner, R., Jamieson, G.S., Kruse, G.H., Otto, R.S., Sainte-Marie, B., Shirley, T.C., & Woodby, D. (Eds.), *Crabs in cold water regions: Biology, management, and economics*. Alaska Sea Grant Program, AK SG–02–01, pp. 751–845.