

**Abstract**—*Pseudnos rossi* new species (Teleostei: Liparidae) is described from two specimens collected in the North Atlantic Ocean off Cape Hatteras, North Carolina, at depths of 500–674 m. *Pseudnos rossi* belongs to the *P. christinae* group, which includes six other species and is characterized by 46–47 vertebrae and the absence of a coronal pore. *Pseudnos rossi* differs from those six species by having characters unique within the genus: straight spine, body not humpbacked at the occiput, and a very large mouth with a vertical oral cleft. Other distinguishing characters include a notched pectoral fin with 15–16 rays, eye 17–19% SL, and color in life orange-rose. With *P. rossi*, the genus *Pseudnos* as currently known includes 26 described and five undescribed species of small meso- or bathypelagic liparids from the Atlantic, Pacific, and Indian Oceans.

## A remarkable new species of *Pseudnos* (Teleostei: Liparidae) from the western North Atlantic Ocean

**Natalia V. Chernova**

Zoological Institute  
Russian Academy of Sciences  
Universitetskaya nab. 1  
St. Petersburg 199034, Russia

**David L. Stein**

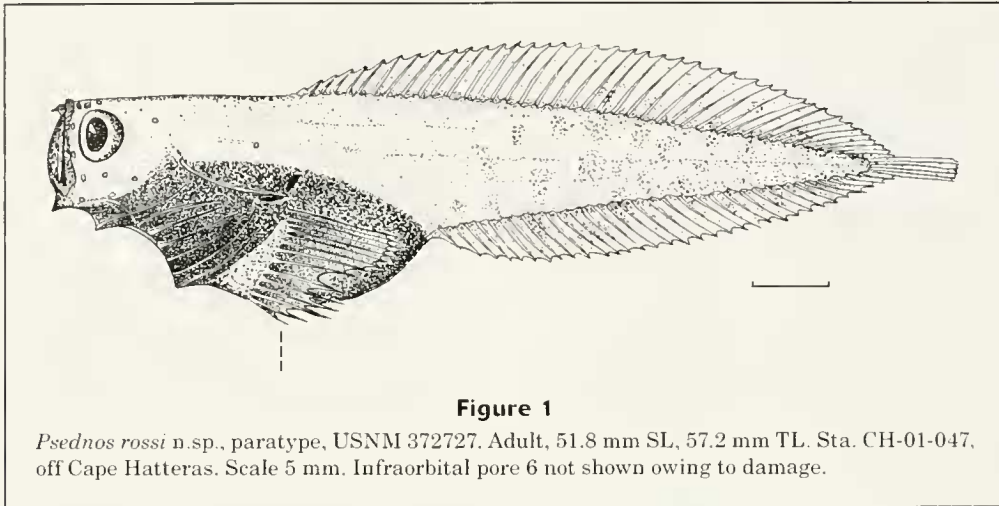
NOAA/NMFS Systematics Laboratory  
Smithsonian Institution  
P.O. Box 37012  
National Museum of Natural History, MRC-0153  
Washington, D.C. 20013-7012  
E-mail address (for D. L. Stein, contact author): david.stein@noaa.gov

The liparid genus *Pseudnos* Barnard 1927 is a group of meso- and bathypelagic snailfishes distinguished from the genus *Paraliparis* by having the infra-orbital canal of the cephalosensory system interrupted behind the eye and usually having a pronounced dorsal curvature of the spine, producing a “humpbacked” body. *Pseudnos* are small, easily damaged, and often misidentified as juvenile *Paraliparis*. Until 1978, the genus was known only from two specimens of a single species (*Pseudnos micrurus* Barnard 1927) collected off Cape Point, South Africa. Two additional specimens were collected in the southern Indian Ocean and reported by Stein (1978). No further specimens or species were described until Andriashev (1992) described another new species. Since then, active searches for material from collections around the world have yielded many specimens from the Atlantic, Pacific, and Indian Oceans. To date, 25 species have been described (Andriashev, 1992, 1993; Chernova, 2001; Stein et al., 2001; Chernova and Stein, 2002) and an additional five are undescribed (one in Stein et al., 2001, three in Chernova and Stein, 2002, all in poor condition; and another that is currently being described by Stein). In this article, we describe an especially noteworthy spe-

cies of the genus from two specimens collected from the North Atlantic off Cape Hatteras, North Carolina.

### Materials and methods

All characters available for both specimens were studied. Characters and terms used were described by Andriashev (1992), Chernova (2001), Stein et al. (2001), and Chernova and Stein (2002). Counts were made from a radiograph of the holotype and from each specimen where possible; vertebral counts include the urostyle. The first caudal vertebra is that with the haemal spine supporting the first anal-fin ray. The posterior tip of the lower jaw in *Pseudnos* forms a distinct and prominent ventrally directed angle, the retroarticular process (Chernova, 2001). Counts and proportions are given as a percentage of standard length (SL) and head length (HL). Nonstandard measurements are the following: distance from mandible to anus (from anterior tip of mandible to center of anus); distance from anus to anal-fin origin (from center of anus to anal-fin origin); interorbital width (measured between upper margins of eyes); postocular head length (distance from posterior margin of eye to tip of opercular flap).



**Figure 1**

*Psednos rossi* n.sp., paratype, USNM 372727. Adult, 51.8 mm SL, 57.2 mm TL. Sta. CH-01-047, off Cape Hatteras. Scale 5 mm. Infraorbital pore 6 not shown owing to damage.

We selected the smaller specimen to serve as the holotype owing to its better condition (skin, pores, shape of head) and the availability of more characters. Unfortunately, it is distorted and does not look natural; therefore the undistorted larger (adult) specimen, the paratype, is illustrated. It is also more useful to have a drawing of an adult for comparison with other *Psednos* specimens.

In these small fishes, precise counts of number of tooth rows are possible only in disarticulated cleared and stained specimens; thus, we provide approximate counts. Similarly, the drawing of the gill arch of the paratype was made without dissection by viewing through an opening in the branchiostegal membrane.

Although Andriashev (1986) and Andriashev and Stein (1998) demonstrated the importance of the pectoral girdle in distinguishing among species and in explaining lipid relationships, we did not dissect, clear, and stain a pectoral girdle from these specimens owing to the high probability of damaging them and destroying other characters (Chernova, 2001; Chernova and Stein, 2002). The new species is so easily distinguished from congeners that it is not necessary for a diagnosis of the species to look at additional characters that the pectoral girdle can provide. Future specimens should be used to study these characters.

The holotype and paratype are permanently deposited in the Division of Fishes, Smithsonian Institution, National Museum of Natural History (USNM collection).

## Results

### *Psednos rossi*, n.sp.

#### Holotype

USNM 372726, juvenile, 37.2 mm SL, TL?, Sta. EL-00-033, off Cape Hatteras (The Point), 35°30.036'N, 74°46.497'W, 500–674 m over about 900 m depth, 23 July 2000, Tucker trawl. Good condition but distorted.

#### Paratype

USNM 372727, adult (sex not identified), 51.8 mm SL, 57.2 mm TL, Sta. CH-01-047, off Cape Hatteras (The Point), 35°28.93'N, 74°45.93'W, 628–658 m over 1090–704 m depth, 24 Aug. 2001, Tucker trawl. Throat slightly damaged, head slightly compressed, skin on head partly missing.

#### Diagnosis

Vertebrae 47, dorsal-fin rays 42–44, coronal pore absent. Mouth vertical, symphysis of upper jaw above level of eye. Body not humpbacked, vertebral column not curved behind cranium. Gill cavity enlarged. Anus on vertical behind head. Pectoral fin notched, rays 8+2+5–6. Eye 17–19% HL.

#### Description

Counts and proportions are given in Table 1. Head large, about one-third SL, its depth less than, and its width equal to or a little greater than, its length (Fig. 1). Head depth slightly greater than its width. Mouth very large, distinctly superior. Jaws almost vertical, at angle of about 90° to horizontal. Symphysis of upper jaw above level of eye. Ascending process of premaxilla horizontal, its distal end almost above center of eye. Posterior tip of lower jaw exactly below symphysis of upper jaw. Posterior (lower) end of mouth cleft well below level of lower margin of eye. When mouth closed, ventral surface of lower jaw forms entire frontal surface of head. Lower jaw included. Symphyseal process present at lower jaw symphysis, projecting forward prominently; retroarticular processes of lower jaw large, acute, directed anteroventrally (Fig. 2A). Teeth large, sharp, spear-shaped, strongly curved inward (Fig. 2B), in (smaller) holotype in approximately 22 and 24 (32 and 35) rows on upper and lower jaw; 5 (8–9) teeth in first full row near symphyses of both jaws. Snout short, 1.5 (1.0) times eye diameter. Olfactory rosette (7 lobes) and nostril above anterior third of eye. Eyes not large, close to upper

**Table 1**

Counts and proportions for the holotype and paratype of *Pseudnos rossi* new species. Proportions are in % of standard length (SL) followed by % head length (HL, in parentheses).

	USNM 372726 Holotype 37.2 mm SL	USNM 372727 Paratype 51.8 mm SL
Vertebrae	47	—
Dorsal-fin rays	44	42
Anal-fin rays	35	33
Pectoral-fin rays	16 [L] 15 [R]	15 [L, R]
Caudal-fin rays	6	6
Gill rakers	—	10
Head length	32.3	29.9
Head width	22.0 (68.1)	13.5 (45.2)
Head depth	23.7 (73.4)	17.4 (58.2)
Body depth	21.5 (66.6)	25.1 (83.9)
Body depth at anal-fin origin	13.4 (41.5)	17.0 (56.8)
Predorsal-fin length	29.6 (91.6)	26.6 (89.0)
Preanal-fin length	47.8 (148.0)	48.3 (161.5)
Mandible to anus	34.9 (108.0)	36.7 (122.7)
Anus to anal fin origin	23.7 (73.4)	21.2 (70.9)
Upper pectoral-fin lobe length	13.4 (41.5)	13.5 (45.2)
Pectoral-fin notch ray length	8.1 (25.1)	—
Lower pectoral-fin lobe length	9.4 (29.1)	—
Eye diameter	5.4 (16.7)	5.8 (19.4)
Snout length	8.1 (25.0)	7.7 (25.8)
Interorbital width	13.4 (42.0)	11.2 (37.4)
Postocular head length	18.8 (58.0)	19.3 (64.5)
Upper jaw length	16.1 (49.8)	12.5 (41.8)
Lower jaw length	16.1 (49.8)	13.5 (45.2)
Gill opening length	5.4 (16.7)	5.4 (18.1)
Opercle length	13.4 (41.5)	12.5 (41.8)

contour of head. Interorbital space flat, 2.5 (1.9) times eye diameter. Gill opening short, 1.0 (0.9) times eye diameter, at 45° angle, entirely above pectoral-fin base and slightly anterior to it (distance between ventral end of gill opening and base of upper pectoral ray about equal to length of gill opening). Opercular flap small, acute. Opercle very long, directed ventrally and posteriorly, its tip below level of posterior end of lower jaw. Interopercle of similar length, visible externally, its anterior tip projecting anteriorly from ventral contour of head (Fig. 1). Long opercle, interopercle and elongated branchiostegal rays support membranes of enlarged branchial cavity that appears externally as a black posterior part of head. Branchial cavity length slightly more than half head length. Branchiostegal rays (4+2) long and distinctly visible externally. Gill rakers modified, closely but irregularly set, mostly alternating (especially on gill arch one), often paired on the outer and inner sides of each gill arch (central part of arches two and three); plates flattened, triangular, similar in shape to those in *P. pallidus* or *Pseudnos* sp.1 of Chernova

and Stein (2002, Figs. 9 and 13), spinule-bearing surface directed internally, flat and longitudinally oval. Spinules closely set, usually in two longitudinal rows, each of five to eight spinules, often with a few additional spinules in between (Fig. 2C).

Sensory pores difficult to see because of thin transparent skin (damaged in paratype). Nasal pores 2, the posterior on a vertical through center of eye. Paired nasal bones (through which the nasal canals run) long, tubular, and visible externally. Coronal pore absent. Lacrimal bones (bearing anterior portion of infraorbital canal) large, visible externally, slightly prominent anteriorly. Infraorbital canal (better preserved in holotype) interrupted behind eye, infraorbital pores 6 (5+1), posteriormost above posterior margin of eye (Fig. 2A). In paratype, skin behind eye missing. Preoperculomandibular pores 6 (3 on lower jaw + 3 on preopercular area). Two temporal pores present:  $t_1$  a short distance behind posterior margin of eye, and  $t_{sb}$ , the suprbranchial pore, above and in front of gill opening (Fig. 2A).

Pectoral fin notched, of 16 (15) rays. Upper lobe of 8 (8) rays, the 2 (2) notch rays more widely spaced and placed exactly at middle of fin base. In holotype, left lower pectoral lobe with 6, on right 5, rays. In paratype, 5 rays on each side. Bases of lower-lobe rays stronger and thicker than those of upper-lobe rays. Level of uppermost pectoral ray below horizontal through lower end of upper jaw. Base of pectoral fin close to vertical, lowest ray almost directly below uppermost. Upper-lobe rays not reaching anal fin origin, lower-lobe rays not reaching vertical through ends of upper lobe rays. In holotype, length of notch rays 1.7 times in upper pectoral-fin lobe length, lower pectoral-fin lobe 1.4 times in it.

Body not humpbacked, dorsal contour of back almost straight; spine horizontal, its anterior end not dorsally

curved (Fig. 3). Neural spines of vertebrae 1–4 neither longer nor broader than those posterior, unlike other species (see Fig. 5 in Chernova, 2001). Maximum body depth 4.2 (4.0) times in standard length and 1.6 (1.5) times depth at anal-fin origin. In holotype, occiput slightly swollen (Fig. 3); in paratype, dorsal outline of head and back in front of dorsal fin origin almost perfectly flat (Fig. 1), possibly an age-related difference. Abdominal part of body long, preanal length almost half of standard length. Interneural of first dorsal-fin ray between neural spines 3 and 4. Dorsal and anal fins moderately deep, maximum depth of erect dorsal fin in paratype 8.9 times in SL, 2.7 times in head length (damaged in holotype). Dorsal and anal fins overlapping about one-third of caudal-fin length. Anus on vertical behind head, slightly behind base of uppermost pectoral ray. Skin transparent. Gelatinous subcutaneous tissue weakly developed. In holotype (smaller specimen) body not as deep and jaws longer than in the paratype (larger specimen). Differences in head width and interorbital width are great because head of paratype was slightly compressed during fixation. Other proportions similar to those of holotype.

Body color in alcohol pale; under magnification, slightly dusky blotches of dots present caudally in paratype and absent in holotype. Head musculature pale. Black peritoneum visible through body wall. Mouth and gill cavities, gill arches, tongue, and both jaws black; gill rakers pale. Musculature of pectoral girdle appears pale on lateral surface of belly. Color in life orange-rose.

#### Distribution

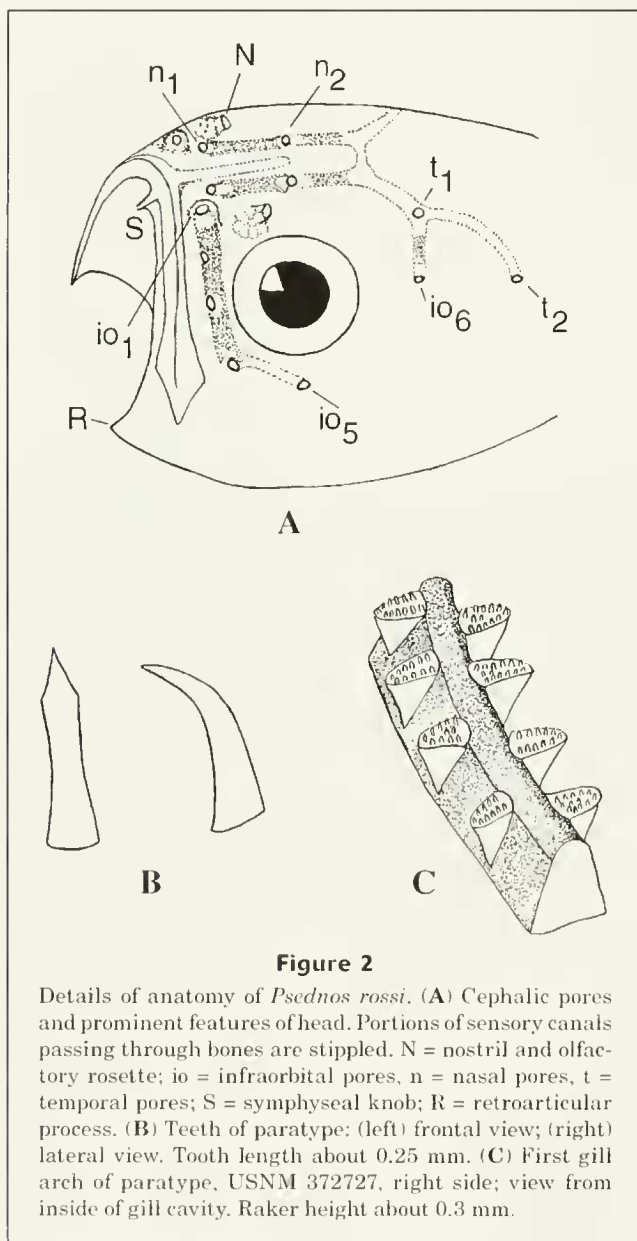
Western North Atlantic off Cape Hatteras, mesopelagic at depths of 500–674 m.

#### Etymology

The patronym “rossi” after Steve W. Ross, who initially notified us of the captures and furnished the specimens to us for examination.

#### Comparative notes

*Pseudnos rossi* seems to belong to the *P. christinae* group (see Chernova, 2001; Chernova and Stein, 2002), including *P. andriashevi*, *P. barnardi*, *P. christinae*, *P. dentatus*, *P. groenlandicus*, and *P. harteli*. Species of this group are characterized by vertebrae 46–47, dorsal-fin rays 38–42, anal-fin rays 33–35, and coronal pore absent (versus the *P. micurus* group having vertebrae 40–44, dorsal-fin rays 34–38, anal-fin rays 28–33, and coronal pore present) (Chernova, 2001). *Pseudnos rossi* distinctly differs from the other species of the *christinae* group in at least having occiput not swollen (vs. greatly swollen), not humpbacked because the vertebral column is straight (vs. humpbacked owing to the greatly curved anterior part of the spine), mouth vertical with jaws at 90° to horizontal, symphysis of upper jaw above level of eye (vs. a more or less oblique mouth at an angle of 30–45° and the upper jaw, symphysis on a horizontal with the lower half of the eye); and anus



**Figure 2**

Details of anatomy of *Pseudnos rossi*. (A) Cephalic pores and prominent features of head. Portions of sensory canals passing through bones are stippled. N = nostril and olfactory rosette; io = infraorbital pores, n = nasal pores, t = temporal pores; S = symphyseal knob; R = retroarticular process. (B) Teeth of paratype: (left) frontal view; (right) lateral view. Tooth length about 0.25 mm. (C) First gill arch of paratype, USNM 372727, right side; view from inside of gill cavity. Raker height about 0.3 mm.



**Figure 3**

Radiograph of *Pseudnos rossi* n.sp., holotype, USNM 372726. Juvenile, 37.2 mm SL. Sta. EL-00-033, off Cape Hatteras.

behind the head (vs. anus below the posterior third of the head). The very oblique, almost vertical mouth occurs often in species of the *P. micrurus* group, five of which have the mouth at 75–85° to the horizontal (*P. anoderkes*, *P. cathetostomus*, *P. microps*, *P. mirabilis*, *P. sargassicus*). However, they all differ as described above.

## Discussion

The physical features of *Pseudnos rossi* are unique in the genus. The straight vertebral column and body are outside the previous diagnosis of the genus, because all previously known species are humpbacked owing to the curved spinal column. Nevertheless, *P. rossi* clearly belongs in *Pseudnos* rather than *Paraliparis* because it has the other generic characters of *Pseudnos* (Chernova, 2001); particularly, its sensory canal system and pores are of *Pseudnos* type, having an interrupted infraorbital canal behind the eye. We suggest that its remarkable body shape is an extreme transformation of the usual *Pseudnos* body shape and is associated with the change of the mouth from oblique and of normal size to vertical and very large. In this process the anterior movement of the bony elements of the jaws greatly enlarges the branchial cavity.

The morphology of *Pseudnos rossi* invites speculation about its ecology. The very large superior mouth with vertical jaws, eyes located close to the dorsal contour of the head and oriented to look forward and up, and straight body suggest adaptation to feeding on detritus and animals (such as copepods) above it in the water column. These adaptations, similar to those of hatchetfishes (family Sternoptychidae), are highly advantageous for a mesopelagic mode of life. Sudden opening of the very large vertical lower jaw could produce a strong orobranchial suction, simultaneously bringing food into the mouth and thus saving energy for this fish, which is probably a poor swimmer.

Work over the last several years has made it clear that *Pseudnos* species exist at mesopelagic depths in the North Atlantic, Indian, North Pacific, and South Pacific Oceans. We confidently expect discovery of additional species from meso- and bathypelagic waters.

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