

Two New Species of Gizzard Shads of the Genus *Nematalosa* (Teleostei, Clupeidae, Dorosomatinae) from the Persian/Arabian Gulf

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Abstract Two new fishes of the genus *Nematalosa* (Clupeidae, Dorosomatinae), apparently allied with *N. nasus*, are described from the Persian/Arabian Gulf. The new species, *N. resticularia* and *N. persara*, are distinguishable from each other and from *N. nasus* by meristic characters, particularly number of prepectoral (abdominal) scutes.

Study of fishes from the Persian/Arabian Gulf reveals three species of *Nematalosa* living in that area, and collected together by beach seine. We identify one of the three as the widespread (Indo-West Pacific) *N. nasus* (Bloch), and name the other two as new. Current keys (Nelson and Rothman, 1973; Wongratana, 1980; Whitehead, 1985) result in identification of all three species as *N. nasus*, as is apparently the current practice (Al-Hassan, 1987). All three species have an expanded third infraorbital bone, the character used in keys to distinguish *N. nasus* from most other species of the genus (Nelson and Rothman, 1973: fig. 13D; Whitehead, 1985: 249). The three species are not known to be distinguishable from one another by external characters other than meristics. The most useful character is the number of prepectoral abdominal scutes, which lie on the midventral line in front of, and beneath, the pectoral fin, and anterior to the first rib. Prepectoral scutes lack the long ascending arm typical of more posterior scutes, the paired arm of which extends dorsally and associates with one rib of each pair on either side.

Specimens were collected by beach seine from four localities in Saudi Arabia during the period 1971–1984, by K. Allen, J. Burchard, K. Carpenter, L. McCarthy, B. Stanaland, and B. Tarr: Tanajib Bay (TB), 27°48'N, 48°51'E; Road Bay (RB), 27°43'N, 48°48'E; Manifa Bay (MB), 27°35'N, 48°55'E; Tarut Island (TI), 26°36'N, 50°03'E. Collecting was supported by the Arabian-American Oil Company (ARAMCO). Counts were taken from radiographs of all specimens in the manner of Nelson and

Rothman (1973). Newly collected specimens mentioned below are deposited in the American Museum of Natural History (AMNH), Bernice P. Bishop Museum (BPBM), Natural History Museum, London (BMNH), and Los Angeles County Museum (LACM). Specimens previously noted in the literature are in the National Museum of Natural History, Washington (USNM), Universitæts Zoologiske Museum, Copenhagen (ZMUC), and Zoologisches Museum, Humboldt Universitæts, Berlin (ZMB).

Nematalosa resticularia sp. nov. (Fig. 1 [above])

Holotype. AMNH 56100, 95 mm, Tarut Island, Saudi Arabia, 13 Apr. 1984.

Paratypes. AMNH 56101, 19, 91–116 mm, same data as holotype.

Other specimens. AMNH 56102, 34, 37–47 mm, TB, 19 July 1983; 56103, 2, 74–75 mm, TB, 17 June 1984; 56104, 7, 38–46 mm, TB, 5 Aug. 1984; 56105, 1, 43 mm, RB, 7 Aug. 1984; 56106, 39, 20–52 mm, TI, 28 June 1971; 56107, 5, 81–92 mm, TI, Oct. 1984; ZMUC C4, 1, 102 mm, Iran, 1938; BPBM 30412, 2, 76–78 mm, Saudi Arabia, 6 June 1984.

Diagnosis. A *Nematalosa* with the third infraorbital bone expanded, its anterior edge vertical or nearly so (as in *N. nasus*). Supraorbital grooves absent. Prepectoral scutes usually 8.

Etymology. From the Latin *resticula* (a small rope); *resticularia* is a feminine noun, signifying a



Fig. 1. Above—*Nematalosa resticularia* sp. nov., holotype, AMNH 56100, 95 mm; below—*N. persara* sp. nov., holotype, AMNH 56108, 138 mm (specimen bent slightly to right).

maker of small ropes, in allusion to the large size and texture of the intestinal diverticula (Fig. 2).

Distribution. Persian/Arabian Gulf, possibly west to Somalia based on one specimen, 53 mm, BMNH 1962.3.13.9, previously identified both as *N. nasus* (Nelson and Rothman, 1973:161) and as *N. arabica* (Wongratana, 1980:177).

Nematalosa persara sp. nov.
(Fig. 1 [below])

Holotype. AMNH 56108, 138 mm, Road Bay, Saudi Arabia, 13 Oct. 1984.

Paratypes. AMNH 56109, 16, 127–152 mm, same data as holotype.

Other specimens. AMNH 56110, 4, 59–70 mm, TB, 19 July 1983; 56111, 1, 70 mm, TB, 22 Feb. 1984; 56112, 1, 61 mm, MB, 4 Aug. 1984; 56113, 9, 59–71 mm, TI, 28 June 1971; 56114, 10, 87–124 mm, TI, 13 Apr. 1984; 56115, 12, 52–59 mm, TI, 17 Apr. 1984; BPBM 30320, 6, 51–58 mm, Saudi Arabia, 13 Apr. 1984; 33197, 5, 76–152 mm, Kuwait, 21 Aug. 1985; BMNH 1982.9.6:128–130, 139–151 mm, Kuwait.

Diagnosis. A *Nematalosa* with the third infraorbital bone expanded, its anterior edge vertical or nearly so (as in *N. nasus*). Supraorbital grooves absent. Prepectoral scutes usually 7.

Etymology. A combination and abbreviation of Persian/Arabian, after the area of occurrence of the species; *persara* is treated as a Latin adjective in the feminine.

Distribution. Persian/Arabian Gulf and northern Arabian Sea to Pakistan, based on BMNH 1977.11.7:1–2 (two specimens, identified as *N. nasus* by Wongratana, 1980: 180), and LACM 38300-5 (15 specimens among 35 *N. nasus*) from Pakistan.

Nematalosa nasus (Bloch)

Gulf specimens examined. AMNH 56116, 7, 44–53 mm, TB, 19 July 1983; 56117, 1, 77 mm, TB, 22 Feb. 1984; 56118, 6, 36–42 mm, TB, 17 June 1984; 56119, 2, 133–144 mm, RB, 13 Oct. 1984; 56120, 57, 52–59 mm, MB,

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2 Aug. 1982; 56121, 38, 38–52 mm, MB, 20 July 1983; 56122, 2, 61–66 mm, MB, 4 Aug. 1984; 56123, 14, 40–50 mm, TI, 28 June 1971; 56124, 10, 84–113 mm, TI, 13 Apr. 1984; 56125, 2, 73–125 mm, TI, Oct. 1984; USNM 147936-7, 107–122 mm, Saudi Arabia, 1948; ZMUC C5, 158 mm, Iran, 1938; BPBM 29442, 6, 121–163 mm, Bahrain, 2–3 Nov. 1983; 30363, 3, 127–152 mm, Saudi Arabia, May 1984.

Diagnosis. A *Nematalosa* with the third infraorbital bone expanded, its anterior edge vertical or nearly so. Supraorbital grooves absent. Prepectoral scutes usually 6.

Identification of Gulf specimens as *N. nasus* (Bloch) is based on counts taken from radiographs of specimens from throughout the range of this species (South Africa to Philippines-Japan), which consistently has six prepectoral scutes, as is true also

for the holotype of *Clupea nasus* Bloch (ZMB 3898), type locality probably Tranquebar (Whitehead, 1969). Gulf specimens previously identified as *N. nasus* are USNM 147936-7 and ZMUC C4-5 (Nelson and Rothman, 1973:162), all of which prove to be *N. nasus* except ZMUC C4, which proves to be *N. resticularia*.

Discussion

Al-Hassan (1987) reported that *Nematalosa nasus* comprises about 50% of the clupeoid catch of the northern Gulf. For this species he reported the range of vertebrae 39–49, with sample means 43 and 45 (Al-Hassan, 1987: fig. 2a, not fig. 2c as stated). These numbers suggest that more than one species

Table 1. Counts of dorsal finrays and predorsal bones (Gulf specimens only)

Species	Unbranched rays				Branched rays					Total rays					Predorsal bones			
	iii	iv	v	vi	11	12	13	14	15	15	16	17	18	19	8	9	10	11
<i>N. resticularia</i>	1	51	30	1	11	64	7	1		6	51	40	1		2	89	17	
<i>N. persara</i>		32	23			6	28	19	2		3	20	27	10	5	51	11	
<i>N. nasus</i>		67	33		1	11	77	33		1	49	67	8	4		113	38	1

Table 2. Counts of anal finrays (Gulf specimens only)

Species	Unbranched rays			Branched rays										Total rays									
	ii	iii	iv	13	14	15	16	17	18	19	20	21	22	16	17	18	19	20	21	22	23	24	25
<i>N. resticularia</i>	14	73	9			1	3	12	31	27	15	5	2			2	8	11	38	27	12	7	2
<i>N. persara</i>	16	46	1					4	22	21	14	2			1		1	8	25	19	11	1	
<i>N. nasus</i>	37	87	1	1		4	10	60	45	6				1	2	5	34	64	34	3			

Table 3. Counts of vertebrae (Gulf specimens only)

Species	Abdominal					Caudal							Total					
	13	14	15	16	17	28	29	30	31	32	33		43	44	45	46	47	48
<i>N. resticularia</i>	28	71	11	1		2	15	58	33	3			13	80	18			
<i>N. persara</i>	1	26	30	10				1	17	30	19					21	43	3
<i>N. nasus</i>		10	89	47	7	1	3	47	89	11	2				18	110	22	3

Table 4. Counts of ventral scutes (pelvic scute included only in total; Gulf specimens only)

Species	Prepelvic						Postpelvic					Total					
	17	18	19	20	21	22	10	11	12	13	14	29	30	31	32	33	34
<i>N. resticularia</i>		3	11	76	11	1	12	66	22	2		1	17	61	18	5	
<i>N. persara</i>		2	58	6	1		2	10	47	8		3	9	41	13	1	
<i>N. nasus</i>	2	118	30	3			1	25	90	36	1	1	20	69	58	5	

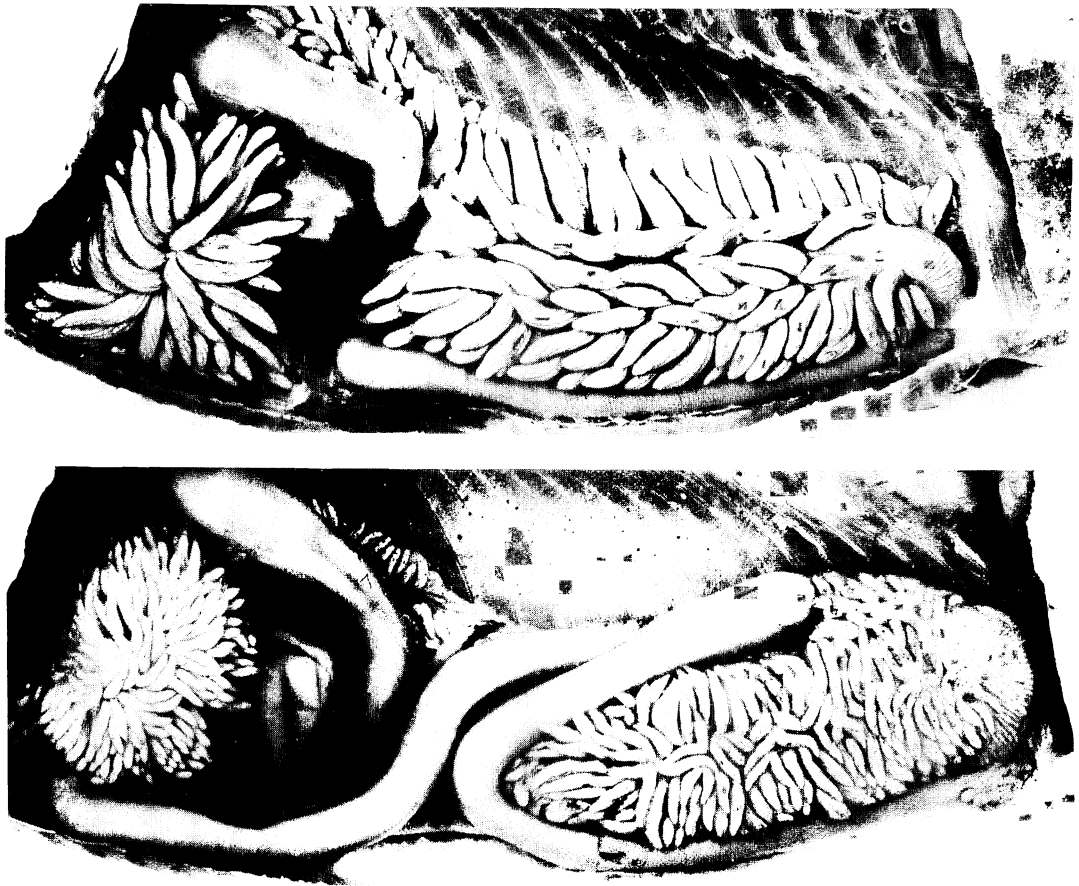


Fig. 2. Abdominal cavity and gut, as seen from left side (anterior to left). Above—*Nematalosa resticularia* sp. nov., AMNH 56101, 91 mm; below—*N. nasus*, AMNH 56124, 91 mm. In size and number of intestinal diverticula, *N. persara* sp. nov. resembles *N. nasus* and other dorosomatines.

occurred in his samples. Similarly, he reported the range of ventral scutes 24–34, with sample means of 29 and 31 (his fig. 2b, not 2d), of anal finrays 17–24, means 20 and 21 (his fig. 2c, not 2a), of dorsal finrays 14–18, means 15 and 16 (his fig. 2d, not 2e), and of pectoral finrays 14–18, means 15 and 16 (his fig. 2e, not 2b; cf., Tables 1–5). Al-Hassan inter-

preted differences in sample means as possible evidence of different geographical populations of one species, *N. nasus*.

Nematalosa resticularia seems a well marked species, differing from *N. persara* and *N. nasus* in meristic characters and in the larger and fewer intestinal diverticula (Tables 1–5, Fig. 2). In contrast, *N. persara* seems only slightly different from *N. nasus* and specimens are not easily distinguished. Specimens from mixed lots, sorted into forms with six or with seven prepectoral scutes, show differences in average dorsal finrays (total rays, Table 1), anal finrays (branched and total rays, Table 2), and vertebrae (caudal and total, Table 3). If further research shows that these two forms represent but one species (*N. nasus*), then that species, for whatever reason, is more variable in the Gulf region than elsewhere.

Table 5. Counts of prepelvic scutes (Gulf specimens only)

Species	Prepectoral				Postpectoral				
	6	7	8	9	10	11	12	13	14
<i>N. resticularia</i>		8	82	12	1	12	84	5	
<i>N. persara</i>		63	4			2	62	2	1
<i>N. nasus</i>	147	6				5	122	25	1

Species of the genus *Nematalosa* are those Indo-Pacific dorosomatines with paired predorsal scales, overlapping along the midline, the lower jaw flared outward before the end of the maxilla, the intestinal loop posterodorsally directed, and the last dorsal finray prolonged as a filament (e.g., Wongratana, 1980). Nine species are currently recognized (Whitehead, 1985). The new Gulf species exhibit these features, but the intestinal loop of *N. reticularia* is sometimes undeveloped (Fig. 2).

Gizzard shads (dorosomatines) are microphagous fishes with numerous gillrakers increasing with age, and with large epibranchial organs, supported by an enlarged fourth epibranchial bone of varied shape (e.g., Nelson, 1967; Miller, 1969). Nelson (1967:83) reported that in *Nematalosa* (and erroneously in *Clupanodon thrissa*, based on misidentified museum specimens of *N. nasus* as subsequently determined by Nelson and Rothman, 1973:163), the fourth epibranchial bone extends posteriorly in a process of unknown significance (Nelson, 1967: fig. 3j, PR, for *N. nasus*). Further survey has shown that this process is present in most species of *Nematalosa*, including the new Gulf species but in no other clupeids (specimens of *N. arabica* and *N. flyensis* were unavailable for examination). *Nematalosa galathea*, similar to *N. nasus* and to the new Gulf species in having an expanded third infraorbital bone but differing in having supraorbital skin grooves, lacks this process and may yet prove related to species of the genus *Gonialosa* (Nelson and Rothman, 1973:158; cf., Wongratana, 1983; Nelson, 1983; Whitehead, 1985:247).

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Persian/Arabian Gulf より得られたニシン科コノシロ亜科ドロクイ属の2新種

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Persian/Arabian Gulf より得られたニシン科コノシロ亜科ドロクイ属の2新種 *Nematalosa reticularia* と *N. persara* を記載した。この2新種及びこれらに近縁な *N. nasus* は、体節の形質、特に prepectoral (abdominal) scutes の数により互いに区別できる。