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ARCHAMIA ATAENIA, A NEW SPECIES OF CARDINALFISH (PERCIFORMES: APOGONIDAE) FROM THE ANDAMAN SEA AND MENTAWAI ISLANDS

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ABSTRACT

The cardinalfish *Archamia ataenia* is described from four specimens from Surin Neur Island off the Andaman Sea coast of Thailand and five from the Mentawai Islands, West Sumatra. It is a close relative of *A. zosterophora*, having the two narrow orange bars on the operculum, a small black spot at the midbase of the caudal fin, and modally 15 anal soft rays. It differs in lacking the broad black bar in the middle of the body and in having 14 pectoral rays (usually 13 in *zosterophora*) and modally 20 gill rakers (22 for *zosterophora*).

INTRODUCTION

Lachner (1951) reviewed the species of the Indo-Pacific apogonid genus *Archamia* Gill. He questioned whether *Archamia* should be regarded as distinct from *Apogon* Lacepède, adding, "it is probably best to retain *Archamia* until a thorough study of *Apogon* has been completed." Fraser (1972) established *Archamia* as a valid genus based on the osteology of the cranium (especially the large suprorbital crest and crests on the frontal bones) and in having 12 or more anal soft rays. Lachner recognized six species of *Archamia*, two of which, *A. dispilus* and *A. biguttata*, were described as new. Lachner and Taylor (1960) added a seventh species, *A. melasma*, from northern Australia (now regarded as a synonym of *A. biguttata* by Randall *et al.*, 1997), and Smith (1961) described another, *A. mozambiquensis*, from East Africa. Chen and Shao (1993) pointed out that Lachner overlooked *A. leai* Waite from the southern Great Barrier Reef and Coral Sea in his review. They described *A. goni* from Taiwan and provided a key to ten species of the genus. Gon and Randall (1995) described *A. bilineata* and *A. irida* from the Red Sea, *A. pallida* from the Arabian Sea coast of Oman, and provided a key to the six western Indian Ocean species of the genus. Gon and Randall are currently working on a revision of *Archamia*.

In January, 1997 the junior author collected four specimens of a possible new species of *Archamia* from Surin Neur Island off the southwest coast of Thailand. Unaware of the Andaman Sea material, the senior author collected five specimens of the same species from Siberut Island, Mentawai Islands off the southwest coast of Sumatra 3.5 months later. We both recognized that our specimens seemed identical to *A. zosterophora* (Bleeker) except for the lack of the broad black bar below the base of the second dorsal fin. Knowing that *A. zosterophora* was not observed in the area where we collected our specimens, and knowing that it loses its black bar when it forages at night, we initially thought our specimens might best be regarded a geographical variant of *zosterophora*. However, when we determined that our specimens have one fewer pectoral-rays, modally two fewer gill-rakers, and some lesser color differences, we were then confident that they represented a new species of *Archamia*.

MATERIALS AND METHODS

Type specimens of the new species have been deposited in the Australian Museum, Sydney

(AMS); the National Museum of Natural History, London (BMNH); Bernice P. Bishop Museum, Honolulu (BPBM); California Academy of Sciences, San Francisco (CAS); National Science Museum, Tokyo (NSMT); Phuket Marine Biological Center, Phuket, Thailand (PMBC); J.L.B. Smith Institute of Ichthyology, Grahamstown (RUSI); and the U.S. National Museum of Natural History, Washington, D.C. (USNM).

Lengths recorded for specimens are standard length (SL), the straight-line distance from the tip of the snout in the median plane to the base of the caudal fin (end of hypural plate). Body depth is the greatest depth; body width is the greatest width just posterior to the head. Head length is measured from the front of the upper lip in the median plane to the most posterior point of the opercular membrane; snout length is taken from the same anterior point to the fleshy edge of the orbit. Orbit diameter is the greatest fleshy diameter of the orbit; interorbital width is the least bony width. Caudal-peduncle depth is the least depth, and caudal-peduncle length is the horizontal distance between verticals at the rear base of the anal fin and the base of the caudal fin; lengths of spines and rays of fins are measured from their extreme bases in a straight line to their tips. Caudal concavity is the horizontal distance between verticals at the tips of the longest and shortest caudal rays. Pectoral-fin length is the length of the longest ray; pelvic-fin length is measured from the base of the spine to the tip of the longest ray.

Counts of pectoral rays include the rudimentary uppermost ray. Counts of lateral-line scales are made to the base of the caudal fin (hence do not include 3 progressively smaller pored scales that extend onto the fin base). Gill-raker counts include all rudiments; the count of lower-limb rakers contains the raker at the angle.

Meristic and morphometric data given in parentheses refer to paratypes. Table 1 provides measurements of type specimens as percentages of the standard length. Proportional measurements in the text are rounded to the nearest 0.05. Table 2 documents the gill-raker counts of *A. zosterophora* and the new species.

Photographs were taken by the senior author.

Archamia ataenia, new species

Figures 1, 2; Tables 1, 2

Holotype: BPBM 37660, 40.6 mm, male, Indonesia, West Sumatra, Mentawai Islands, Siberut Island, Sarabua Bay, 1°28.8′S, 99°9.7′E, from branching coral, 6 m, quinaldine, J.E. Randall, 24 April 1997.

Paratypes: AMS I.38525-001, 40.6 mm; BMNH 1998.1.6.1, 41.5 mm; BPBM 37843, 40.0 mm; CAS 98472, 42.2 mm, all with same data as holotype; PMBC 13792, 44.3 mm, Andaman Sea, Thailand, Surin Neur Island, S side, 9°24′56′′N, 97°52′40′′E, from branching coral, 7 m, spear, U. Satapoomin, 7 January 1997; NSMT-P 54387, 44.1 mm, RUSI 56252, 38.5 mm, and USNM 347598, 44.1 mm, same data as preceding.

Diagnosis: Dorsal rays VI-I,9; anal rays II,14–16, usually 15; pectoral rays 14 (one of nine with 13); lateral-line scales 24; predorsal scales 6; gill rakers 5–6 + 15–16 (total 20–21, modally 20); preopercular ridge smooth with a small flat spine at angle; preopercular edge serrate; posterior edge of maxilla indented; body depth 2.55–2.75 in SL; color in life translucent gray with a small black spot at midbase of caudal fin, two narrow dusky orange bars on opercle; and a broad black stripe on side of snout, edged in iridescent blue-green lines that continue onto iris of eye.

Description: Dorsal rays VI-I,9; anal rays II,15 (two paratypes with 14, one with 16, five with 15); all dorsal and anal soft rays branched, the last to base; pectoral rays 14 (one of nine with 13), the upper 2 and lower 3 unbranched; pelvic rays I,5; principal caudal rays 17, the upper and lower unbranched; upper procurrent caudal rays 7 (7–8), the posterior one or two segmented; lower procurrent caudal rays 8 (7–8), the posterior one or two segmented; lateral line complete, the pored scales 24 (plus 3 progressively smaller pored scales on caudal-fin base); predorsal scales 6, the sixth scale broadly indented posteriorly; scales above lateral line to origin of first dorsal fin 1.5; scales

below lateral line to origin of anal fin 5.5; circumpeduncular scales 12; gill rakers 6 + 15 (one paratype with 6 + 15, one with 5 + 16, six with 5 + 15); pseudobranchial filaments 15 (12–17); branchiostegal rays 7; vertebrae 10 + 14; supraneural (predorsal) bones 3.

Body depth 2.7 (2.55–2.75) in SL; body very compressed, the width 2.65 (2.6–2.8) in depth; head length 2.45 (2.45–2.5) in SL; dorsal profile of head straight in interorbital region, becoming rounded at front of snout and slightly convex on nape; a distinct middorsal ridge on nape; snout length 4.2 (4.0–4.15) in head; orbit diameter 3.0 (2.85–3.1) in head; interorbital width 4.15 (4.0–4.2) in head; caudal-peduncle depth 2.4 (2.3–2.55) in head; caudal-peduncle length 1.95 (1.95–2.1) in head.

Mouth moderately large, the maxilla extending to or slightly posterior to a vertical through posterior edge of pupil, the upper-jaw length 2.0 (1.9–2.0) in head; posterior end of maxilla with an angular indentation and rounded corners; lower jaw projecting; mouth strongly oblique, the gape forming an angle of about 45° to horizontal axis of body; supramaxilla not present; a band of very small villiform teeth in jaws, the band at front of upper jaw in 2–3 rows, the inner row at edge of gape, the 1 or 2 anterior rows shorter and buttressing the posterior row; side of upper jaw with a maximum of about 6 irregular rows of teeth, narrowing to 1 or 2 rows posteriorly; lower jaw of holotype with about 3 rows of teeth anteriorly, soon narrowing to 2 rows and to a single row for more than posterior half of jaw; a single row of about 20 very small conical teeth on palatines; vomer exposed as a strong ridge forming an incurved V with a few small conical teeth posteriorly on the inner face of ridge; tongue spatulate with numerous slender papillae on upper surface. Longest gill rakers on lower limb near angle, their length about half orbit diameter.

Opercular spine not evident (posterior edge of opercle broadly flexible); preopercular ridge smooth with a short flat spine at angle; edge of preopercle nearly fully serrate (holotype with 42 serrae). Anterior nostril a short membranous tube (a little higher posteriorly) in front of center of eye about 2 nostril diameters from groove at base of upper lip; posterior nostril a slit-like aperture in front of upper edge of pupil, its length about 2.5 in pupil diameter; internarial distance about half pupil diameter; nasal chamber cavernous, the skin over the roof thin. Lateralis system of head with many very small pores (especially numerous in interorbital region, around orbit, and on preopercle); numerous bands of sensory pores on head, more transverse than longitudinal; a pair of prominent pores at front of lower jaw.

Scales very weakly ctenoid (the cteni only along central part of scale margin), thin, and flexible; scales present on nape, opercle, and preopercle, those on opercle larger than scales of body; no scales on occiput, interorbital, snout, or ventrally on head; no scales on fins except for small scales along base of anal fin, on about basal third of caudal fin, and a scaly process of 2 large scales extending midventrally from base of pelvic fins to half length of pelvic spine.

Origin of first dorsal fin over fourth lateral-line scale, the predorsal distance 2.35 (2.3–2.4) in SL; spines of first dorsal fin slender; first dorsal spine 4.05 (3.95–4.35) in head; second dorsal spine 2.6 (2.5–2.8) in head; third dorsal spine longest, 2.5 (2.4–2.6) in head; second dorsal fin separated from first dorsal fin by two ridged median scales, the second indented posteriorly; origin of second dorsal fin above tenth lateral-line scale; spine of second dorsal fin 2.3 (2.2–2.4) in head; first dorsal soft ray longest, 1.4 (1.35–1.4) in head; last dorsal soft ray slightly shorter than penultimate ray; origin of anal fin directly below origin of second dorsal fin; first anal spine short, 7.8 (6.8–7.8) in head; second anal spine 2.45 (2.3–2.5) in head; first anal soft ray longest, 1.55 (1.5–1.6) in head; last anal soft ray equal to or slightly longer than penultimate ray; caudal fin forked, the lobes slightly rounded, the fin length 2.8 (2.8–3.0) in SL; caudal concavity 3.5 (3.25–4.1) in head; pectoral fins pointed, the third ray longest, 1.45 (1.4–1.5) in head; pelvic fins reaching origin of anal fin, the first soft ray longest, 1.85 (1.8–1.9) in head.

Color in life: translucent gray (the vertebral column faintly visible), with a small black spot at midbase of caudal fin (containing last pored scale

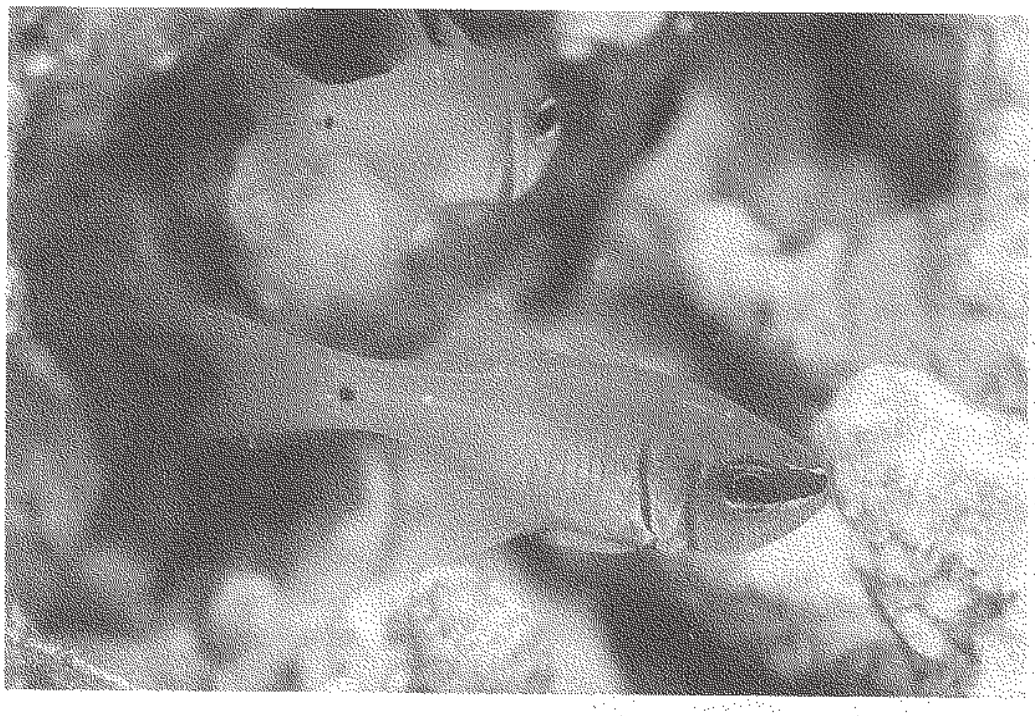

Figure 1 Underwater photograph of *Archamia ataenia*, Mentawai Islands, West Sumatra.

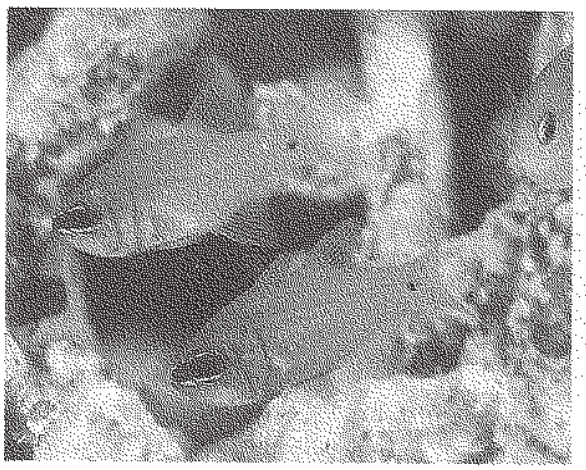

Figure 2 Underwater photograph of a pair of *Archamia ataenia*, Mentawai Islands, West Sumatra.

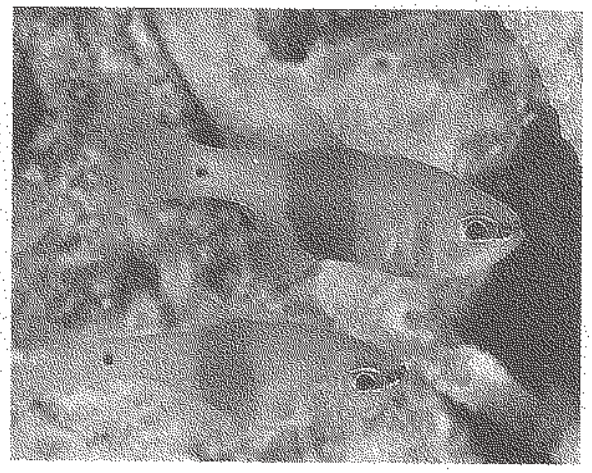

Figure 3 Underwater photograph of a pair of *Archamia zosterophora*, Halmahera, Indonesia.

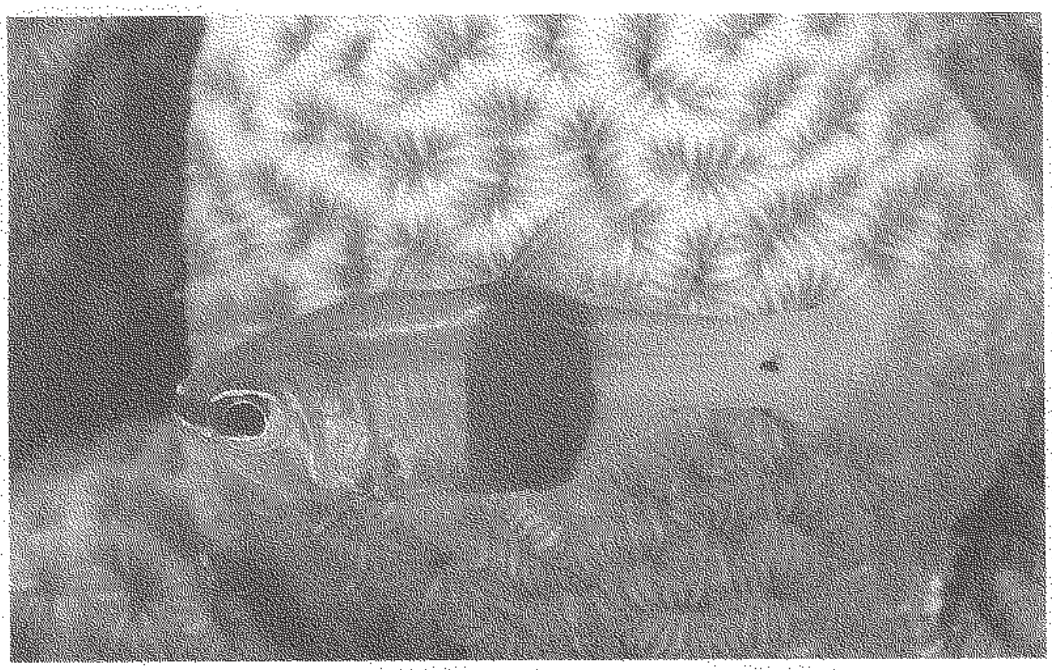

Figure 4 Underwater photograph of *Archamia zosterophora*, Palau.

Figure 5 Underwater photograph of *Archamia zosterophora* taken at night, Palau.

of lateral line); two narrow dusky orange bars on operculum; a broad black stripe on side of snout, edged above and below by an iridescent blue-green line, these lines continuing onto iris, one above and one below pupil; iris otherwise black; a midventral blackish orange-red streak on thorax and abdomen; a row of tiny blackish dots at base of anal fin with a second row of dots above and nearly parallel to the first; fins largely transparent, the spines and rays of dorsal and caudal fins faintly pale orangish.

Color of holotype in alcohol: body pale translucent cream, very finely speckled with melanophores, denser dorsally; a small roundish black spot at midbase of caudal fin (1.3 mm in greatest diameter); head silvery over lower opercle and cheek with two narrow vertical blackish bars on operculum, one near posterior margin, and the other following ridge of preopercle; a broad black stripe on side of snout, continuing on upper lip across front of snout; a broad blackish midventral band from isthmus to origin of anal fin; fins pale except dusky pigment on first three spines of first dorsal fin and spine of second dorsal fin; an internal row of tiny blackish dots along base of anal fin posterior to fourth soft ray, and a second row above it, converging with the first posteriorly and continuing along ventral edge of caudal peduncle; peritoneum pale; intestine blackish.

Remarks: As mentioned above, we first thought our specimens of this cardinalfish were merely a geographical variant of *Archamia zosterophora* (Bleeker) which had lost the broad black to blackish bar in the middle of the body. We have not observed typical *zosterophora* (see figures 3 and 4) in Sumatra or the Andaman Sea. Our specimens have the same two distinctive orange vertical streaks on the operculum, the small black spot at the base of the caudal fin, the black stripe on the side of the snout, the dusky orange midventral stripe on the thorax and abdomen, the double row of dark dots at and above the base of the anal fin, and the same high count of anal soft rays. This initial opinion was influenced also by the discovery, while night diving in Palau, that *zosterophora* loses its black bar at night, as well as the two narrow orange vertical bars on the operculum (Figure 5). The night form was believed to be another species of *Archamia* when first observed; only when the black bar below the second dorsal fin could be faintly seen on the color transparency under a dissecting microscope as a finely dotted zone of melanophores was it realized that the fish was *zosterophora.*

We name our fish *Archamia ataenia* from the Greek *a* for without and the Latin *taenia* (*tainia* in the Greek) for ribbon, band, or bar, in reference to the absence of the broad black bar on the body as seen on *A. zosterophora.*

Closer examination of the color slides of the two species revealed three other color differences. *A. zosterophora* has a yellow area posteriorly in the iris behind the pupil, the blue-green edge dorsally on the black stripe of the snout is present only at the front of the snout, and the orange bars on the operculum lack the blackish pigment as seen on *ataenia* or have very little of this pigment.

The two species may also be separated by the number of pectoral-fin rays. Eight of our type specimens have 14 pectoral rays, and only one has 13. We have counted pectoral rays of 45 specimens of *A. zosterophora,* all of which have 13. In addition, there is a difference in the number of gill rakers (Table 2).

Our specimens were collected from large aggregations that took refuge in a colony of branching coral in a shallow (6–7 m) calm area normally protected from heavy surge. The 42.2-mm male had some developing ova in its mouth. The 40.0-mm specimen is a fully mature female with a large ovary.

A distribution of Andaman Sea to southwestern Sumatra and the Mentawai Islands is not limited to *Archamia ataenia.* We have found the wrasse *Halichoeres kallochroma* (Bleeker) in the Andaman Sea and Mentawai Islands, as well as a new species of parrotfish of the genus *Scarus* similar to *S. flavipectoralis* Schultz, and an undescribed grouper of the genus *Cephalopholis* closely related to *C. microprion* (Bleeker). The rabbitfish *Siganus magnificus* (Burgess), described from the Andaman Sea, was observed and photographed by the senior author in the Mentawai Islands; its range was extended to Java by Kuiter and Debelius (1994). Other fishes known at the

present time only from the Andaman Sea include the longfin *Plesiops thysanopterus* Mooi, the grunt *Pomadasys andamanensis* McKay & Satapoomin, the damselfishes *Pomacentrus alleni* Burgess and *P. polyspinus* Allen, and the blennies *Ecsenius lubbocki* Springer and *Meiacanthus* sp. (Smith-Vaniz, MS). During the last Ice Age with the sea level estimated to be 100 m lower than it is today, the Andaman Sea was a nearly enclosed basin walled off by the barriers formed by the Andaman Islands and Nicobar Islands (McManus, 1985). This or earlier similar isolation may have been the basis for the speciation of the endemic fishes.

Table 1 Proportional measurements of type specimens of *Archamia ataenia* expressed as percentages of the standard length

	Holotype	Paratypes						
	BPBM 37660	RUSI 56252	AMS I.38525-001	BPBM 37843	CAS 98472	NSMT-P 54387	USNM 347598	PMBC 13792
Standard length (mm)	40.6	38.5	39.4	40.0	42.2	44.1	44.1	44.3
Body depth	37.3	36.4	36.7	37.3	37.7	36.7	39.0	36.3
Body width	14.1	13.2	13.7	13.3	14.0	13.5	14.9	13.3
Head length	40.7	40.3	40.0	40.4	40.4	40.8	40.6	40.1
Snout length	9.7	9.7	10.0	10.0	10.1	9.8	10.4	10.8
Orbit diameter	13.5	13.1	13.2	13.6	14.2	13.6	13.8	13.0
Interorbital width	9.8	9.7	9.9	10.0	9.6	9.9	10.2	9.7
Caudal-peduncle depth	17.0	17.8	17.4	15.8	16.2	17.0	17.8	16.0
Caudal-peduncle length	20.8	20.8	19.8	20.4	19.4	19.4	19.9	20.3
Predorsal length	42.6	42.7	42.0	42.7	41.6	42.0	43.1	41.7
Preanal length	55.7	54.6	54.7	55.5	54.8	56.2	56.9	55.4
Prepelvic length	36.9	36.5	36.7	37.2	37.8	36.5	38.5	36.2
Upper-jaw length	20.2	20.1	20.3	20.7	21.1	20.9	21.5	20.3
First dorsal spine	10.1	10.1	9.9	10.3	10.3	9.6	9.3	9.3
Second dorsal spine	15.5	15.6	15.5	15.4	14.4	15.3	16.2	15.3
Third dorsal spine	16.3	16.1	broken	16.5	15.6	15.9	17.0	16.3
Spine of second dorsal fin	17.4	18.5	17.5	broken	17.0	17.9	18.6	17.6
Longest dorsal ray	28.8	29.9	29.2	broken	29.6	29.4	29.5	28.3
First anal spine	5.2	5.7	5.3	5.2	5.9	5.4	5.2	5.9
Second anal spine	16.5	17.7	16.5	16.3	16.8	17.7	17.6	17.4
Longest anal ray	26.4	27.1	26.8	25.8	26.1	27.0	27.2	25.4
Caudal-fin length	35.5	35.6	34.8	33.4	broken	34.1	35.2	33.3
Caudal concavity	11.8	11.7	11.5	11.0	—	11.2	11.6	11.3
Pectoral-fin length	27.8	28.6	28.7	26.6	28.3	28.4	28.8	28.5
Pelvic-spine length	15.4	16.2	15.5	15.0	15.4	16.1	16.1	15.8
Pelvic-fin length	22.1	22.1	22.2	22.0	21.4	21.5	21.5	21.0

Table 2 Gill-raker counts of *Archamia ataenia* and *A. zosterophora*

Species	Upper-limb Rakers		Lower-limb Rakers			Total Rakers			
	5	6	15	16	17	20	21	22	23
A. ataenia	7	2	8	1		6	3		
A. zosterophora	4	41	5	39	1	2	5	37	1

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