

## Dorsal Scutes in the Chinese Gizzard Shad *Clupanodon thrissa* (Linnaeus)

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In some fossil and Recent clupeoid fishes, there occur median scales on the dorsal surface, from the occiput to the origin of the dorsal fin. Such scales sometimes form "scutes," a term used also for similar structures along the ventral surface, typically from the pectoral girdle to the anal fin of many Recent clupeoids. Species having dorsal as well as ventral scutes have been called "double-armed herrings," in reference to the thickened, median ridge or "keel" of the scutes—a sort of dermal "armor." Double-armed herrings have hitherto been known to include a few Recent, marine species (perhaps as few as three) of the Australian genera *Hyperlophus* and *Potamalosia*, and the South American genus *Ethmidium*. Dorsal scutes have been said to occur also in several fossil clupeoids of the genera *Diplomystus*, *Gasteroclupea* and *Knighitia*. On occasion it has been suggested that the double-armed species be taxonomically separated from other clupeoids. The writer has discussed this problem elsewhere (1970), there finding reason to agree that the Recent double-armed species are more closely related not among themselves, but to species which lack dorsal scutes, as has generally been believed since Regan's (1917, 1922) revisions. Thus, *Hyperlophus* and *Potamalosia* have often been placed in one subfamily (Pellonulinae), and *Ethmidium* in a second subfamily (Alosinae), each subfamily with several other species lacking dorsal scutes. As here reported, the occurrence of dorsal scutes in *Clupanodon thrissa*, an undoubted gizzard shad of a third subfamily (Dorosomatinae) often recognized, makes the concept

of "double-armed herrings" even more untenable, taxonomically.

The dorsal scutes of *C. thrissa* (fig. 1B-F) generally number from 20 to 25, and extend from the occiput to near the dorsal-fin origin. They are flanked on each side by a row of larger, "predorsal" scales, which do not themselves overlap in the midline. Such non-overlapping scales occur not only in *C. thrissa*, and in its probably nearest relative (*Clupanodon punctatus*), but also in some and perhaps all of the New World gizzard shads (*Dorosoma* spp.). The remaining Indo-Pacific gizzard shads, excepting only *Anodontostoma chacunda* with median scales, have paired predorsal scales overlapping in the midline. The overlapping condition is probably primitive relative not only to the median scales of *Anodontostoma*, and to the non-overlapping scales of *Clupanodon* and *Dorosoma*, but also to the presence of dorsal scutes in *C. thrissa*.

During a systematic revision of the Indo-Pacific gizzard shads, the writer has found that dorsal scutes are easily used to identify specimens of *C. thrissa*, a species which has often been confused with other Indo-Pacific species of gizzard shads (*Clupanodon punctatus*, *Nematalosa come*, *N. japonica*, *N. nasus*). In Japanese literature, *C. thrissa* has often been confused with *C. punctatus*, a species readily separated from *C. thrissa* by the absence of dorsal scutes, and the presence of many rows of small dark spots on the sides of the body; *C. thrissa*, in contrast, has a single row of larger spots (fig. 1A). *C. thrissa* has been reported to occur in Japanese waters. But its distribution, so far as known to the

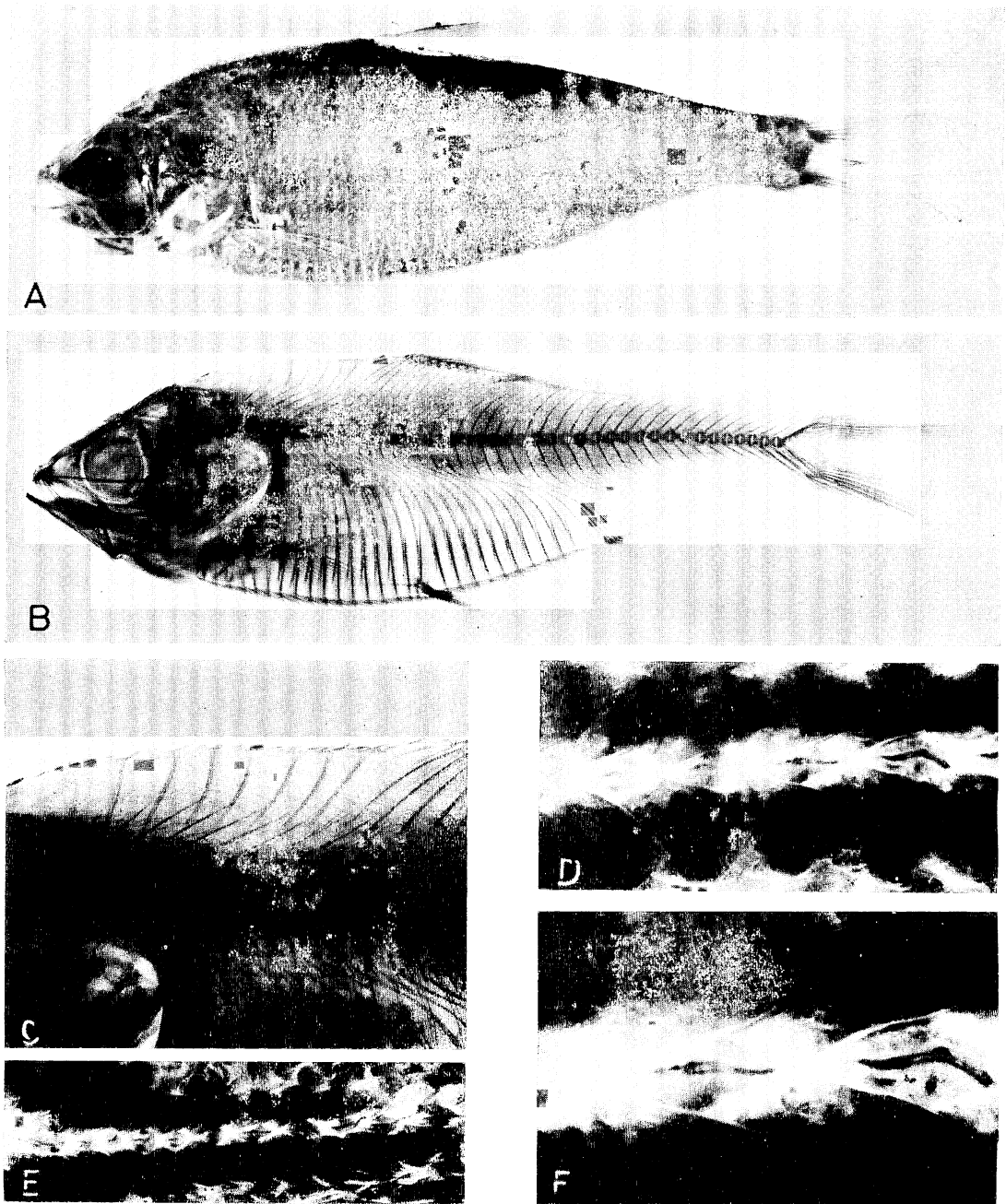


Fig. 1. *Clupanodon thrissa* (Linnaeus). A, preserved specimen, 129 mm standard length (U. S. Nat. Mus. no. 130606); B, roentgenograph of preserved specimen, 63 mm st. len. (Amer. Mus. Nat. Hist. no. 17738); C, enlarged detail of B; D-F, dorsal scutes and scales stained with alizarin, preserved specimen, 128 mm st. len. (Acad. Nat. Sci. Philadelphia, no. 52655-6), various magnifications.

writer from published descriptions and figures, and from specimens in American and British museums, is restricted to the coasts of China and Taiwan. However, *C. thrissa* might be expected to occur in Japanese waters, for all other Far East Asian gizzard shads (*Clupanodon punctatus*, *Nematalosa japonica*, *N. nasus*) known from the Asian mainland are known also from Japan.

**Key to the Far East Asian gizzard shads**  
(modified from Whitehead, 1962)

- I. Paired predorsal scales not overlapping; edge of third infraorbital bone nearly horizontal; suboperculum not rectangular; outer edge of dentary not flared. . . . .  
 . . . . . *Clupanodon* Lacépède, 1803.
  - A. Dorsal scutes present; outer demi-branches on first two gill arches only half length of inner demi-branches; branched dorsal rays 11–13 (usually 12 or 13); branched anal rays 20–26 (22–24); vertebrae 44 or 45, with first caudal the 11th–13th (12th or 13th) vertebra; prepelvic scutes 17–20 (18 or 19); postpelvic scutes 10–12 (10 or 11); total ventral scutes 27–31 (29 or 30); predorsal bones 7–9 (8). China, Taiwan . . . . .  
 . . . . . *Clupanodon thrissa* (Linnaeus, 1758).
  - B. Dorsal scutes absent; outer demi-branches on first two gill arches three-quarters of length of inner demi-branches; branched dorsal rays 12–15 (usually 13 or 14); branched anal rays 17–22 (18–21); vertebrae 47–51 (48–50), with first caudal the 14th–18th (15th–17th) vertebra; prepelvic scutes 19–22 (20 or 21); postpelvic scutes 12–15 (13–15); total ventral scutes 33–37 (34 or 35); predorsal bones 8–11 (9 or 10). China, Korea, Japan . . . . . *Clupanodon punctatus* ((Temminck and Schlegel, 1846).
- II. Paired, predorsal scales overlapping; edge of third infraorbital bone oblique or vertical; suboperculum rectangular; outer edge of dentary flared. . . *Nematalosa* Regan, 1917.

- A. Edge of third infraorbital bone oblique; branched dorsal rays 12–14 (usually 13 or 14); branched anal rays 18–21 (18 or 19); vertebrae 47–48, with first caudal the 15th–17th (15th or 16th) vertebra; prepelvic scutes 18–19 (19); postpelvic scutes 13 or 14; total ventral scutes 32 or 33; predorsal bones 9–10 (9). China, Japan. . . . .  
 . . . . . *Nematalosa japonica* Regan, 1917.
- B. Edge of third infraorbital bone vertical; branched dorsal rays 12–14 (usually 12 or 13); branched anal rays 17–21 (18–20); vertebrae 45–47 (45 or 46), with first caudal the 14th–16th vertebra; prepelvic scutes 18–20 (19); postpelvic scutes 10–12 (11); total ventral scutes 28–31 (30); predorsal bones 8–9 (9). India, Ceylon, Philippines, Thailand, China, Japan. . . . .  
 . . . . . *Nematalosa nasus* (Bloch, 1795).

**Notes:** Counts were made such that the figured specimen of *C. thrissa* (fig. 1B) has 45 vertebrae, the first caudal the 12th vertebra; 18 prepelvic scutes; 11 post-pelvic scutes; and 8 predorsal bones. The numbering of infraorbitals follows Nelson (1969). Infraorbital bones with horizontal, oblique and vertical edges are illustrated in Nelson (1969, fig. 3E), Whitehead (1962, figs. 4a and 4b), respectively. Rectangular and non-rectangular subopercular bones are illustrated in Whitehead (1962, figs. 3a–b).

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シナドロクイ *Clupanodon thrissa* (Linnaeus) の背部稜鱗  
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ニシン類中には背部正中線に沿い、後頭部から背鰭起部に亘って稜鱗をもっているものがある。絶滅したものでは *Diplomystus*, *Gasteroclupea* 及び *Knightia* の三属、現在のものではオーストラリアの *Hyperlophus* と *Potamalosa* に属する海産のものと南アメリカの *Ethmi-*

*dium* 属のもののがそれである。筆者はインド-太平洋産コノシロ類の分類の検討を行なっている中に、中国のコノシロ類の1種シナドロクイ *Clupanodon thrissa* (Linnaeus) がこの背部稜鱗を具えていることによって、他の数種のインド-太平洋産コノシロ類から容易に識別されることを知った。Whitehead(1962)の検索表に手を加えて、第頁に極東のコノシロ類の検索表を示す。

従来、シナドロクイは日本でも見られるというように報告されているが、査定に誤りがあったらしい。どうも中国の大陸部と台湾の沿岸だけに分布しているらしい。しかし、アジア大陸から知られているコノシロ類の他の種が、すべて日本にも出現するといわれていることから考えると、シナドロクイが日本に出現する可能性はある。かつて、背部と腹部に稜鱗をもつニシン類を double-armored herrings という一群に属するものと考えて、他のニシン類から分離して取扱ったことがあったが、Regan (1917, 1922) 以来広く認められているように、現生の “double-armored herrings” はまとまりのよい一群ではなく、むしろそのメンバー間の関係は疎遠で、背部稜鱗を欠くものと近縁である。このことは筆者(1970)が既に論じた所であるが、シナドロクイに背部稜鱗があることは “double-armored herrings” という一群を設けることの不当なことを示す証拠を更に加えたことになると思う。

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