

Sensory Papilla Patterns of the Cheek Lateralis System in the Gobiid Fishes *Acentrogobius* and *Glossogobius*, and Their Significance for the Classification of Gobioid Fishes

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ABSTRACT. The sensory papilla patterns of the cheek lateralis system are described and compared in various species of *Acentrogobius* and *Glossogobius*. Methods of studying and naming the papilla lines are discussed. Two basic patterns are recognized, a transverse pattern with several vertical papilla lines and two horizontal lines, and a longitudinal pattern with only horizontal lines. The significance of the orientation of the papillae within the lines and the development of ridges connecting the papillae in determining homologies is discussed. It is suggested that the transverse papilla pattern has developed independently in *Glossogobius circumspectus* and *Acentrogobius viridipunctatus* from structurally different longitudinal patterns.

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Almost all gobioid fishes have lateralis system sensory papillae or free neuromasts on the head and body outside the head canals. The papillae are developed as small bumps, arising from the skin, sometimes on large flaps, arranged in characteristic lines or rows. Their importance in the classification of gobioid fishes has long been recognized by European and Japanese workers (Sanzo, 1911; Aurich, 1938; Miller & Wongratana, 1979; Akihito & Meguro, 1975; Takagi, 1957).

Generally two distinctive patterns have been recognized (Aurich, 1938). In the transverse pattern the cheek and preopercular papillae are developed in two horizontal and four or more vertical lines (Fig. 1). In the longitudinal pattern the papillae are arranged only in more or less horizontal lines (Fig. 2). Considerable variation occurs in these patterns, but by examining the arrangement of the lines and the orientation of the papillae within these lines, it is possible to group all gobiids within one or the other pattern type, with the exception of species with a very reduced number of papillae.

Some workers have simply illustrated the papilla patterns (Hoese & Allen, 1977; Aurich, 1938; Takagi, 1957), but others have labelled the various lines with numerical or alphabetical characters. At present no standardization exists. Akihito & Meguro (1975, 1977, 1980) numbered all the papilla lines, beginning at the snout, without discriminating between the vertical and

horizontal lines. This system has considerable internal consistency when dealing with species in the same genus. It has a disadvantage in comparisons of genera with different patterns, since the same lines in different genera often have different numbers. European workers (Miller, 1974; Miller & Wongratana, 1979; Iljin, 1930) have generally followed the nomenclature of Sanzo (1911). The work of Sanzo was the first detailed study of sensory papillae in gobioid fishes and is still a classic work. Sanzo numbered the vertical rows under the eye, beginning below the front of the eye, lettered the horizontal rows under the eye from a to d, and labelled other papilla rows with alphabetic characters, often using a prime mark to indicate branches of the various rows. This system offers the greatest potential for determining phylogeny. However, there are several disadvantages. The system was based on European gobiids and is often not easily applicable to the vast mosaic of patterns found among other gobiid fishes. For example, many Indo-Pacific genera have more than four horizontal cheek lines (a to d of Sanzo). Also, determining homologies in the various lines has often proved difficult.

Several questions exist regarding the transverse and longitudinal papilla patterns. It is not known which pattern, if either, is primitive, or whether either pattern is monophyletic. Since both patterns occur across conventional taxonomic groupings, one or both patterns would appear to be polyphyletic. However, it could be