主論文の要約

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学 位 論 文 題 目
Phylogenetic systematics of the family Hoplichthyidae
(Teleostei: Scorpaeniformes)
（ハリゴチ科魚類の系統分類学的研究）

Introduction

The fishes of the family Hoplichthyidae inhabit the continental shelves and slopes of the Pacific and Indian oceans in the temperate to tropical zones, and are characterized morphologically by an extremely depressed head, the dorsal surfaces of the head and body covered with many spines and serrated ridges, and lowest three to five pectoral-fin rays free. Matsubara and Ochiai (1950a, b, c) taxonomically revised this family. They recognized 10 valid species among 14 nominal species at that time and described five Japanese hoplichthyid species, based on the specimens of only four Japanese species including two name-bearing types. After their research, a comprehensive taxonomic revision of this family has not been made, although unidentified and new species of this family have been reported by several researchers. The phylogeny of Hoplichthyidae, on the other hand, have been studied by several researchers. Matsubara and Ochiai (1950a, b) inferred the phylogenetic relationships of the 10 species and recognized a single genus in this family, although the materials for the inference were based on the restricted anatomical morphologies of only three species. Imamura (1996) and Kawai (2006) also examined the osteology and myology of Hoplichthyidae and inferred interrelationships of this family. However, they examined only three hoplichthyid species, and did not describe the anatomical morphologies of Hoplichthyidae in detail.

Therefore, the purposes of the present study are: 1) to revise Hoplichthyidae taxonomically and describe its external morphology; 2) to describe the osteological and myological morphologies of this family in detail; 3) to reconstruct the phylogenetic relationships of hoplichthyids based on the morphological characters; and 4) to propose the classification of the family Hoplichthyidae based on the reconstructed phylogenetic relationships. Adaptive characters to the benthic lifestyle of

Hoplichthyidae are also discussed in this study.

Results

[Reconstruction of the phylogenetic relationships of Hoplichthyidae] The phylogenetic relationships of Hoplichthyidae were inferred based on the osteological, myological and external morphologies of six hoplichthyid species as ingroups and three sebastid species as outgroups. As the result, 56 synapomorphies, which were commonly observed in Hoplichthyidae but not in outgroups, were recognized, and therefore, Hoplichthyidae was considered to be a distinct monophyletic group supported by these synapomorphies. In addition, the interrelationships of this family were reconstructed based on characters in 22 transformation series. As the result of the analysis, a single strict consensus tree of two equally parsimonious cladograms (tree length 37, consistency index 0.81 and rescaled consistency index 0.73) was obtained. Clade A of the tree, including all hoplichthyid species, was supported by six synapomorphies, and divided into the clades B and C. Clade B, including five hoplichthyid species, was supported by 11 synapomorphies. Clade C, including only *H. haswelli*, was supported by nine apomorphic characters including six autapomorphies. Although *Rhinhoplichthys*, established based on *H. haswelli*, has been regarded as a junior synonym of *Hoplichthys*, it was recognized as valid genus in the present study, because clade C including *H. haswelli* was distinctly separated from clade B including *Hoplichthys*.

[Taxonomic revision of Hoplichthyidae] Hoplichthyidae was taxonomically revised based on the examination of about 700 hoplichthyid specimens including 15 type specimens of 16 nominal species. As the result, two genera and 16 species including four undescribed and one unidentified species were recognized. Major new findings are summarized below.

Hoplichthys platophrys, which was known from Hawaii and had been regarded as valid, was considered to be a junior synonym of *H. citrinus*. In addition, *H. pectoralis* and *H. filamentosus*, which were known from the Philippines and Japan to Australia, respectively, and had been regarded as valid, were considered to be junior synonyms of *H. fasciatus*. On the other hand, *H. acanthopleurus* and *H. gregoryi*, which had been regarded as junior synonyms of *H. gilberti*, were

recognized as valid in this study. *Hoplichthys prosemion* and *H. smithi*, which had been regarded as junior synonyms of *H. regani* and *H. gilberti*, respectively, were considered in the present study to be junior synonyms of *H. gregoryi* and *H. regani*, respectively.

Hoplichthys sp. 1, *Hoplichthys* sp. 2 and *Hoplichthys* sp. 3, collected from Australia and New Caledonia, New Caledonia and New Zealand, and Australia, respectively, were distinguished from all valid species of *Hoplichthys* and considered to be undescribed species. *Rhinhoplichthys* sp., collected from Australia, was separated from *R. haswelli*, the sole species of the genus, and also considered to be an undescribed species.

[Proposed new classification of Hoplichthyidae]

Family Hoplichthyidae

Genus *Hoplichthys* Cuvier, 1829

H. langsdorfii Cuvier, 1829

H. citrinus Gilbert, 1905

H. gilberti Jordan and Richardson, 1908

H. regani Jordan, 1908

H. acanthopleurus Regan, 1908

H. ogilbyi McCulloch, 1914

H. fasciatus Matsubara, 1937

H. gregoryi (Fowler, 1938)

H. mimaseanus Nagano, Endo and Yabe, 2013

H. imamurai Nagano, McGrouther and Yabe, 2013

Hoplichthys sp. 1 (undescribed species)

Hoplichthys sp. 2 (undescribed species)

Hoplichthys sp. 3 (undescribed species)

Hoplichthys sp. 4 (unidentified species)

Genus *Rhinhoplichthys* Fowler, 1938

R. haswelli (McCulloch, 1907)

Rhinhoplichthys sp. (undescribed species)

[General discussion] The morphological specificity and its adaptation for the benthic lifestyle of Hoplichthyidae were discussed with comparisons with its related taxa, Platycephalidae, Triglidae and Peristediidae. As the result, the common ancestor of these four families was considered to have been already adapted to the benthic lifestyle by possessing the flat ventral surfaces of the head and body, and lacking the anal-fin spines. In addition, it was assumed that the common ancestor of Hoplichthyidae, Peristediidae and Triglidae was epibenthic fishes, not burying in the sea bottom, and had been adapted to the benthic lifestyle in the different way from that of Platycephalidae which buries in the sea bottom, such as possessing the free pectoral-fin rays and the armored head. On the other hand, Hoplichthyidae was considered to have been independently adapted to the benthic lifestyle in the different way from those of Peristediidae and Triglidae, by acquisition of the characters such as the free pectoral-fin rays used for supporting the body, and the basihyal articulating with the ventral hypohyal. In addition, the large basihyal and the independent ascending process of the premaxilla, which were commonly observed in Hoplichthyidae and Platycephalidae, were considered to be the homoplastic characters independently acquired in these families. Accordingly, it was concluded in the present study that the family Hoplichthyidae is a unique group among Scorpaeniformes, being well adapted to the benthic lifestyle by acquisition of the characters including those sharing with other taxa, those homoplastic with them, and those solely evolved in the family.