



Taxonomy of the Superfamilies Congiopodoidea Gill, 1889 and Synanceiidea Swainson, 1839 (Pisces: Perciformes)

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Abstract

The genus *Congiopodus* includes 6 species, it is recommended that the species *Congiopodus kieneri* be considered valid. The genus belongs to the monotypic family Congiopodidae. Its sister family *Zanclorhynchidae* includes the monotypic genus *Alertichthys* and *Zanclorhynchus* with two species. Both families, in turn, form the superfamily Congiopodoidea. Its sister superfamily Synanceiidea is recommended to be considered as follows: Synanceiidae, Tetrarogidae, Choridactylidae, Minoidae, Aploactinidae, Gnathanacanthidae and Pataecidae. Both superfamilies belong to the suborder Scorpaenoidei of the order Perciformes. The position of the family Apistidae needs further clarification. Also it is needed more studies to clarify the position of genus *Erosa* in the family Synanceiidae. The parameters used in the previous article are given, the resulting cladogram is described.

Keywords: Congiopodoidea; Perciformes; Synanceiidea; Scorpaenoidei; Taxonomy

Introduction

The position and composition of the superfamily Congiopodoidea have been revised many times and continue to be debated to this day [1]. Until recently, the group was considered as a family. The fishes of the discussed group live in the Southern Hemisphere, inhabit the shelves of South America, Africa, Australia and New Zealand in tropical to temperate waters (genus *Congiopodus* Perry, 1811), *Alertichthys blacki* Moreland, 1960 is endemic to the New Zealand Plateau, the genus *Zanclorhynchus* Gunther, 1880 inhabits the shelves of islands and uplifts within the Circum-Antarctic Current of the Southern Ocean [2-4].

The superfamily Congiopodoidea comprises the monotypic family Congiopodidae Gill, 1889 and *Zanclorhynchidae* Andriashev, 1993 with two genera, *Zanclorhynchus* and *Alertichthys* Moreland, 1960. The genus *Congiopodus* comprises 6 species: *C. torvus* (Gronow, 1772), *C. peruvianus* (Cuvier, 1829), *C. spinifer* (Smith, 1839), *C.*

leucopaecilus (Richardson, 1846), *C. kieneri* (Sauvage, 1878), and *C. coriaceus* Paulin et Moreland, 1979 [4-6]. *Congiopodus kieneri* is now often reduced to a synonym, although in 1971 Hureau [7] unconditionally confirmed the validity of the species. But this work was published in French and was ignored. Thus, in the well-known Eschmeyer's Catalog of Fishes, *C. kieneri* is synonymized with *C. peruvianus* without reference to supporting works [4], although, on the contrary, in this catalog are works where *C. kieneri* is indicated as valid [5,8]. Moreover, for example, Moland JM [9] argued that only the *C. peruvianus* inhabits the waters off South America, but almost 20 years later, in collaboration with Paulin [5], he changed his mind and mentioned *C. kieneri* as valid species. A clear diagnosis of *C. kieneri* was also made by Mandritsa SA [10]. In this paper, the author follows Hureau and accepts the validity of *C. kieneri*.

The family *Zanclorhynchidae* includes the monotypic genus *Alertichthys* Moreland, 1960 and *Zanclorhynchus* Gunther, 1880 with two species *Z. spinifer* Günther, 1880

and *Z. chereshevi* Balyshkin, et al. Zhukov M [11]. In turn, *Z. spinifer* includes 4 subspecies: *Z. s. spinifer* Günther, 1880, *Z. s. heracleus* Zhukov et Balushkin, 2018, *Z. s. armatus* Zhukov, 2019 and *Z. s. macquariensis* Zhukov M [3,12].

Not so long ago, the poorly studied genus *Perryena* Whitley, 1940 was traditionally included in the family Congiopodidae, usually as incertae sedis [13-16]. Later, it was assigned to Neocentropogoninae Mandrytsa, 2001 in the family Tetrarogidae Smith, 1949 [10,15]. Now the genus *Perryena* with a single species *Perryena leucometopon* (Waite, 1922) is separated into a family Perryenidae Honma, Imamura et Kawai, 2013, a sister clade to Tetrarogidae + Synanceiidae Swainson, 1839 + Aploactinidae Jordan et Starks, 1904 + Congiopodidae + Gnathanacanthidae Gill, 1892 + Pataecidae Gill, 1872, where the basal group is family Apistidae Gill, 1859 [17]. Thus, *Perryena* is not closely related to Congiopodidae.

Initially, the genus *Zanclorhynchus* was assigned to the family Scorpaenidae Risso, 1827 [18,19], but since 1937 it has been assigned to the family Congiopodidae [20]. The monophyly of this group has been shown by a number of authors [10,16,21] and is now beyond doubt. Japanese researchers, who devoted many years to the study of scorpionfishes, attributed Congiopodidae s.l. to superfamily Scorpaenoidea sensu Imamura, 2004 with Sebastidae Kaup, 1873, Sebastobidae Imamura, 2004, Scorpaenidae, Apistidae, Tetrarogidae, Synanceiidae, Aploactinidae, Gnathanacanthidae, Pataecidae, Caracanthidae Gill, 1885, Eschmeyeridae Mandrytsa, 2001, Neosebastidae Matsubara, 1943, Plectrogeniidae Fowler, 1938, Parabembridge Jordan et Hubbs, 1925, Bembridge Kaup, 1873, Triglide Rafinesque, 1815, Peristediidae Jordan et Gilbert, 1883, Hoplichthyidae Kaup, 1873, and Platycephalidae Swainson, 1839 [22]. They considered the position of this superfamily in the suborder

Scorpaenoidei of the order Scorpaeniformes, but now the rank of the order has been reduced to the rank of a suborder in the order Perciformes, and the rank of Congiopodidae s.l. raised to a superfamily, which requires a revision of the composition of Scorpaenoidea sensu Imamura, 2004, but does not cancel the relationship.

Genetic studies show a different picture from the morphological described above. The studies of Smith, et al. [23] deny the monophyly of the group Congiopodidae + Zanclorhynchidae, for example. Other works confirm their monophyly, but Congiopodoidea fishes are placed on the phylogenetic tree at a considerable distance from Scorpaenidae, closer to the root of all scorpion fish [24,25]. This position, in turn, is consistent with other morphological and taxonomic studies, according to the results of which it is proposed to raise the rank of Congiopodoidea to the level of a suborder [10,26-28].

The purpose of this work is to clarify the above constructions of relationships. It also became necessary to describe all parameters used for cladistic analysis in previous paper as well as to present full character matrix and to describe the resulting cladogram [1].

Materials and Methods

Phylogenetic analysis was carried out using the ASADO 1.61 and PAUP 4.0a169 software packages, the Heuristic algorithm was used; out of 77 characters, 9 are uninformative. The tree is rooted, the outgroups are *Sebastes*, *Scorpaena* and *Scorpaenodes*. All parameters were given equal weight, the values of the parameters were ordered, except Nos. 10, 19, 45. The value of all parameters follows Voskoboinikova, et al. [1] except character 24, mostly follows Imamura H [21] but their numbering may differ.

Parameters Used for Cladistic Analysis

| | 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31-35 | 36-40 | 41-45 | 46-50 | 51-55 | 56-60 | 61-65 | 66-70 | 71-75 | 76-77 |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Sebastes</i> | 00000 | 00100 | 00000 | 00000 | 00020 | 00000 | 00000 | 00000 | 00000 | 01000 | 00000 | 00000 | 00000 | 00100 | 00000 | 00 |
| <i>Scorpaena</i> | 00000 | 01210 | 00000 | 00000 | 00020 | 00000 | 10000 | 00000 | 00010 | 01000 | 00000 | 00000 | 00100 | 00100 | 00000 | 00 |
| <i>Scorpaenoides</i> | 00000 | 00210 | 00000 | 00000 | 00020 | 00001 | 00000 | 00000 | 00010 | 00000 | 00000 | 00000 | 00100 | 00000 | 00000 | 00 |
| <i>Apistus</i> | 00000 | 01211 | 00100 | 00020 | 00020 | 01000 | 01000 | 00000 | 00010 | 01010 | 00000 | 00000 | 00100 | 00101 | 00000 | 00 |
| <i>Tetraroge</i> | 00230 | 01211 | 00000 | 00000 | 00100 | 00000 | 01100 | 00001 | 01011 | 01000 | 00100 | 00000 | 21131 | 01111 | ?0000 | 00 |
| <i>Synanceia</i> | 00230 | 01212 | 00000 | 00020 | 00021 | 00001 | 01100 | 00010 | 01112 | 01000 | 00100 | 00000 | 00131 | 01111 | 00000 | 10 |
| <i>Erosa</i> | 00230 | 01211 | 00000 | 00000 | 10021 | 00001 | 01100 | 00001 | 0111? | 01000 | 00010 | 00000 | 00101 | 01111 | 10000 | 10 |
| <i>Inimicus</i> | 00230 | 01211 | 00000 | 00000 | 00021 | 00001 | 01100 | 00101 | 01012 | 01020 | 00100 | 00010 | 20131 | 01101 | 10101 | 10 |
| <i>Choridactylus</i> | 00230 | 01211 | 00000 | 20000 | 00021 | 00001 | 01100 | 10101 | 01110 | 21030 | 00100 | 00010 | 20131 | 01101 | 10000 | 00 |
| <i>Minous</i> | 00230 | 01211 | 00100 | 10020 | 10021 | 00001 | 01100 | 00101 | 01112 | 11011 | 00001 | 10011 | 20131 | 01101 | 10100 | 01 |
| <i>Aploactis</i> | 00230 | 01212 | 00000 | 00021 | 00021 | 00001 | 01000 | 01101 | 0?212 | 01001 | 00121 | 01011 | 00131 | 10101 | 10000 | 01 |

| | | | | | | | | | | | | | | | | |
|------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| <i>Erisphex</i> | 00230 | 01211 | 00000 | 00001 | 00121 | 00001 | 01000 | 01101 | 01112 | 01001 | 01121 | 01011 | 21121 | 10111 | 10000 | 01 |
| <i>Congiopodus</i> | 01121 | 01220 | 00111 | 21001 | 11101 | 00111 | 01010 | 12001 | 00012 | 10101 | 01100 | 11010 | 00101 | 01111 | 11101 | 10 |
| <i>Alertichthys</i> | 00110 | 11221 | 21111 | 21101 | 01121 | 10011 | 01011 | 01101 | 10012 | 11001 | 11201 | 11001 | 00101 | 10111 | 11101 | 11 |
| <i>Zanclorhynchus</i> | 00110 | 11221 | 11111 | 21001 | 01111 | 10011 | 01011 | 01101 | 10012 | 11001 | 11201 | 11111 | 10101 | 10111 | 11100 | 11 |
| <i>Gnathanacanthus</i> | 10230 | 01211 | 00000 | 20010 | 00001 | 00001 | 0101? | 10001 | 01111 | 01001 | 00001 | 00001 | 20111 | 00101 | 11011 | 01 |
| <i>Pataecus</i> | 10230 | 00012 | 00000 | 00121 | 00001 | 00001 | 01010 | 11001 | 01111 | 01101 | ?023? | 01201 | 20131 | 01111 | 11111 | 21 |

Table 1: Character matrix of superfamilies Synanceiidea and Congiopoidea.

- The first three infraorbitals: firmly connected (0), separated (1). The first three infraorbitalia are fused in all the studied groups (0), except for *Gnathanacanthus* and *Pataecus*, in which the value is 1
- Vertical ridge on parietale: absent (0), present (1). Only *Congiopodus* (1) has a vertical ridges, while the rest have a value of 0.
- Position of the two anteriormost pterygiophores of the dorsal fin: between the second and third neural spines (0), between the first and second (1), before the first (2), ordered as 0–1–2. The position of the first two proximal pterygiophores between the second and third neural processes in the outer groups *Sebastes*, *Scorpaena*, and *Scorpaenoides*, as well as *Apistus* (0); between the first and second - in *Congiopodus*, *Alertichthys*, and *Zanclorhynchus* (1); in the rest, the first pterygiophores are shifted forward of the first spinous neural process (2).
- The number of first pterygiophores of the dorsal fin between the first and second neural spinous processes: absent and located behind (0), two (1), five or more (2), absent and located in front (3), ordered as 0–1–2–3. The first pterygiophores are located behind the second vertebra in the outer groups *Sebastes*, *Scorpaena*, and *Scorpaenoides*, as well as *Apistus* (0); located between the first and second vertebrae in *Zanclorhynchus* and *Alertichthys* (1); five first pterygiophores in *Congiopodus leucopaecilus*, *C. kieneri*, *C. peruvianus* and six in *C. spinifer* and *C. torvus* (2); the first pterygiophores between the first and second vertebrae are absent, shifted forward in other genera (3).
- Connection of supraoccipitale and frontale: present (0), absent (1). Connected in *Congiopodus* (0), in other genera they are separated (1).
- The position of the supraoccipitale: on the posterior or on the posterior and upper surfaces of the cranium (0), only on the upper surface (1). The superior position was noted in *Zanclorhynchus* and *Alertichthys* (1); the rest have a value of 0.
- The position of the pore on the third infraorbital: on the edge of the bone (lower or posterior) (0), below the upper or in front of the posterior edge (1). The extreme position of the pore noted only in *Sebastes*, *Scorpaenodes* and *Pataecus* (0); the rest have a value of 1.
- Suborbital stay on the third infraorbital bone: absent (0), its posterior edge is pointed or bluntly rounded and loosely articulated with the praeoperculum (1), the posterior margin is wide and firmly connected to the praeoperculum (2), ordered as 0–1–2. The stay is absent in *Pataecus* (0), the articulation with the praeoperculum is weak in *Sebastes* (1), in all the rest it is firmly attached (2).
- The fourth and fifth infraorbitals: both are present (0), the fourth is absent (1), both are absent (2), ordered as 0–1–2. The fourth and fifth infraorbitals found in *Sebastes* (0), both are absent in *Zanclorhynchus*, *Alertichthys* and *Congiopodus* (2); the rest have a value of 1.
- Dermosphenoticum: attached to sphenoticum (0), fused with sphenoticum (1), absent (2), unordered. Relatively weak connection of the sixth infraorbital and sphenoticum is noted in the outgroup *Sebastes*, *Scorpaena* and *Scorpaenodes*, and in *Congiopodus* (0); dermosphenoticum is absent in *Synanceia*, *Aploactis*, and *Pataecus* (2); the rest have a value of 1.
- Infraorbital sensory canal on the third infraorbitale: continuous (0), rupture occurs (1), rupture is permanent (2), ordered as 0–1–2. The gap occurs as an intraspecific variation in *Zanclorhynchus* (1); always present in *Alertichthys* (2); the rest have a value of 0.
- Infraorbital sensory canal below dermosphenoticum: continuous (0), not continuous (1). Rupture below dermosphenoticum found in *Zanclorhynchus* and *Alertichthys*, the rest have a value of 0.
- Tubercles on the neurocranium: absent (0), present (1). Tubercles are found in *Apistus*, *Minous*, *Zanclorhynchus*, *Alertichthys*, and *Congiopodus* (1), the rest have a value of 0.
- Nasal and neurocranium: loosely attached (0), firmly attached (1). Character 14-1 has been noted in *Congiopodus*, *Zanclorhynchus*, and *Alertichthys*, the rest have a value of 0.
- Medial connection of epiotica: absent (0), present (1). Ossa epiotica join medially at *Congiopodus*, *Zanclorhynchus*, and *Alertichthys*; the rest have a value of 0.
- Teeth on the vomer: located in one group (0), grouped

- in two spots (1), absent (2), unordered. Two groups of teeth on the vomer are present in *Minous* (1); teeth absent in *Choridactylus*, *Gnathanacanthus*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (2); the rest have a value of 0.
17. First vertebra: separated (0), fused with the posterior wall of the neurocranium (1). Fusion of the first vertebra with the neurocranium was noted in *Congiopodus*, *Zanclorhynchus*, and *Alertichthys*, the rest have a value of 0.
 18. Parasphenoideum and pterosphenoideum: not connected (0), connected (1). Connection found in *Alertichthys* and *Pataecus* (1), the rest have a value of 0.
 19. Basisphenoideum: the posterior edge of the bone is attached to the neurocranium (0), the posterior edge of the bone is free (1), absent (2), unordered. Character 19-1 found in *Gnathanacanthus*, 19-2 in *Apistus*, *Synanceia*, *Minous*, *Aploactis*, and *Pataecus*, the rest have a value of 0.
 20. Prooticum and intercalare: connected (0), separated (1). Separated in *Aploactis*, *Erisphex*, *Pataecus*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1); the rest have a value of 0.
 21. Intercalare and posttemporale: connected by ligament (0), fused (1). Fused bones have been noted in *Erosa*, *Minous*, and *Congiopodus* (1), the rest have a value of 0.
 22. Posttemporale: loosely attached to neurocranium (0), firmly attached (1). Firm connection was noted in *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1), the rest have a value of 0.
 23. Skinny sensory canal between pteroticum and praeoperculum: present (0), absent (1). Canal is absent in *Tetraroge*, *Erisphex*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1), the rest have a value of 0.
 24. Parietal spine: absent (0), not always developed (1), present (2), ordered as 0–1–2. The spine is developed to varying degrees in *Zanclorhynchus spinifer*, but is completely absent in *Z. chereshevi* (1), spine absent in *Tetraroge*, *Congiopodus*, *Gnathanacanthus*, and *Pataecus* (0), the rest have a value of 2.
 25. Baudelot's ligament: attached to the basioccipitale (0), attached to the first vertebra (1). Originates from the basioccipitale in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, and *Tetraroge* (0), the rest have a value of 1.
 26. Associated with sensory canals spines on frontale, pteroticum and posttemporale: absent (0), present (1). Spines are present in *Zanclorhynchus* and *Alertichthys* (1); the rest have a value of 0.
 27. Notch on the os praemaxillare between the ascending process and the main part of the bone: present (0), absent (1). The notch absent in *Apistus* (1), the rest have a value of 0.
 28. Posteroventral and ventromedial ridges on cleithrum: absent (0), present (1). Character 28-1 found only in *Congiopodus*; the rest have a value of 0.
 29. Ossa palatinum and ectopterigoideum: connected (0), separated (1). Bones separated in *Congiopodus*, *Alertichthys*, and *Zanclorhynchus* (1), the rest have a value of 0.
 30. Teeth on palatinum: present (0), absent (1). Teeth are present in *Sebastes*, *Scorpaena*, *Apistus*, and *Tetraroge* (0), the rest have a value of 1.
 31. Ossa ectopterigoideum and metapterigoideum: separated (0), connected medially (1). The bones are medially connected in *Scorpaena* (1), the rest have a value of 0.
 32. Metapterygoid lamina: present (0), absent (1). Character 32-0 in the outgroup *Sebastes*, *Scorpaena*, and *Scorpaenodes*, the rest have a value of 1.
 33. Distance between os metapterigoideum and os hyomandibulare: significant (0), reduced or absent (1). Bones are widely spaced in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, *Aploactis*, *Erisphex*, *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (0), the rest have a value of 1.
 34. Posterior edge of preoperculum: with spine(s) (0), smooth (1). A smooth edge is found in *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (1), the rest have a value of 0.
 35. Precoracoid foramen: perforating (0); opens on the inner surface of the cleithrum (1). Character 35-1 found in *Alertichthys* and *Zanclorhynchus* (1), value for *Gnathanacanthus* not assigned; others have a value of 0.
 36. Os basihyale: ossified (0), absent (1). The bone is absent in *Choridactylus*, *Congiopodus*, *Gnathanacanthus*, and *Pataecus* (1), the rest have a value of 0.
 37. Branchiostegal rays: seven (0), six (1), five (2), ordered as 0–1–2. Six rays have been noted in *Aploactis*, *Erisphex*, *Zanclorhynchus*, *Alertichthys*, and *Pataecus* (1), five rays in *Congiopodus* (2), the rest have a value of 0.
 38. Interarcular cartilage: present (0), absent (1). Cartilage is absent in *Inimicus*, *Choridactylus*, *Minous*, *Aploactis*, *Erisphex*, *Zanclorhynchus*, and *Alertichthys* (1), the rest have a value of 0.
 39. Tooth plate on the second epibranchial: present (0), absent (1). Second epibranchiale without tooth plate in *Synanceia* (1); the rest have a value of 0.
 40. Tooth plate on the third epibranchial: present (0), absent (1). A tooth plate are noted in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, and *Synanceia* (0); the rest have a value of 1.
 41. First pharyngobranchiale: present (0), absent (1). The first pharyngobranchial is absent in *Zanclorhynchus* and *Alertichthys* (1); the rest have a value of 0.
 42. Tooth plate on the second pharyngobranchiale: present (0), absent (1). Tooth plate is noted in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, *Congiopodus*, *Alertichthys*, and *Zanclorhynchus* (0), in *Aploactis* fused

- pharyngobranchials from the second to the fourth with one large spot of teeth of unclear position, therefore the character value is not assigned, the rest have a value of 1.
43. From the second to the fourth ossa pharyngobranchialia: separated (0), the third and fourth are connected (1), all three are connected (2), ordered as 0-1-2. Three pharyngobranchials fused in *Aploactis* (2), the third and fourth fused in *Synanceia*, *Erosa*, *Choridactylus*, *Minous*, *Erisphex*, *Gnathanacanthus*, and *Pataecus* (1), the rest have a value of 0.
 44. Extrascapulare mediale: present (0), absent (1). Medial extrascapular bone is present in *Sebastes* (0); the rest have a value of 0.
 45. Lateral extrascapular: a single element with three pores (0); with two elements - horizontal and vertical tubes, each with two pores (1); a single element with two pores (2), unordered. Os extrascapulare laterale with three pores is noted in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, and *Choridactylus* (0); no value assigned to *Erosa*; the bone consists of two elements in *Tetraroge*, *Gnathanacanthus*, and *Pataecus* (1); the rest have a value of 2.
 46. Cleithrum and coracoid: without ventromedial connection (0), with partial ventromedial connection (1), tightly connected ventromedially (2), ordered as 0-1-2. Dense ventromedial junction of ossa cleithrum and coracoideum is found in *Choridactylus* (2), partly connected in *Minous*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1), the rest have a value of 0.
 47. Uppermost actinost and scapula: separated (0), fused (1). Character 47-0 in *Scorpaenodes* and *Congiopodus* (0); the rest have a value of 1.
 48. Postcleithrum: absent (0), present (1). The bone is noted in *Congiopodus* and *Pataecus* (1); the rest have a value of 0.
 49. Number of free lower rays of the pectoral fin: absent (0), one (1), two (2), three or more (3), ordered as 0-1-2-3. One free lower ray noted in *Apistus* and *Minous* (1), two rays in *Inimicus* (2), three in *Choridactylus* (3), the rest have no free rays (0).
 50. Branched rays of the pectoral fin: present (0), absent (1). The rays of the pectoral fin do not branch in *Minous*, *Aploactis*, *Erisphex*, *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (1), the rest have a value of 0.
 51. Notch between the anterior processes of the pelvic bones: absent (0), present (1). The notch is found in *Zanclorhynchus* and *Alertichthys* (1); the value in *Pataecus* is not assigned; the rest have a value of 0.
 52. Praeoperculo-mandibular canal (CPM) and temporal canal (CT) of the sensory system: connected (0), separated (1). There is no connection between CPM and CT in *Erisphex*, *Congiopodus*, *Alertichthys*, and *Zanclorhynchus* (1); the rest have a value of 0.
 53. The supratemporal commissure (CST) of sensory system: continuous (0), interrupted (1), interrupted three times (2), ordered as 0-1-2. CST is continuous in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, *Erosa*, *Minous*, and *Gnathanacanthus* (0); interrupted once in *Tetraroge*, *Synanceia*, *Inimicus*, *Choridactylus*, *Aploactis*, *Erisphex*, *Congiopodus* (1); the commissure interrupted three times in *Pataecus*, *Alertichthys*, and *Zanclorhynchus* (2).
 54. Number of rays of the ventral fin: six (0), five (1), four (2), absent (3), ordered as 0-1-2-3. Five rays of the ventral fin are noted in *Erosa* (1); four in *Aploactis* and *Erisphex* (2); no rays in *Pataecus* (3); the rest have a value of 0.
 55. Branched rays of the ventral fin: present (0), absent (1). The branched rays are absent in *Minous*, *Aploactis*, *Erisphex*, *Alertichthys*, *Zanclorhynchus*, and *Gnathanacanthus* (1); due to the absence of rays in *Pataecus*, the value of this character is not assigned; the rest have a value of 0.
 56. Number of spines on the first pterygiophore of the dorsal fin: two (0), one (1). One spine is noted in *Minous*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1), the rest have a value of 0.
 57. Spine on the first pterygiophore of the anal fin: present (0), absent (1). Character 57-1 in *Aploactis*, *Erisphex*, *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, and *Pataecus*, the rest have a value of 0.
 58. Second ray on first pterygiophore of anal fin: present (0), sometimes present (1); absent (2), ordered as 0-1-2. The second element on the first pterygiophore as an intraspecific variability is often absent in *Zanclorhynchus* (1), absent in *Pataecus* (2); the rest have a value of 0.
 59. Ray on the second pterygiophore of the anal fin: spine (0), soft (1). A soft ray was noted in *Inimicus*, *Choridactylus*, *Minous*, *Aploactis*, *Congiopodus*, and *Zanclorhynchus* (1), the rest have a value of 0.
 60. Branched rays of the dorsal and anal fins: present (0), absent (1). The rays in the anal and dorsal fins are not branched in *Minous*, *Aploactis*, *Erisphex*, *Alertichthys*, and *Zanclorhynchus* (1), the rest have a value of 0.
 61. Number of rays on the last pterygiophores of the dorsal and anal fins: two (0), usually two (1); one (2), ordered as 0-1-2. The ray on the last pterygiophore of the dorsal and/or anal fins is sometimes single as an intraspecific variability in *Zanclorhynchus* (1); always one ray in *Tetraroge*, *Inimicus*, *Choridactylus*, *Minous*, *Gnathanacanthus*, and *Pataecus* (2); the rest have a value of 0.
 62. First pterygiophore of dorsal fin: free (0), fused with neurocranium (1). It is fused with the neurocranium in *Tetraroge* and *Erisphex* (1), the rest have a value of 0.
 63. Supraneural: present (0); absent (1). One supraneural was noted in *Sebastes* (0); the rest have a value of 1.
 64. Stays of the dorsal and anal fins: free and ossified (0),

- fused with the previous pterygiophore (1), free cartilage (2), absent (3), ordered as 0–1–2–3. The ossified stay is separated from the previous pterygiophore in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, *Erosa*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (0); ossified and firmly attached to the previous pterygiophore in *Gnathanacanthus* (1); unossified in *Erisphex* (2); absent in *Tetraroge*, *Synanceia*, *Inimicus*, *Choridactylus*, *Minous*, *Aploactis*, and *Pataecus* (3).
65. Tubular scales of the lateral line: absent (0), present (1). Lateral line with perforated scales found in *Sebastes*, *Scorpaena*, *Scorpaenodes*, and *Apistus* (0); in other genera, the lateral line is represented by tubular elements (1).
66. Spines on the scales of the lateral line: absent (0), present (1). Spines are noted in *Aploactis*, *Erisphex*, *Zanclorhynchus*, and *Alertichthys* (1); the rest have a value of 0.
67. Scales on the body: present (0), absent (1). Body scales absent in *Tetraroge*, *Synanceia*, *Erosa*, *Inimicus*, *Choridactylus*, *Minous*, *Congiopodus*, and *Pataecus* (1); the rest have a value of 0.
68. Third and fourth hypurals: separate (0); fused (1). Separate hypurals are noted for *Scorpaenodes* (0), the rest have a value of 1.
69. Fifth hypurale: present (0), absent (1). The fifth hypurale is absent in *Tetraroge*, *Synanceia*, *Erosa*, *Erisphex*, *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, and *Pataecus* (1); for the rest, the attribute value is 0.
70. Lower hypural plate and parhypurale: separate (0), fused (1). Parhypurale separated from lower hypural plate in *Sebastes*, *Scorpaena*, and *Scorpaenodes* (0), the rest have a value of 1.
71. Hemal spine and centrum of the third preural vertebra: separated (0), fused (1). The character 71-0 found in *Sebastes*, *Scorpaena*, *Scorpaenodes*, *Apistus*, and *Synanceia*, no value defined for *Tetraroge*, the rest have a value of 1.
72. Hemal spine and centrum of the second preural vertebra: separated (0), fused (1). The character 72-1 noted for *Congiopodus*, *Zanclorhynchus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (1); the rest have a value of 0.
73. Urostyle and upper hypural plate: separated (0), fused (1). The upper hypural plate is fused with the urostyle in *Inimicus*, *Minous*, *Congiopodus*, *Alertichthys*, *Zanclorhynchus*, and *Pataecus* (1), the rest have a value of 0.
74. Urostyle and lower hypural plate: separated (0), fused (1). The lower hypural plate is fused with the urostyle in *Gnathanacanthus* and *Pataecus* (1), the rest have a value of 0.
75. Uroneural: present (0), absent (1). Absent in *Inimicus*, *Congiopodus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (1); the rest have a value of 0.
76. Number of epurals: three (0), two (1), one (2), ordered as 0–1–2. Two epurals were noted in *Synanceia*, *Erosa*, *Inimicus*, *Congiopodus*, *Zanclorhynchus*, and *Alertichthys* (1); one epurale in *Pataecus* (2); the rest have a value of 0.
77. Branched rays of the caudal fin: present (0), absent (1). In the caudal fin, the rays do not branch in *Minous*, *Aploactis*, *Erisphex*, *Zanclorhynchus*, *Alertichthys*, *Gnathanacanthus*, and *Pataecus* (1), the rest have a value of 0.

Discussion

Morphology

Imamura H [21] used 17 synapomorphies to substantiate the monophyly of Congiopodoidea, Ishii, et al. [16] used only 11 of them because of the impossibility of including 6 reversions in a particular method of building phylogenetic relationships, but added 2 more synapomorphies. In total, 35 characters are apomorphic according to Ishii, et al. [16] for Congiopodidae sensu Honma, Imamura, and Kawai, 2013:

1. Absence of fifth os infraorbitale.
2. The presence of tubercles on the skull, bone granules are also found on the head of Apistidae, *Minous* Cuvier, 1829, Triglididae, Peristediidae, Hoplichthyidae and some Platycephalidae (e.g. *Suggrundus* Whitley, 1930 and *Rogadius* Jordan et Richardson, 1908).
3. Ossa nasalia firmly attached to the cranium.
4. Os intercalare and os posttemporale sutured.
5. Praeoperculo-mandibular and temporal canals of the head are not connected.
6. Baudelot's ligament is absent.
7. Os palatinum is separated from ectopterigoideum (an autapomorphy of Congiopodidae s.l. among the superfamily Scorpaenoidea sensu Imamura 2004).
8. Absence of the first vertebra.
9. One ray on the first pterygiophore.
10. Absence of levator posterior.
11. Presence of adductors I-III. Ishida M [29], as well as Imamura, et al. [22], include the presence of separate adductors I-III into autapomorphic characters of Congiopodidae s.l. in the superfamily Scorpaenoidea sensu Imamura 2004.
12. Absence of musculus obliquus superioris on the cranium (a similar character is typical among Scorpaenoidea and for *Synanceia* Bloch et Schneider, 1801, *Erosa* Swainson, 1839, *Pterigotrigla* Waite, 1899, Peristediidae, *Hoplichthys haswelli* McCulloch, 1907, *H. langsdorfii* Cuvier, 1829).
13. The gill membrane is widely fused with the isthmus, leaving a narrow gill opening (an autapomorphy of Congiopodidae s.l. within the superfamily Scorpaenoidea sensu Imamura 2004)

14. No teeth on the vomer.
15. Urostyle fused with the upper hypural plate.
16. Suborbital stay broad and firmly connected to os praeoperculum.
17. The fourth os infraorbitale absent.
18. Os prooticum and os intercalare separated.
19. Teeth on os palatinum are absent.
20. The metapterigoid lamina absent.
21. Branchiostegal rays 5-6.
22. Os praeoperculum with smooth edge.
23. No tooth plate on third epibranchiale.
24. Os extrascapulare mediale absent.
25. Os extrascapulare laterale with one element (elongated tubular) with two openings of sensory pores.
26. No first spine on first anal pterygiophore.
27. Supraneurale absent.
28. The first and second hypuralia are fused (in the lower hypural plate).
29. The third and fourth hypuralia are fused (in the upper hypural plate).
30. Fifth hypurale absent.
31. Fused lower hypural plate and parhypurale.
32. Attachment of a A_2A_3 musculus adductor mandibulae partially medially in relation to m. levator arcus palatini.
33. Musculus levator opercula attaches to os pteroticum and os posttemporale in *Zanclorhynchus* and *Alertichthys* (an even more advanced position in *Congiopodus* in the family - attachment of m. levator opercula only to os posttemporale).
34. Musculus transversus ventralis anterior and m. ventralis posterior separated.
35. Tubular lateral line segments (tubular lateral line scales are also characteristic of representatives of the following families from the superfamily Scorpaenoidea sensu Imamura, 2004: Tetrarogidae, Synanceiidae, Aploactinidae, Gnathanacanthidae, and Pataecidae) [21].

In total, the clade Congiopodidae sensu Honma, Imamura, Kawai, 2013 in the work of Ishii, et al. [16] is supported by 9 characters (Figure 1).

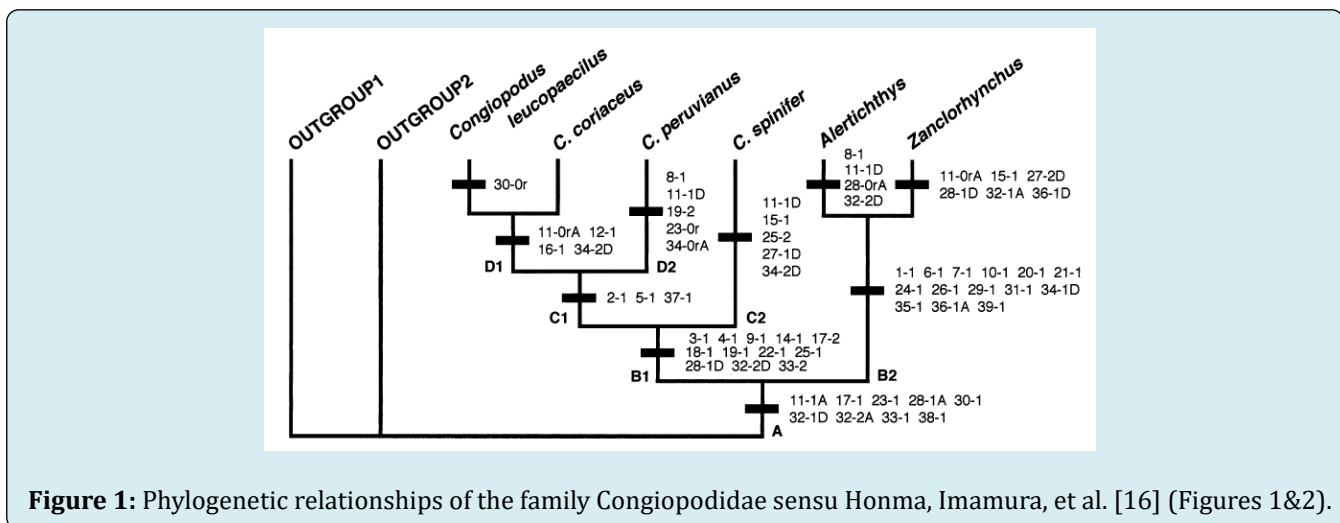


Figure 1: Phylogenetic relationships of the family Congiopodidae sensu Honma, Imamura, et al. [16] (Figures 1&2).

In this paper, the author does not agree with the absence of Baudelot's ligament and the loss of the first vertebra. As evidence of such a loss, Ishii, et al. [16] presented the following characteristics, in their opinion, of Congiopodoidea sensu Voskoboinikova et Zhukov, 2021:

1. The absence of Baudelot's ligament.
2. First neural spine bent anteriorly, although in all families belonging to the same clade with Congiopodidae and Zanclorhynchidae: Apistidae, Tetrarogidae, Synanceiidae, Aploactinidae, Gnathanacanthidae, and Pataecidae (Imamura, 2004), the first two neural spines are bent anteriorly.
3. In *Zanclorhynchus* and *Alertichthys*, the first two pterygiophores inserted between the first and second neural spines; in Congiopodidae, the pterygiophores are shifted onto the cranium – while in other families

the first 2 pterygiophores inserted between the second and third neural processes [16]. Thus, for example, the second neural spine is homologous to the third one in all other fish of the superfamily Scorpaenoidea sensu Imamura, 2004.

The erroneous nature of that statement was recently proven in a study on comparative osteology of the neurocraniums *Alertichthys*, *Zanclorhynchus*, and *Congiopodus* [1]. Baudelot's ligament was found. In *Congiopodus*, the pterygiophores and neural spines are not shifted onto the cranium. The pterygiophores are inclined strongly anteriorly in the long and wide cavity formed for them from the upper ridges of the ossa parietalia, and with their lower ends they are inserted between the neural spines of the first and second vertebrae already behind the posterior profile of the skull.

Pterygiophores shifted onto the skull, for example, are found in Gnathanacanthidae and Pataecidae from the neighboring clade, but not in Congiopodidae. Congiopodidae have the first vertebra; in *Congiopodus*, it is fused with the cranium and is actually included in the posterior wall of the skull; its neural spine separates the medial ends of the ossa epiotici. In *Zanclorhynchus* and *Alertichthys*, the first vertebra is not completely fused to the cranium and shows some mobility.

In addition to clarifying the position of pterygiophores and the first vertebra, Voskoboinikova and Zhukov identified 13 additional synapomorphies. In total, they used 77 parameters for analysis, of which 16 were corrected and added regarding to the work of Imamura [21]:

1. The presence of a vertical ridge on parietale.
2. Position of the first pterygiophores of the dorsal fin.
3. Number of first pterygiophores between the first and second neural spines.
4. The presence of Baudelot's ligament.
5. The presence of connection of os supraoccipitale and os frontale.

6. Position of the os supraoccipitale.
7. Medial connection of ossa epiotici.
8. The presence of the first vertebra.
9. Os posttemporal state.
10. The presence of spines on the frontale, pteroticum and posttemporale.
11. Presence of posteroventral and ventromedial ridges on os cleithrum.
12. Condition of the precoracoid foramen.
13. The presence of a notch between the anterior processes of the pelvic bones.
14. State of the infraorbital cannal in infraorbital 2.
15. Connection between the praeoperculo-mandibular and temporal canals.
16. State of the supratermporal commissure.

In the group analyzed Voskoboinikova OS [1] the position of *Congiopodus* + *Zanclorhynchus* + *Alertichthys* changed, the group, relative to other genera, took a position closer to the root of the tree, and the genus *Apistus* also turned out to be basal (Figures 2&3).

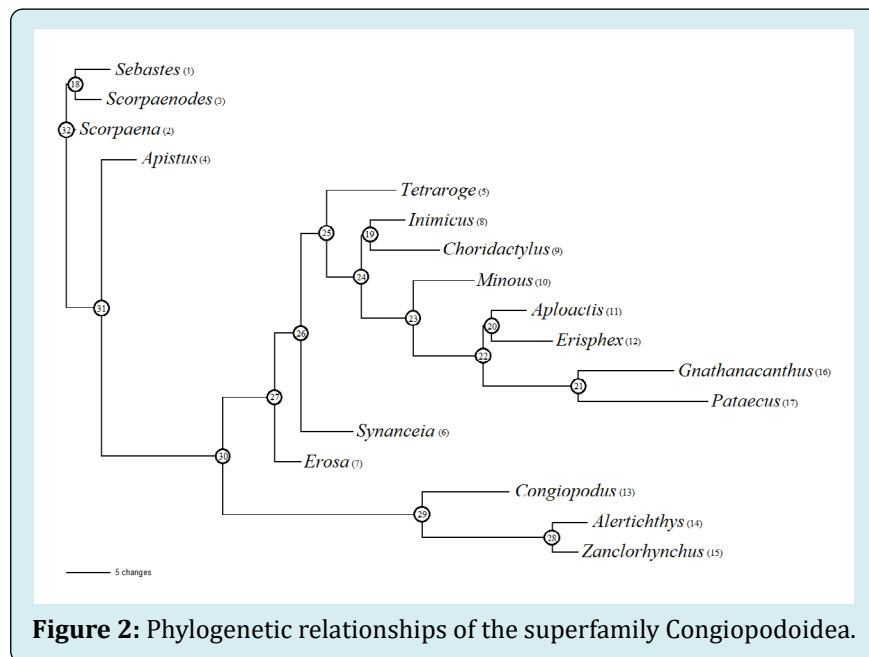


Figure 2: Phylogenetic relationships of the superfamily Congiopodoidea.

Length of resulting tree 202, CI 0.505, RI 0.664. The *Sebastes*+*Scorpaenodes* branch is supported by character 7 (1→0). Node 18 is supported by characters 8 (2→1), 9 (1→0), 44 (1→0), 63 (1→0) to *Sebastes* and 30 (0→1), 47 (1→0), 68 (1→0) to *Scorpaenodes*. The *Scorpaena* branch is supported by character 31 (0→1). In recent molecular genetic studies [24], all the genera studied in the cladistic analysis were assigned to the same family Synanceiidae, with the exception of outgroups (*Sebastes*, *Scorpaena*, *Scorpaenodes*) and genera of the superfamily Congiopodoidea (*Congiopodus*, *Alertichthys*, *Zanclorhynchus*). The resulting cladogram

(Figure 2) is consistent with this hypothesis, except for the position of the genus *Apistus*. It took an basal position relative to other genera under study, its branch is supported by three characters: 19 (0→2), 27 (0→1), 49 (0→1). The branch containing all other analyzed genera is supported by twelve features: 3 (0→1), 4 (0→2), 25 (0→1), 30 (0→1), 40 (0→1), 45 (0→2), 53 (0→1), 65 (0→1), 67 (0→1), 69 (0→1), 71 (0→1), 76 (0→1). The branch Synanceiidae sensu Smith et al., 2018 without *Apistus* (30→27) is supported by six characters: 3 (1→2), 4 (2→3), 13 (1→0), 33 (0→1), 42 (0→1), 43 (0→1). The clade Congiopodoidea (30→29) is

supported by 22 characters: 9 (1→2), 14 (0→1), 15 (0→1), 16 (0→2), 17 (0→1), 20 (0→1), 22 (0→1), 23 (0→1), 24 (2→1), 25 (1→2), 29 (0→1), 34 (0→1), 37 (0→1), 46 (0→1), 50 (0→1), 52 (0→1), 56 (0→1), 57 (0→1), 59 (0→1), 72 (0→1), 73 (0→1), 75 (0→1). The branch of the family Congiopodidae (29→13) is supported by ten characters: 2 (0→1), 5 (0→1), 10 (1→0), 21 (0→1), 24 (1→0), 28 (0→1), 36 (0→1), 37 (1→2), 47 (1→0), 48 (0→1). The branch of the family Zanclorhynchidae (29→28) is supported by 15 characters: 4 (2→1), 6 (0→1), 11 (0→1), 12 (0→1), 26 (0→1), 35 (0→1), 38 (0→1), 41 (0→1), 51 (0→1), 53 (1→2), 55 (0→1), 60 (0→1), 66 (0→1), 67 (1→0), 77 (0→1). *Alertichthys* is supported by four parameters 11 (1→2), 18 (0→1), 24 (1→2), 59 (1→0). *Zanclorhynchus* is supported by three - 58 (0→1), 61 (0→1), 75 (1→0).

Erosa is supported by characters 21 (0→1), 53 (1→0), 54 (0→1). In the other direction, the node is supported by one feature - 64 (0→3). *Synanceia* is supported by characters 10 (1→2), 19 (0→2), 39 (0→1), 40 (1→0), 71 (0→1). The branch 26→25 is supported by two parameters 61 (0→2) and 76 (1→0). *Tetraroge* is supported by seven attributes: 23 (0→1), 24 (2→0), 25 (0→1), 30 (0→1), 43 (0→1), 45 (2→1),

62 (0→1). The branch 25→24 is supported by characters 38 (0→1), 49 (0→1), 59 (0→1), 69 (1→0). The *Inimicus* + *Choridactylus* branch is supported by one parameter 49 (1→2). Within it, *Inimicus* is supported by characters 43 (1→0), 73 (0→1), 75 (0→1), 76 (0→1), and *Choridactylus* by 16 (0→2), 36 (0→1), 45 (2→0), 46 (0→2), 49 (2→3). *Minous* is supported by seven attributes: 13 (0→1), 16 (0→1), 21 (0→1), 46 (0→1), 53 (1→0), 56 (0→1), 73 (0→1). The 23→22 branch is also supported by seven parameters: 20 (0→1), 33 (1→0), 37 (0→1), 49 (0→1), 54 (0→2), 57 (0→1), 67 (0→1). The clade *Aploactis* + *Erisphex* is supported by one character 66 (0→1). *Aploactis* is supported by parameters 10 (1→2), 43 (1→2), 61 (2→0), while *Erisphex* is supported by characters 19 (2→0), 23 (0→1), 52 (0→1), 62 (0→1), 64 (3→2), 69 (0→1). The clade *Gnathanacanthus* + *Pataecus* is supported by ten characters: 1 (0→1), 24 (2→0), 34 (0→1), 36 (0→1), 38 (1→0), 45 (2→1), 59 (1→0), 72 (0→1), 74 (0→1), 75 (0→1). *Gnathanacanthus* supported by characters 16 (0→2), 19 (2→1), 20 (1→0), 37 (1→0), 53 (1→0), 54 (2→0), 57 (1→0), 64 (3→1); *Pataecus* - 7 (1→0), 8 (2→0), 10 (1→2), 18 (1→2), 48 (0→1), 53 (1→2), 54 (2→3), 58 (0→2), 67 (0→1), 69 (0→1), 73 (0→1), 76 (0→2).

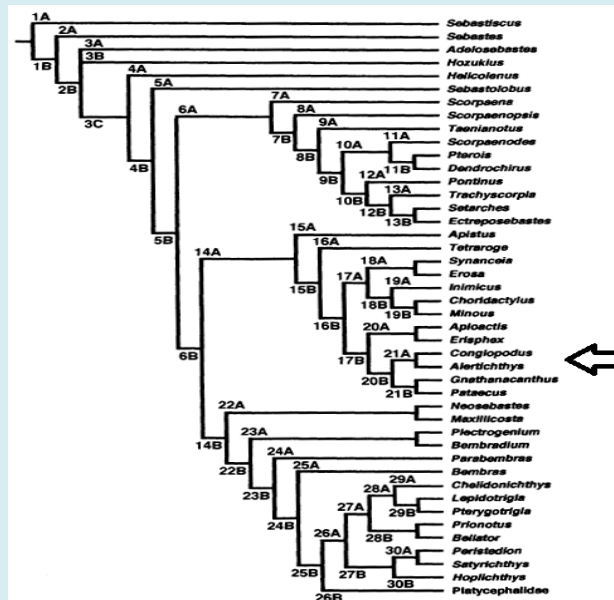


Figure 3: Phylogenetic relationships of the superfamily Scorpaenoidea sensu Imamura H [21]. The fish of the group under discussion are shown by an arrow.

Contradictory information has been published about the presence of teeth on the vomer and os palatinum. The teeth of *Alertichthys* are described by Moreland JM [9] as small, forming wide oval groups on the symphyses on both jaws. He indicated the presence of teeth on the vomer, visible only on the stained material in large (i.e., about 80 mm) specimens in his collection, and all of his specimens are juvenile. Imamura

argued that the genus *Congiopodus* lacks teeth in the jaws [21]. However, already in 2008, together with Ishii, et al. [16], he suggested the presence of intraspecific variability in the species *C. leucopaecilus* (teeth are absent / present on both jaws) and *C. coriaceus* (teeth are absent / present on the lower jaw). Or they suggested the probability that teeth are always present, but can easily fall out [16]. In the

original description of the genus *Zanclorhynchus*, Gunther A [18] indicates the absence of teeth at all: "Snout pointed; mouth very protractile, lateral, narrow, and toothless". However, Waite ER [19], in describing the second case of capturing *Zanclorhynchus* from Macquarie Island, describes the presence of very small teeth on the jaws and vomer. The author agrees with the results of a number of studies [3,6,11] and acknowledges the presence of teeth on both jaws in the Congiopodoidea group, but their absence on the vomer. Thus, out of 35 apomorphic characters proposed for Congiopodoidea by Ishii, et al. [16], in this work the author recognizes 32 apomorphies.

Agassiz was the first to point out a significant scale weight in the taxonomy of fish, taxonomically dividing fish on this basis: ganoid, placoid, ctenoid, and cycloid fish [30]. This taxonomic division did not last long, but the scale nomenclature introduced by Agassiz still exists. Roberts, in his work on the comparative morphology of Teleostei scales within the group, described the presence of cycloid and three main types of spined scales: spinoid, crenate, and ctenoid [31]. The spinoid type, in turn, was divided into five, the fourth of which is specific, in addition to Congiopodoidea, also for Luvaridae Gill, 1885, Chiasmodontidae Jordan et Gilbert, 1883, juvenile specimens of some Istiophoridae Rafinesque, 1815 and Xiphiidae Rafinesque, 1815, Aploactinidae, some Cottidae Bonaparte, 1831, most Triacanthodidae Gill, 1862 and Monacanthidae Nardo, 1843, and some Molidae Bonaparte, 1835 [31]. This fourth type of spinoid scale is characterized by "scales lack division into fields and are not closely imbricated; they have one or more stout, often buttressed and recurved, spines which arise submarginally, generally from the central region; shape of scale base is often circular" [31]. In the original description, Günther did not consider the submerged scales of *Zanclorhynchus* to be scales at all, but noted small tubercles on the body [18]. However, there are scales, the scaling is very dense in some parts [3,11,12], long spines protrude on the surface of the skin of *Zanclorhynchus* and *Alertichthys* [3,9,32]. Thus, out of the entire related clade Synanceiidae sensu Smith WL [23], which includes 169 species, the value of this parameter unites Zanclorhynchidae only with Aploactinidae (17 genera, 50 species) and one species of *Congiopodus* – *C. spinifer*.

The caudal fin skeletal characters has long been widely used for the bony fish system [33-35]. According to Ishii, et al. [16], the upper hypural plate in is formed by fusion the third and fourth hypurals, uroneurals and urostyle (H3+H4+ur+ct), H5 is absent; the lower hypural plate was formed from the first and second hypuralia and parhypuralia (H1+H2+PH) [21]. Imamura argues that uroneuralia is absent in all Congiopodidae, which brings them closer to Pataecidae and Peristediidae; in 2008, in collaboration with Ishii N [16], he came to the conclusion that uroneuralia are

fused with the upper hypural plate in all *Congiopodus*, except for *C. leucopaecilus*, in which the uroneuralia are separate. The latest data obtained on *Zanclorhynchus* suggest that one pair of uroneurals separated from the upper hypural plate exist at least in the form of intraspecific variability in the genus *Zanclorhynchus* [3]. The lower hypural plate fused with the parhypuralia considers a synapomorphy belonging to the clade of Apistidae, Tetrarogidae, Synanceiidae, Aploactinidae, Congiopodidae s.l., Gnathanacanthidae, and Pataecidae [17,21]. A distinctive parameter for the superfamily Scorpaenoidea sensu Imamura, 2004 is a presence of three epuralia, while Congiopodoidea has two, and Pataecidae has one [21].

Thus published morphological data point to the monophyly of Congiopodoidea, but different researchers come to conflicting conclusions regarding the sister group.

Genetic

In the Introduction notes the results of Smith and Wheeler WL [23], they analyzed the mitochondrial and nuclear genes: mtDNA (12S rDNA, 16S rDNA and tRNA-Val), nuclear DNA (28S rDNA, histone HS and TMO-4c4). In the constructed tree, the clade with *Congiopodus peruvianus* included, for example, *Perca flavescens* (Mitchill 1814), and the sister clade included, among others, *Zanclorhynchus spinifer* and *Harpagifer kerguelensis* Nybelin, 1947. This result should be considered a clear error and should be used only for illustration of still imperfections of genetic methods.

Zhukov's M result [36] of comparison of nucleotide sequences of COI within the superfamily Congiopodoidea (Figure 4) showed a slightly different pattern from the results of Ishii and Imamura (Figure1). But it is the genetic result that shows the more explanatory geographic distribution of *Congiopodus* - *C. coriaceus* and *C. leucopaecilus* live sympatrically in Australia and New Zealand, while *C. peruvianus* and *C. spinifer* inhabit waters off southern South America and southern Africa, respectively. Two clades of *Congiopodus* may indicate an eastward distribution along the Circumantarctic Current, similar to the distribution of *Zanclorhynchus* [3], which cannot explain, for example, the external position of *C. spinifer* to other *Congiopodus* in the Ishii and Imamura cladogram (Figure 1).

The results of genetic studies are varied. Smith WL, et al. [25] provide some of them (Figure 5). It can be seen that the position of Congiopodoidea with different methods vary strongly. According to Smith, et al. [37], Congiopodoidea inserted into the clade with Neosebastidae, and, together with even Cottoidei, formed the sister group to the clade including Synanceiidae. Other researchers Lautredou AC [38] put Congiopodoidea in an external position to the clade,

which includes not only Synanceiidae, but even Scorpaenidae. For Smith WL et al. [25] themselves, the result is that Congiopodoidea is even more distant from all Scorpaenoidei,

the superfamily, together with two suborders Cottoidei and Zoarcoidei, formed a sister clade to Scorpaenoidei (Figure 6).

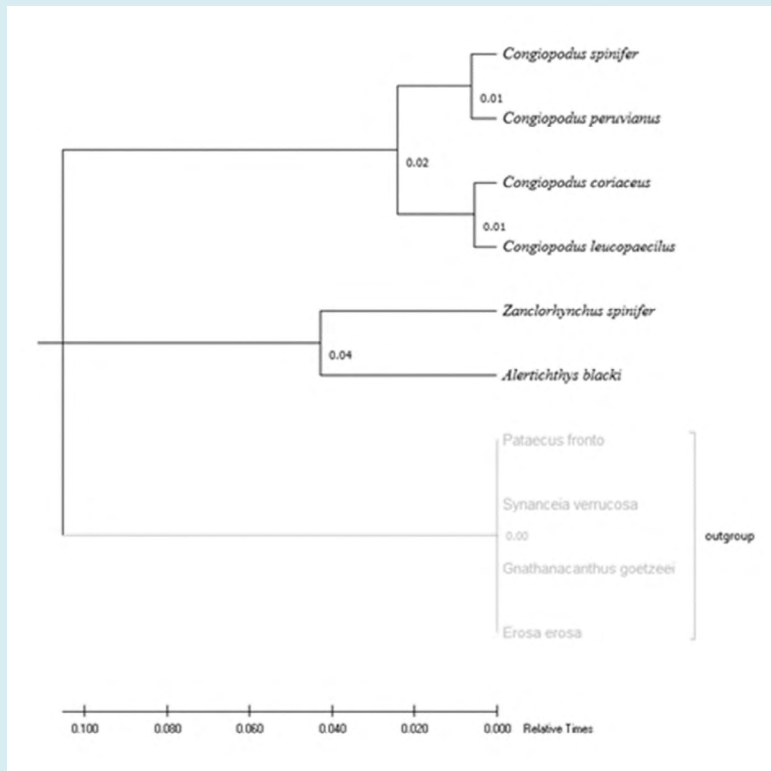


Figure 4: Phylogenetic tree of the superfamily Congiopodoidea, constructed from a 652 bp region of the COI gene (Figure 1).

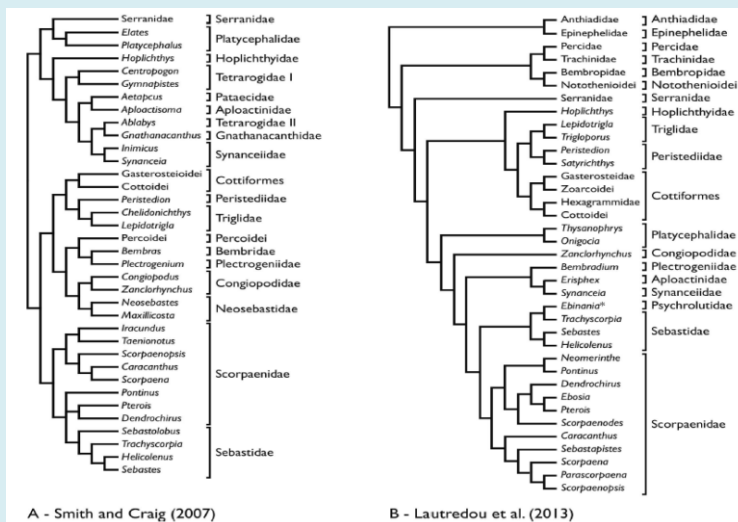


Figure 5: Phylogenetic relationships in A - Scorpaenoidei and related groups [37], B - Scorpaeniformes and related groups [38]. (Figure 2).

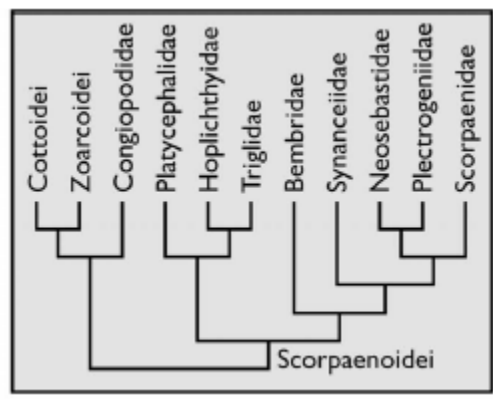


Figure 6: Cladogram of Scorpaenoidei families and sister group (Figure 3, partly).

The results of Smith, et al. [25] correspond to the hypothesis of the taxonomic rank of the suborder, but one cannot ignore the many synapomorphies that unite Congiopodoidea and Synanceiidae sensu Smith et al., 2018. Undoubtedly, the described results need additional verification and, due to the wide range of interpretations, cannot be accepted without confirming studies.

Contradictions in the Results of Relations of Congiopodoidea and Proposals for their Correction

On the obtained phylogenetic trees (Figures 2&3), the sister branch to the superfamily Congiopodoidea includes a taxonomically complex group, now belonging to one family Synanceiidae [4,39]. Previously [15,40] the following systematic position of these taxa was considered: two genera *Apistus* and *Tetraroge* belonged to the corresponding subfamilies Apistinae Gill, 1859 and Tetraroginae Smith, 1949 within the family Scorpaenidae. The same family included *Minous* in the tribe Minoini, *Inimicus* and *Choridactylus* in the tribe Choridactylini, *Synanceia* and *Erosa* in the tribe Synanceini of the subfamily Synanceiinae Swainson, 1839. *Gnathanacanthus* and *Pataecus* in Gnathanacanthidae and Pataecidae, respectively. Imamura H [21] introduced a slightly different taxonomy, relegating *Apistus* and *Tetraroge* to separate families Apistidae and Tetrarogidae, respectively. But the unresolved contradiction is the family Synanceiidae, which simultaneously includes *Synanceia* and *Erosa*, *Inimicus*, *Choridactylus*, *Minous*, albeit in different subfamilies Synanceiinae, Inimicinae Gill, 1905 Choridactylinae Kaup, 1859 and Minoinae Jordan et Starks, 1904, respectively. Against this background, the decision to unite the entire sister to superfamily Congiopodoidea group into one family Synanceiidae Smith WL, et al. [25] is understandable and removes almost all contradictions. Here, only the inclusion of the genus *Apistus* in the same family

looks erroneous. Its position is clearly basal both in the study by Imamura H [21] and by Voskoboinikova, et al. [1]. Considering, in turn, the entire group as part of the family Scorpaenidae, which additionally includes two subfamilies Zanclorhynchinae and Congiopodinae, is also erroneous. The morphological differences between Congiopodoidea and the rest of Scorpaenoidea sensu Imamura 2004 are so great that Mandritsa SA [10] proposed to separate Congiopodidae and Zanclorhynchidae into their suborder Congiopodoidei. Justifying the special position of Congiopodoidei sensu Mandritsa, 2001, he pointed out a number of characters that are absent in Scorpaenoidei sensu Imamura and Yabe, 2002:

1. The infraorbital sensory canal in os lacrimale contains two neuromasts (three in Scorpaenoidei sensu Imamura and Yabe, 2002).
2. Abdominal (trunk) vertebrae 14–19 (9–13 in Scorpaenoidei).
3. Significant distance between os palatinum and the pterygoid bones.
4. Main pore in praeoperculo-mandibular sensory canal is absent between os dentale and os anguloarticulare.
5. Os dentale bears only 1–2 main pores (Scorpaenoidei usually has 4).
6. Articular process on os praemaxillare not developed.
7. Temporal fossa absent (Scorpaenoidei always has).

However, the erection of the group to a suborder has not received further support [15,28,40–42]. To remove contradictions, *Apistus* should be considered as belonging to its own family Apistidae, and the family Synanceiidae sensu Smith 2018 without Apistidae should be considered in the rank of the superfamily Synanceiidea with a corresponding increase in the rank of subfamilies to families. Also it is needed more studies to clarify the position of genus *Erosa* in the family Synanceiidae.

The proposed taxonomy of the group as part of the suborder Scorpaenoidei of the order Perciformes satisfies both the majority of genetic and morphological studies (the family Tetrarogidae can be further divided into two families, which will remove some contradictions in the results of molecular studies):

superfamily Synanceiidea Swainson, 1839 sedis mutabilis
family Apistidae Gill, 1859

genus *Apistops* Ogilby, 1911
genus *Apistus* Cuvier, 1829
genus *Cheroscorpaena* Mees, 1964

superfamily Synanceiidea Swainson, 1839

family Synanceiidae Swainson, 1839 incertae sedis
genus *Erosa* Swainson, 1839

family Synanceiidae Swainson, 1839

genus *Dampierosa* Whitley, 1932
genus *Leptosynanceia* Bleeker, 1874
genus *Pseudosynanceia* Day, 1875

genus *Synanceia* Bloch et Schneider, 1801
 genus *Trachicephalus* Swainson, 1839
 family Tetrarogidae Smith, 1949
 genus *Ablabys* Kaup, 1873
 genus *Centropogon* Günther, 1860
 genus *Cocotropsis* Barnard, 1927
 genus *Cottapistus* Bleeker, 1876
 genus *Glyptauchen* Günther, 1860
 genus *Gymnapistes* Swainson, 1839
 genus *Liocranium* Ogilby, 1903
 genus *Neocentropogon* Matsubara, 1943
 genus *Neovespicula* Mandrytsa, 2001
 genus *Notesthes* Ogilby, 1903
 genus *Ocosia* Jordan et Starks, 1904
 genus *Paracentropogon* Bleeker, 1876
 genus *Pseudovespicula* Mandrytsa, 2001
 genus *Richardsonichthys* Smith, 1958
 genus *Snyderina* Jordan et Starks, 1901
 genus *Tetraroge* Günther, 1860
 genus *Vespacula* Jordan et Richardson, 1910
 family Choridactylidae Kaup, 1859
 genus *Choridactylus* Richardson, 1848
 genus *Inimicus* Jordan et Starks, 1904
 family Minoidae Jordan et Starks, 1904
 genus *Minous* Cuvier, 1829
 family Aploactinidae Jordan et Starks, 1904
 genus *Acanthosphex* Fowler, 1938
 genus *Adventor* Whitley, 1952
 genus *Aploactis* Temminck et Schlegel, 1843
 genus *Aploactisoma* Castelnau, 1872
 genus *Bathyaploactis* Whitley, 1933
 genus *Cocotropus* Kaup, 1858
 genus *Erisphex* Jordan et Starks, 1904
 genus *Kanekonia* Tanaka, 1915
 genus *Matsubarichthys* Poss et Johnson, 1991
 genus *Neoaploactis* Eschmeyer et Allen, 1978
 genus *Paraploactis* Bleeker, 1864
 genus *Peristrominous* Whitley, 1952
 genus *Prosoproctus* Poss et Eschmeyer, 1979
 genus *Pseudopataecus* Johnson, 2004
 genus *Ptarmus* Smith, 1947
 genus *Sthenopus* Richardson, 1848
 genus *Xenaploactis* Poss et Eschmeyer, 1980
 family Gnathanacanthidae Gill, 1892
 genus *Gnathanacanthus* Bleeker, 1855
 family Pataecidae Gill, 1872
 genus *Aetapcus* Scott, 1936
 genus *Neopataecus* Steindachner, 1884
 genus *Pataecus* Richardson, 1844
 superfamily Congiopodoidea Gill, 1889
 family Congiopodidae Gill, 1889

genus *Congiopodus* Perry, 1811
 family Zanclorhynchidae Andriashev, 1993
 genus *Alertichthys* Moreland, 1960
 genus *Zanclorhynchus* Günther, 1880

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Conflict Of Interest

The author declare that he have no conflict of interest.

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