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**A STUDY OF MORPHOMETRY AND MERISTIC COUNTS OF GENUS
OXYURICHTHYS BLEEKER, 1857 FROM ESTUARY AND COASTAL OF NGHE AN
 PROVINCE, VIETNAM (TELEOSTEI: GOBIIDAE)**

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This research identified 45 specimens of genus *Oxyurichthys* Bleeker, 1874 collected from estuary and coastal of Nghe An province in north center region Vietnam. We have classified four species: *Oxyurichthys microlepis* (Bleeker, 1849); *Oxyurichthys ophthalmonema* (Bleeker, 1856); *Oxyurichthys tentacularis* (Valenciennes, 1837); *Oxyurichthys visayanus* Herre, 1927. The species *Oxyurichthys ophthalmonema* (Bleeker, 1856) and *Oxyurichthys visayanus* Herre, 1927 was first discovered in the study area and north center region of Vietnam.

Keywords: Estuary, Coastal, Nghe An, Vietnam, *Oxyurichthys microlepis*, *Oxyurichthys ophthalmonema*, *Oxyurichthys tentacularis*, *Oxyurichthys visayanus*.

**STUDIUL MORFOMETRIEI ȘI AL MĂSURILOR MERISTICE DE GENUL *OXYURICHTHYS* BLEEKER,
 1857 DE LA ESTUARUL ȘI COASTA PROVINCIEI NGHE AN, VIETNAM (TELEOSTEI: GOBIIDAE)**

Această cercetare a identificat 45 de specii din genul *Oxyurichthys* Bleeker, 1874, colectate de la estuar și coasta provinciei Nghe An în nordul regiunii centrale a Vietnamului. Noi am clasificat patru specii: *Oxyurichthys microlepis* (Bleeker, 1849); *Oxyurichthys ophthalmonema* (Bleeker, 1856); *Oxyurichthys tentacularis* (Valenciennes, 1837); *Oxyurichthys visayanus* Herre, 1927. Speciile *Oxyurichthys ophthalmonema* (Bleeker, 1856) and *Oxyurichthys visayanus* Herre, 1927, au fost descoperite pentru prima dată în zona de studiu și în nordul regiunii centrale a Vietnamului.

Cuvinte-cheie: estuar, coastă, Nghe An, Vietnam, *Oxyurichthys microlepis*, *Oxyurichthys ophthalmonema*, *Oxyurichthys tentacularis*, *Oxyurichthys visayanus*.

Introduction

Oxyurichthys Bleeker, 1857 is a genus of fish in the subfamily Gobionellinae [1], known commonly as arrowfin gobies. They are distributed in the tropical and subtropical Indian and Pacific Oceans; one species is also known from the western Atlantic Ocean. Most species live in shallow waters under 10 meters deep over fine substrates such as silt. According to fishbase.org (2018) [2], genus *Oxyurichthys* consists 23 species: *Oxyurichthys amabilis* Seale, 1914; *Oxyurichthys auchenolepis* Bleeker, 1876; *Oxyurichthys cornutus* Culloch & Waite, 1918; *Oxyurichthys formosanus* Nichols, 1958; *Oxyurichthys guibei* Smith, 1959; *Oxyurichthys heisei* Pezold, 1998; *Oxyurichthys lemayi* (Smith, 1947); *Oxyurichthys lonchotus* (Jenkins, 1903); *Oxyurichthys microlepis* (Bleeker, 1849); *Oxyurichthys mindanensis* (Herre, 1927); *Oxyurichthys notonema* (Weber, 1909); *Oxyurichthys ophthalmonema* (Bleeker, 1856); *Oxyurichthys papuensis* (Valenciennes, 1837); *Oxyurichthys paulae* Pezold, 1998; *Oxyurichthys petersenii* (Steindachner, 1893); *Oxyurichthys petersii* (Klunzinger, 1871); *Oxyurichthys saru* Tomiyama, 1936; *Oxyurichthys stigmalophius* (Mead & Böhlke, 1958); *Oxyurichthys takagi* Pezold, 1998; *Oxyurichthys tentacularis* (Valenciennes, 1837); *Oxyurichthys uronema* (Weber, 1909); *Oxyurichthys viridis* Herre, 1927; *Oxyurichthys visayanus* Herre, 1927. However by Nguyen Nhat Thi [3, 4] and Ho Anh Tuan [5, 6] in Vietnam there are only 3 species of this genus as: *Oxyurichthys microlepis* (Bleeker, 1849); *Oxyurichthys papuensis* (Valenciennes, 1837); *Oxyurichthys tentacularis* (Valenciennes, 1837). During the time to research on fish in from estuary and coastal of Nghe An province, Vietnam. We have already collected 45 specimens of *Oxyurichthys* Bleeker, 1857. In this study we classify and analyse these specimens.

1. Material and methods

Fish specimens were collected mainly from fishing men in these survey regions. Fishing tools are fishnets, rackets, casting – net, multi size fishing – rods and also professional tools of fishermen such as: fishing basket, fishing traps, etc. Some other specimens was bought from local people. All samples were given full information in field trip diary, sampling notes, taking pictures and fixed with formaline 8- 10% and reserving with formaline 5% in Biological Museum Vinh University, Vinh City, Vietnam.

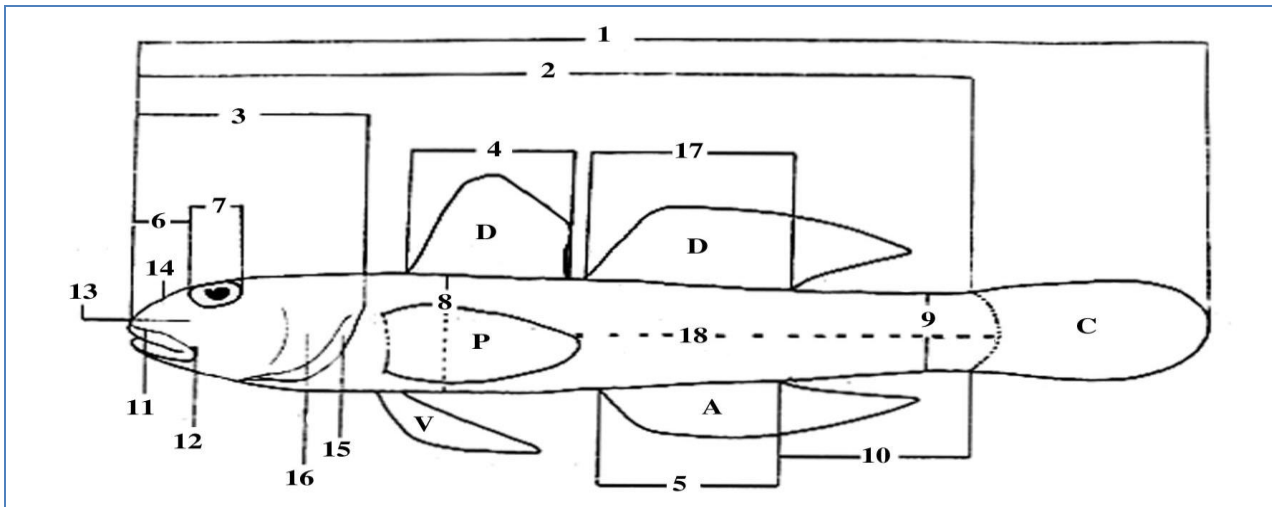


Fig.1. Measurements taken on *Oxyurichthys* by Nguyen Nhat Thi (2000).

Note of figure 1: 1. Total length L; 2. Standard length L_0 ; 3. Head length; 4. Length of first dorsal fin; 5. Length of anal fin; 6. Snout length; 7. Diameter of eye; 8. Body depth; 9. Caudal peduncle depth; 10. Length of caudal peduncle; 11. Premaxillary; 12. Maxillary; 13. Preorbital; 14. Nostrils; 15. Opercle; 16. Preopercle; 17. Length of second dorsal fin; 18. Scales in longitudinal row. P. Pectoral fins; D. Dorsal fin; C. Caudal fin; V. Pelvic fins; A. Anal fin.

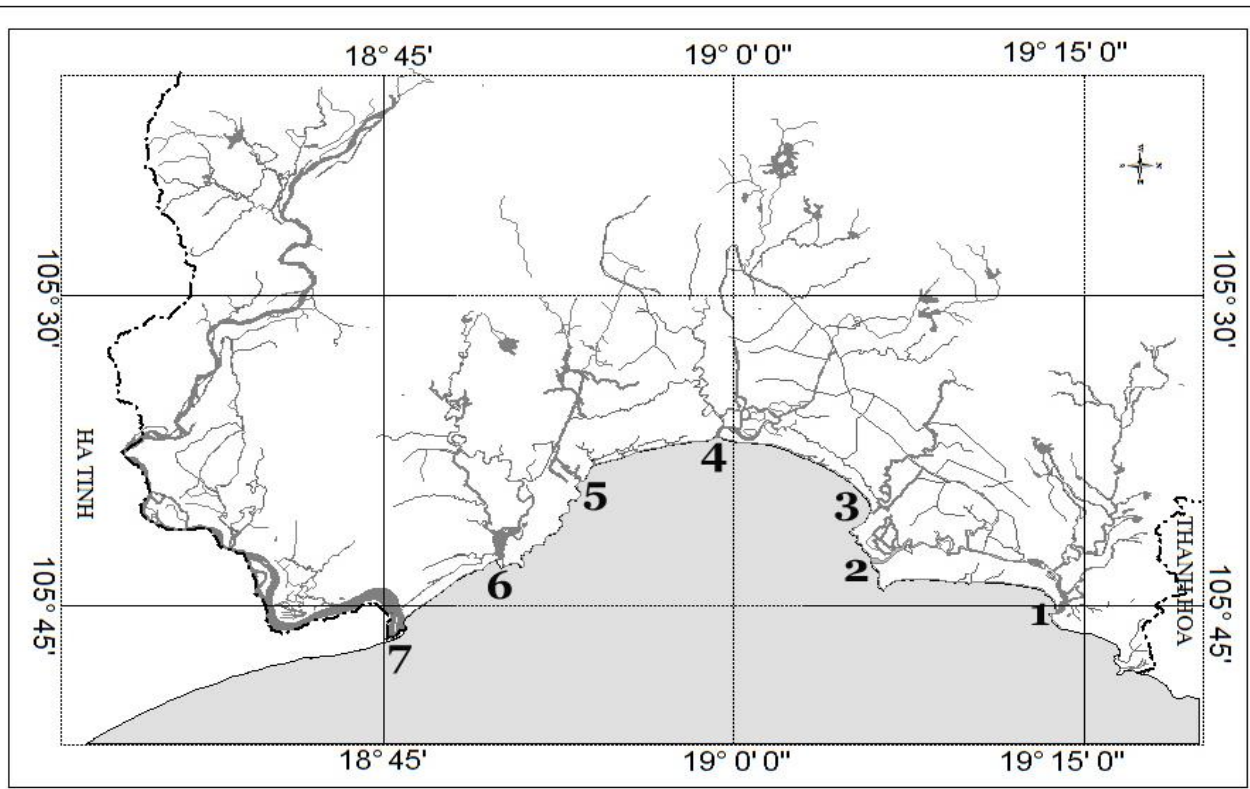


Fig.2. Sampling locality of *Oxyurichthys* in estuary and coastal of Nghe An province.

Note: 1 = LC (Lạch Cờn); 2 = LQ (Lạch Quèn); 3 = LT (Lạch Thơi - Quỳnh Thơi); 4 = DN (Diễn Ngọc); 5 = DB (Diễn Bích); 6 = NQ (Nghị Quang); 7 = CH (Cửa hội)

We have carried out samplings (90 specimens) at 7 points in estuary and coastal of Nghe An province, North Central of Vietnam, each sampling point is from 0.5 km to 1 km.

We use the following materials to identify species: Ho Anh Tuan (2016) [7]; Nguyen Nhat Thi (2000) [3]; Kottelat M.(1989) [8]; Mai Dinh Yen (1978) [9]; Nguyen Van Hao (2005) [10]; Rainboth J. (1996) [11]; Tetsji Nakabo (2002) [12].

2. Results and discussion

2.1. *Oxyurichthys microlepis* (Bleeker, 1849)

Synonyms. *Gobius microlepis* Bleeker, 1849; *Euctenogobius cristatus* Day, 1873; *Gobius cristatus* (Day, 1873); *Gobius longicauda* Steindachner, 1893; *Oxyurichthys longicauda* (Steindachner, 1893); *Gobius nuchalis* Barnard, 1927.

Diagnosis. 12.5 - 13.5 second dorsal-fin elements, 12 - 13.5 anal-fin elements; upper jaw teeth in single row; fleshy tongue rounded; upper lip slightly indented but not deeply constricted at premaxillary symphysis; dark spot present on dorsoposterior surface of eye, no ocular cirrus or cornification; anterior nares with dark anteromedial spot; no spots on gular membrane beneath preopercle or anterior process of quadrate; scales of dorsum with individual spots on posterior margin; five round blotches along mid-side of body; nape fully scaled to membranous crest; all scales including trunk cycloid; prepelvic area scaled; lateral scales 48 - 54; first dorsal-fin spines not elongate, reaching to second to fourth second dorsal-fin element; 18 - 23 pectoral-fin rays; pelvic fins dusky; first dorsal fin with black spot on membrane behind sixth spine.

Material examined. (14 specimens); CH - 1; DB - 01; LT - 01; DB - 02; LC - 49; LC - 126; LC - 29; LC - 107; LC - 120; NQ - 21; NQ - 23; LQ - 103; LC - 31; LQ - 09. Nguyen Thi Lam, Nguyen Thi Thao Nguyen, Dang Thi Minh Oanh, 10 to 12 August 2016; 06 - 08 December 2016; 10 - 12 April 2017.



Oxyurichthys microlepis (Bleeker, 1849).

Meristics. First dorsal: VI; Second dorsal: I. 12.5 - 13.5; Anal: I. 12 - 13.5; Pectoral: 18 - 23; Pelvic: I.5; Caudal: 18 - 23. Scales in lateral series: 48 - 54; Transverse scale rows: 16 - 19; Scales along caudal peduncle: 5 - 9.

Morphometric

Standard length = 5.78 (5.04 - 6.59) Body depth of first dorsal fin = 5.50 (5.02 - 5.98) Body depth of second dorsal fin = 3.97 (3.51 - 4.27) Lateral head length = 7.20 (6.37 - 8.07) Dorsal head length = 2.48 (2.32 - 2.80) Anal fin base = 7.14 (6.51 - 7.73) First dorsal fin base = 2.48 (2.24 - 2.71) Second dorsal fin base; Lateral head length = 3.02 (2.60 - 3.66) Snout length = 4.54 (3.92 - 5.04) Eye diameter = 5.37 (4.26 - 6.85) Fleshy interorbital width = 2.23 (2.03 - 2.46) Postorbital = 1.53 (1.34 - 1.77) Head width in maximum = 2.58 (1.36 - 3.34) Lower jaw length; Fleshy interorbital width = 0.87 (0.57 - 1.09) Eye diameter; First dorsal fin base = 0.35 (0.30 - 0.39) Second dorsal fin base = 0.35 (0.31 - 0.42) Anal fin base.

2.2. *Oxyurichthys ophthalmonema* (Bleeker, 1856)

Synonyms. *Gobius ophthalmonema* Bleeker, 1856; *Oxyurichthys ophthalmonemus* (Bleeker, 1856); *Oxyurichthys ophthalmonepis* (Bleeker, 1856); *Oxyurichthys ophthalmonemus* (Bleeker, 1856).

Diagnosis. 12.5 - 13.5 second dorsal-fin elements, 13 - 14 anal-fin elements; upper jaw teeth in single row; fleshy tongue rounded; upper lip not constricted, about equal in width at premaxillary symphysis as near rear margin of the jaws; elongate tentacle on dorsoposterior surface of eye; anterior nares with dense black spot medially; no spots evident on gular membrane; small diffuse greyish brown to blackish spot sometimes present on posterior part of dorsal scales, mainly anterodorsally, spots may be absent, indistinct or present in patches; margins of dorsal scales with narrow dark margins; usually five diffuse oval blotches along mid-side of body, blotch at caudal base smallest and often triangular; five or six brownish to greyish short saddles on dorsum, posteriormost over caudal peduncle always most prominent; in some specimens, dorsal saddles composed of pairs of greyish brown blotches at bases of fin rays; indistinct narrow dusky to greyish bars present on body posterior to anal-fin origin confluent with mid-lateral blotches and dorsal saddles; membranous crest with dark margin present on nape; scales ctenoid laterally on trunk posterior to middle of first dorsal fin, cycloid anteriorly; prepelvic region scaled; lateral scales 48 - 56; first dorsal-fin spines not greatly elongate, first spine longest, just reaching past third or fifth second dorsal-fin element; 21 - 23 pectoral-fin rays; pelvic fins dusky, not barred or mottled.

Material examined (7 specimens): DB - 06; DB - 05; DB - 04; DB - 03; CH - 28; CH - 33; CH - 13.



Oxyurichthys ophthalmonema (Bleeker, 1856).

Meristics. First dorsal: VI; Second dorsal: I. 12.5 - 13.5; Anal: I. 13 - 14; Pectoral: 21 - 23; Pelvic: I.5; Caudal: 14 - 15. Scales in lateral series: 48 - 56; Transverse scale rows: 17 - 19; Scales along caudal peduncle: 7 - 9.

Morphometric.

Standar length = 5.94 (5.36 - 6.36) Body depth of first dorsal fin = 5.79 (5.50 - 6.07) Body depth of second dorsal fin = 4.02 (3.61 - 4.30) Lateral head length = 7.23 (5.90 - 7.85) Dorsal head length = 2.57 (2.43 - 2.67) Anal fin base = 7.85 (7.03 - 9.01) First dorsal fin base = 2.69 (2.61 - 2.80) Second dorsal fin base; Lateral head length = 3.08 (2.82 - 3.54) Snout length = 3.97 (3.60 - 4.22) Eye diameter = 6.75 (5.52 - 7.54) Fleshy interorbital width = 2.04 (1.77 - 2.17) Postorbital = 1.54 (1.40 - 1.62) Head width in maximum = 3.21 (2.51 - 3.74) Lower jaw length; Fleshy interorbital width = 0.59 (0.56 - 0.65) Eye diameter; First dorsal fin base = 0.35 (0.30 - 0.39) Second dorsal fin base = 0.33 (0.28 - 0.37) Anal fin base.

2.3. *Oxyurichthys tentacularis* (Valenciennes, 1837)

Synonyms. *Gobius tentacularis* Valenciennes, 1837

Diagnosis. Tentacle on dorsoposterior of eye, usually elongate; upper lip constricted at premaxillary symphysis, less than half maximum lip width; first dorsal-fin spines not elongate, generally reaching to base the second or third second dorsal-fin element when appressed; anterior nares with low rim, darkly pigmented; nape with naked median membranous crest; no gular spots; scales on dorsum lightly outlined in black, but no spots; four indistinct oblong dusky blotches laterally slightly above mid-side of body, in some specimens, blotches connected to dusky dorsum by broad diffuse oblique bars and a diffuse dusky blotch present on caudal-fin base; no saddle present on caudal peduncle; scales ctenoid laterally on trunk posterior to vertical through origin of second dorsal fin, cycloid anteriorly; prepelvic region scaled; lateral scales 49 - 55; 20 - 24 pectoral-fin rays; pelvic fins dusky, neither barred nor mottled.

Material examined (15 specimens): CH - 07; CH - 10; CH - 09; CH - 20; CH - 35; CH - 40; CH - 17; CH - 18; LQ - 119; LQ - 29; LQ - 123; LQ - 135; NQ - 22; NQ - 13; LQ - 105.



Oxyurichthys tentacularis (Valenciennes, 1837).

Meristics. First dorsal: VI; Second dorsal: I. 12 - 13; Anal: I. 13 - 13.5; Pectoral: 20 - 24; Pelvic: I.5; Caudal: 13 - 15. Scales in lateral series: 49 - 55; Transverse scale rows: 17 - 20; Scales along caudal peduncle: 5 - 9.

Morphometric

Stander length = 5.52 (5.11 - 6.00) Body depth of first dorsal fin = 5.33 (4.92 - 6.06) Body depth of second dorsal fin = 3.93 (3.62 - 4.26) Lateral head length = 7.11 (6.01 - 7.74) Dorsal head length = 2.48 (2.31 - 2.78) Anal fin base = 7.12 (6.19 - 7.63) First dorsal fin base = 2.53 (2.37 - 2.68) Second dorsal fin base; Lateral head length = 2.93 (2.37 - 3.50) Snout length = 4.04 (3.64 - 4.54) Eye diameter = 6.61 (5.91 - 7.70) Fleshy interorbital width = 1.98 (1.82 - 2.16) Postorbital = 1.59 (1.47 - 1.81) Head width in maximum = 2.65 (2.13 - 3.20) Lower jaw length; Fleshy interorbital width = 0.61 (0.53 - 0.68) Eye diameter; First dorsal fin base = 0.36 (0.32 - 0.39) Second dorsal fin base = 0.35 (0.32 - 0.43) Anal fin base.

2.4. *Oxyurichthys visayanus* Herre, 1927

Synonyms. Not Synonym

Diagnosis. 13 - 13.5 second dorsal-fin and 13 - 13.5 anal-fin elements; single row of teeth in upper jaw; fleshy tongue rounded; upper lip not constricted at premaxillary symphysis; dark spot present on dorsoposterior surface of eye, but no cirrus or cornification; anterior nares with dark anteromedial spot; two concealed pairs of dark brown spots in gular region beneath preopercle and anterior process of quadrate; scales of dorsum without dark spots on posterior margin; four rectangular or square dark brown blotches along mid-side, fifth basicaudal blotch rounded to triangular; nape naked in most individuals, when scaled only along margins with broad naked median; membranous crest present on nape; scales ctenoid laterally on trunk posterior to middle of first dorsal fin, cycloid anteriorly; prepelvic area naked; lateral scales 51 - 54; first dorsal-fin spines

moderately elongate with filamentous tips, reaching fourth or fifth second dorsal element when appressed; 21 - 23 pectoral-fin rays; pelvic fins dusky; first dorsal fin dusky with one to three rows of whitish spots.

Material examined (8 specimens): CH - 08; CH - 12; CH - 45; CH - 32; CH - 28; CH - 23; CH - 01; CH - 16.



Oxyurichthys visayanus Herre, 1927

Meristics. First dorsal: VI; Second dorsal: I.13 - 13.5; Anal: I. 13 - 13.5; Pectoral: 21 - 23; Pelvic: I.5; Caudal: 14 - 16. Scales in lateral series: 51 - 54; Transverse scale rows: 17 - 19; Scales along caudal peduncle: 6 - 8.

Morphometric

Standar length = 5.80 (4.97 - 6.24) Body depth of first dorsal fin = 5.96 (5.68 - 6.47) Body depth of second dorsal fin = 4.03 (3.97 - 4.15) Lateral head length = 7.20 (6.48 - 7.88) Dorsal head length = 2.52 (2.37 - 2.65) Anal fin base = 7.71 (6.66 - 8.89) First dorsal fin base = 2.56 (2.44 - 2.72) Second dorsal fin base; Lateral head length = 3.21 (2.93 - 3.41) Snout length = 4.07 (3.75 - 4.43) Eye diameter = 6.39 (5.57 - 7.20) Fleshy interorbital width = 2.07 (1.81 - 2.20) Postorbital = 1.60 (1.45 - 1.69) Head width in maximum = 3.35 (3.06 - 3.62) Lower jaw length; Fleshy interorbital width = 0.64 (0.58 - 0.78) Eye diameter; First dorsal fin base = 0.34 (0.29 - 0.39) Second dorsal fin base = 0.33 (0.28 - 0.37) Anal fin base.

Conclusion

Analysis and identification of 45 specimens of genus *Oxyurichthys* Bleeker, 1874 collected from estuary and coastal of Nghe An province in north center region Vietnam. We have classified four species: *Oxyurichthys microlepis* (Bleeker, 1849); *Oxyurichthys ophthalmonema* (Bleeker, 1856); *Oxyurichthys tentacularis* (Valenciennes, 1837); *Oxyurichthys visayanus* Herre, 1927. Which has species: *Oxyurichthys ophthalmonema* (Bleeker, 1856) and *Oxyurichthys visayanus* Herre, 1927 was first discovered in the study area and north center region Vietnam.

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