2013/04/25

動物分類学

理学部　遠藤広光

Ichthyol Res (2008) 55:367–373
DOI 10.1007/s10228-008-0057-y

FULL PAPER

A new species of anglerfish (Lophiidae: *Lophiodes*) from the western Pacific

Hsuan-Ching Ho · Kwang-Tsao Shao

Lophiodes endoi Ho and Shao, 2008

エンドウヒメアンコウ（アンコウ目アンコウ科）

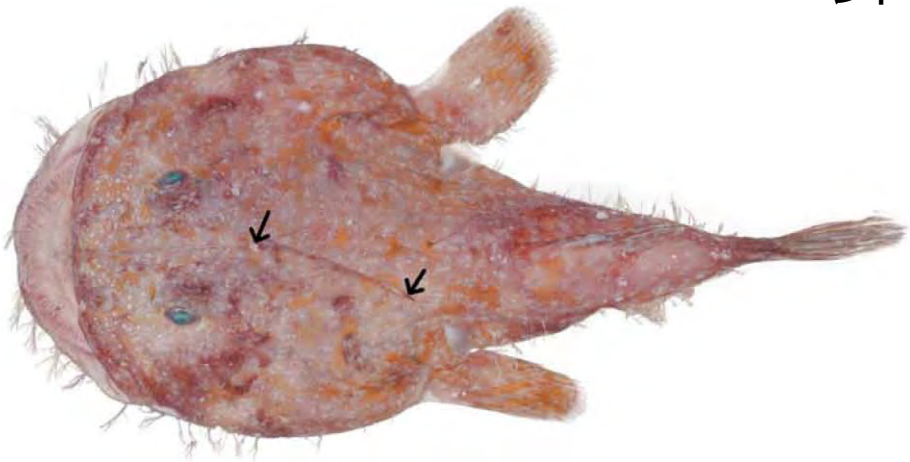

Fig. 1 *Lophiodes endoi* sp. nov., holotype, ASIZP 63175, male, 192 mm SL. Photo by H.-C. Ho. *Left arrow* indicates the esca and *right arrow* indicates the tendrils on the third dorsal spine

New lophiid from the western Pacific

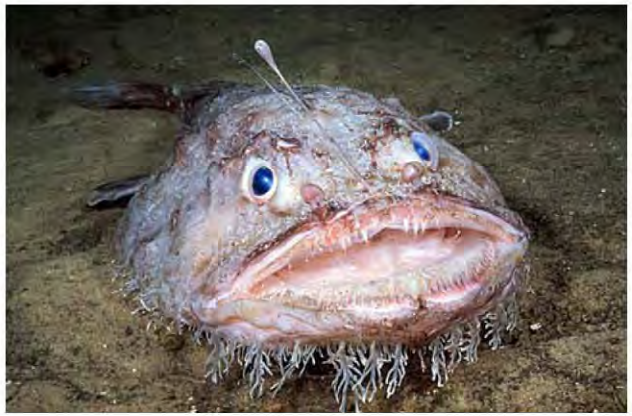

Fig. 2 Underwater photograph of *Lophiodes endoi* sp. nov., male, ca. 260 mm TL. Specimen not obtained. Photo by K. Aitken from an underwater vehicle at Greenwell Point, New South Wales, Australia, at depth about 160 fathoms (used with authority)

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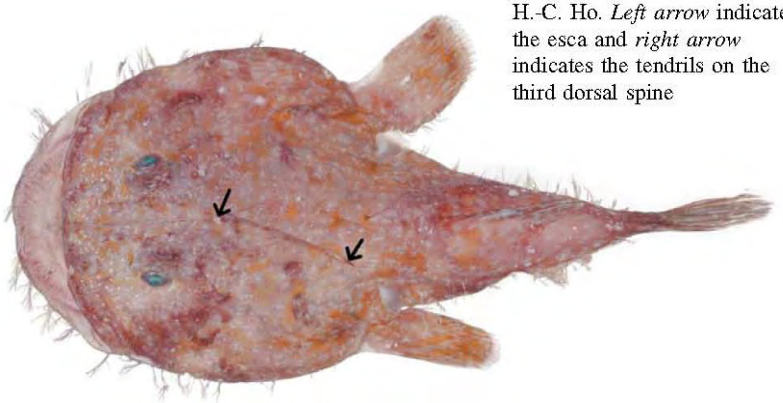

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***Lophiodes endoi* sp. nov.** (New English name: Endo's Anglerfish) (New Japanese name: Endou-himeankou) (Figs. 1, 2, 3a, 4a, 5a, 6a)

Lophiodes sp.: Okamura 1984:267, 376 (one specimen, BSKU 32471, is included as paratype); Ho and Shao 2007:28 (all specimens used are included in type series).

Holotype. ASIZP 63175, male, 192 mm, 24°53′N, 122°13′E, Nan-fang-ao, Su-ao, northeastern Taiwan, northwestern Pacific, 280–310 m, 9 May 2004.

Paratypes. 54–380 mm SL, 40 specimens. Taiwan (near type locality): AMS I.43853-001, 2 specimens, 240–270 mm; ASIZP 63170, 245 mm, 9 May 2004; ASIZP

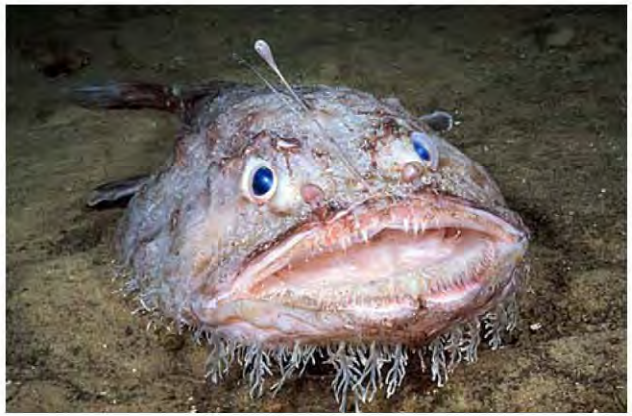
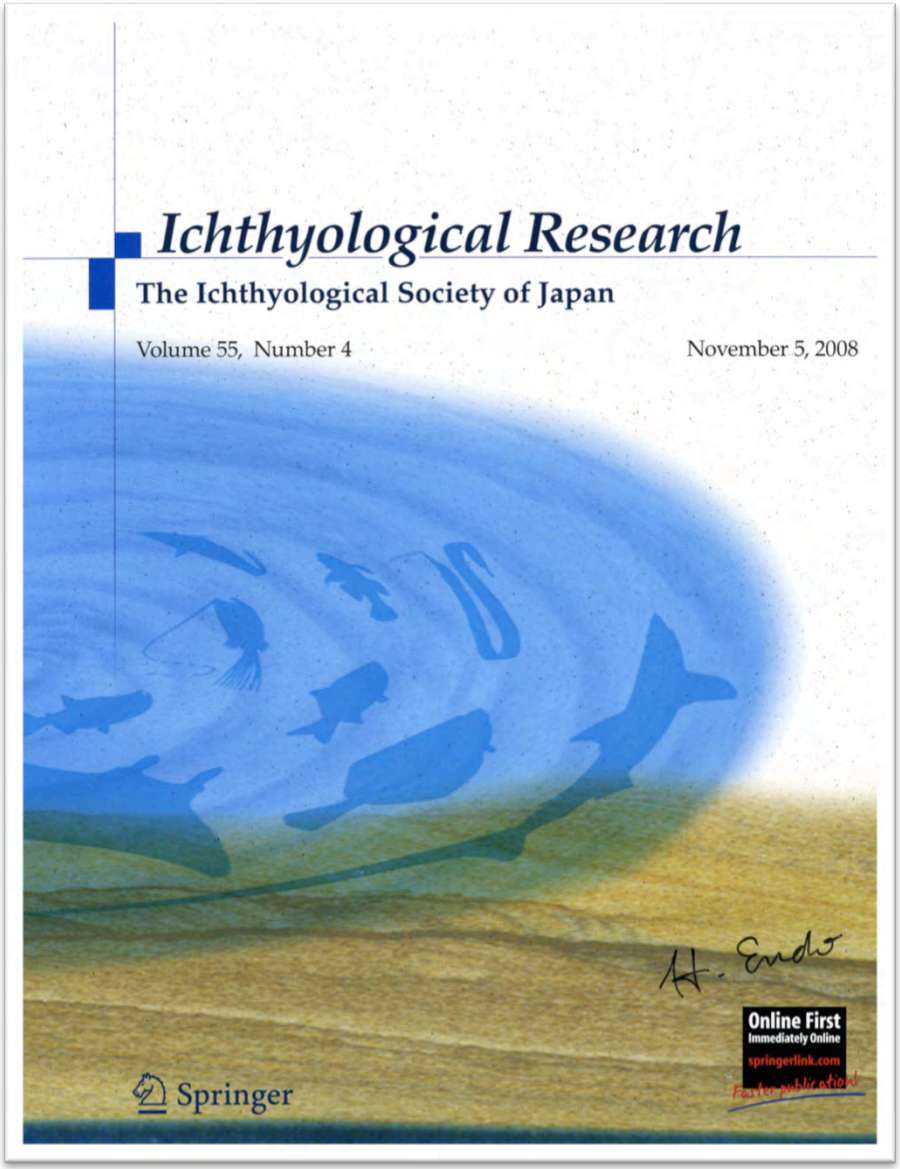
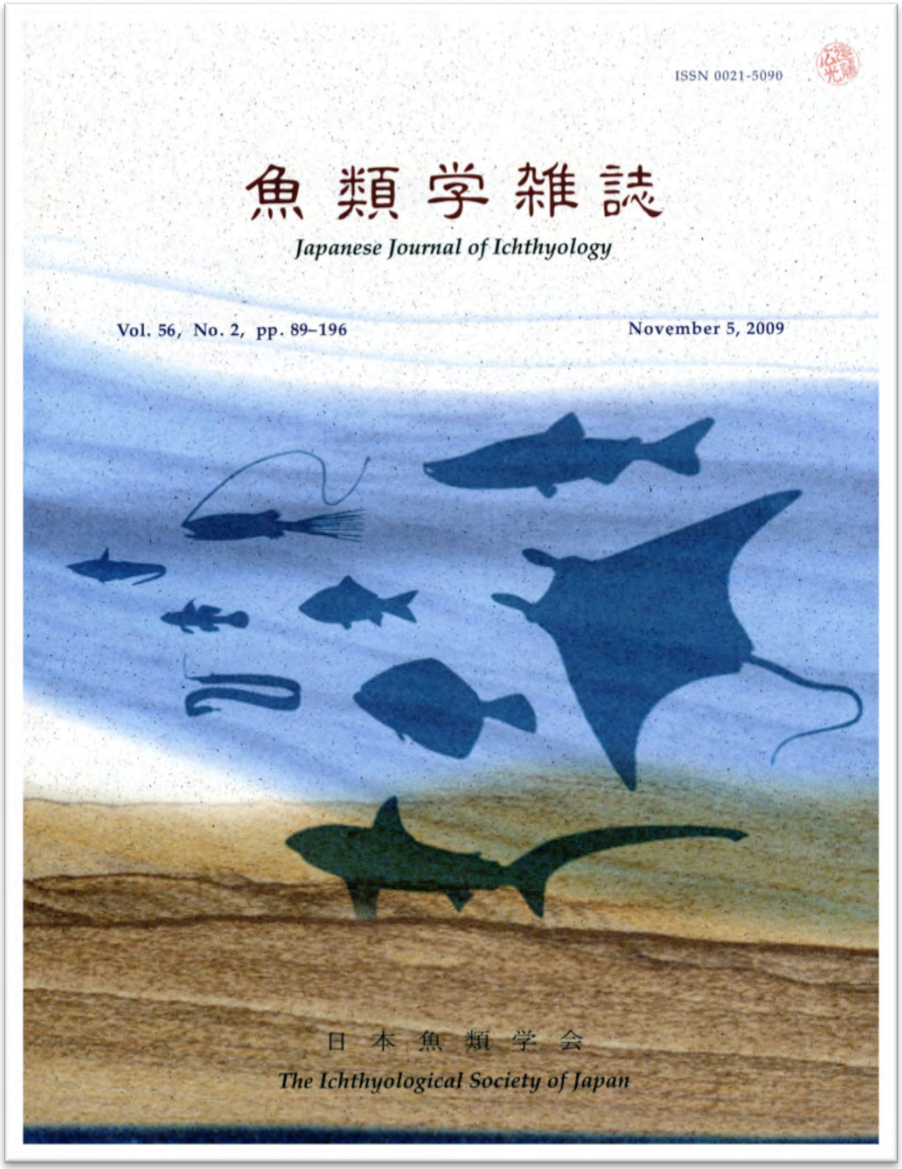


Fig. 2 Underwater photograph of *Lophiodes endoi* sp. nov., male, ca. 260 mm TL. Specimen not obtained. Photo by K. Aitken from an underwater vehicle at Greenwell Point, New South Wales, Australia, at depth about 160 fathoms (used with authority)

日本魚類学会の英文誌と和文誌

＊新種記載の論文が発表されるのは英文誌





種の違いは形態の違いで認識される

trawlers; otherwise collecting methods are described in the material examined. Symbolic codes for institutions are those provided by Leviton et al. (1985) with exception of the Biodiversity Research Center, Academia Sinica, Taipei, Taiwan (ASIZP). Data of congeners used for comparison were presented in Caruso (1981) and Ho and Shao (2007). Specimens used here for comparison are listed in the last section.

***Lophiodes endoi* sp. nov.** (New English name: Endo's Anglerfish) (New Japanese name: Endou-himeankou) (Figs. 1, 2, 3a, 4a, 5a, 6a)

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Diagnosis. A species of the *Lophiodes mutilus* group differing from congeners by the following characters: a rounded esca with paler tip (Fig. 3a); third dorsal spine bearing a pair of black tendrils located at two-thirds of illicial length (Fig. 4a); 18–22 (mainly 20–21) pectoral fin rays; a relatively short head (33.4–39.6% SL, $\bar{x} = 35.7\%$ SL); a relatively short illicium (16.5–26.7% SL, $\bar{x} = 21.7\%$

Fig. 1 *Lophiodes endoi* sp. nov., holotype, ASIZP 63175, male, 192 mm SL. Photo by H.-C. Ho. *Left arrow* indicates the esca and *right arrow* indicates the tendrils on the third dorsal spine

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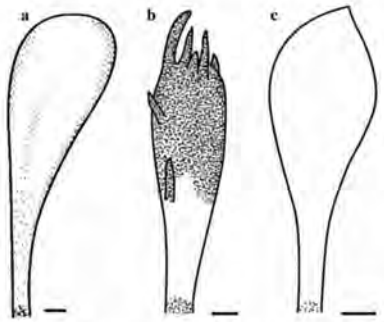


Fig. 3 Escae of three *Lophiodes* species. **a** *L. endoi* sp. nov., from the holotype; **b** *L. bruchius*, BSKU 32034, 310 mm SL; **c** *L. monodi*, from the holotype. *Bar* 1 mm

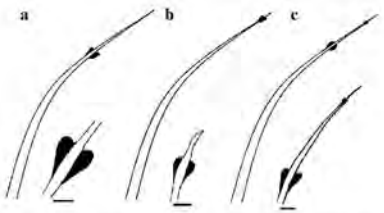


Fig. 4 Tendrils (*right side*) and their positions on third dorsal spines (*left side*) of three *Lophiodes* species. **a** *L. endoi* sp. nov., from the type; **b** *L. bruchius*, BSKU 30618, 125 mm SL; **c** *L. monodi*, from USNM 215002, 144 mm SL. *Bar* 2 mm (for tendrils only)

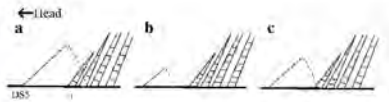


Fig. 5 Comparisons of the fifth dorsal spine lengths of three *Lophiodes* species. **a** *L. endoi* sp. nov., from the holotype; **b** *L. bruchius*, from BSKU 30618, 125 mm; **c** *L. monodi*, from the holotype. *DS5* fifth dorsal spine, *i* first dorsal fin ray

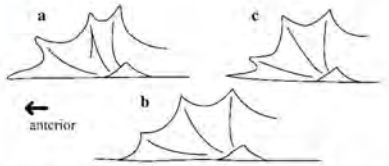


Fig. 6 Frontal spines of three *Lophiodes* species. **a** *L. endoi* sp. nov., from the holotype; **b** *L. bruchius*, BSKU 30714, 194 mm SL; **c** *L. monodi*, from the holotype

SL); a relatively short third dorsal spine (30.0–42.3% SL, $\bar{x} = 36.5\%$ SL); fifth dorsal spine relatively long, when folded back reaching base of third dorsal fin ray (Fig. 5a), and anterior frontal spine enlarged (Fig. 6a).

Description. Proportional measurements, expressed in percent of SL and HL, and meristics of the specimens of the type series are given in Table 1.

Head and body moderately depressed; head relatively short (33.4–39.6% SL, $\bar{x} = 35.7\%$ SL); tail cylindrical, somewhat depressed, tapering posteriorly; eye large; gill openings extending in front of pectoral fins; both maxilla and frontal ridge smooth, without knobs; frontal divided into three spines, anterior one enlarged, directed forward (Fig. 6a), sometimes divided into two sub-spines; sphenotic with two spines, inner spine well developed, straight and directed upward; inner frontal spine present in specimens smaller than 300 mm and reduced in specimens larger than 300 mm; single interopercular spine; parietal spine present at either side of third dorsal spine base, reduced in larger specimens; hyomandibula with two spines, anterior spine smaller, becoming blunt with three knobs in larger specimens; humeral spine well developed with three to four spines.

All dorsal fin spines, except for the third, devoid of tendrils; second to sixth dorsal spines bearing a tiny dark bulb at tip in most specimens; illicium lightly pigmented, relatively short (16.5–26.7% SL, $\bar{x} = 21.7\%$ SL), when folded back reaching third dorsal spine base, reaching sphenotic spines in larger specimens; esca a rounded bulb, slightly darker than illicium, tip pale (Fig. 3a); second dorsal spine slightly longer than illicium, when folded back

形，計数・計測形質と分布の違い

Table 1 Morphometric data, expressed in percent SL and HL, and meristics of the type series of *Lophiodes endoi* sp. nov.

		ASIZP 63175			
		Holotype	Holotype + paratypes		
Standard length		192 mm	54–380 mm (n = 41)		
Proportion as % SL			Range	Average	SD
Head length		39.6	33.4–39.6	35.7	1.6
Illicial length		23.2	16.5–26.7	21.7	2.3
Second dorsal spine length		30.0	22.7–30.2	26.9	2.2
Third dorsal spine length		38.5	30.0–42.3	36.5	2.9
Tail length		25.4	20.2–28.4	25.4	1.8
Proportion as % HL					
Head width		19.8	49.8–61.0	56.6	2.7
Head depth		60.1	60.1–72.4	65.7	3.0
Distance between inner sphenotic spines		39.2	39.2–47.9	44.3	2.1
Distance between posterior frontal spines		33.9	33.9–44.0	40.1	2.6
Snout width		16.6	16.6–22.5	19.1	1.5
Snout length		43.1	40.9–58.0	49.2	5.3
Distance between pterotic and sphenotic spines		15.5	14.9–19.3	17.4	1.1
Distance between quadrate and anterior palatine spines		67.7	48.3–87.2	75.7	7.6
Distance between opercular and subopercular spines		36.5	36.5–50.1	43.0	3.4
Meristics	n	Holotype	Range	Frequency	
Dorsal fin rays	41	8	7–8	7(5), 8(36)	
Anal fin rays	41	6	5–6	5(2), 6(39)	
Pectoral fin rays	41	20	18–22	18(1), 19(1), 20(16), 21(21), 22(2)	
Vertebrae	12	19	19	19(12)	

reaching between third dorsal spine base and end of neurocranium; third dorsal spine relatively short (30.0–42.3% SL, $\bar{x}$ = 36.5% SL), bearing one pair of darkly pigmented tendrils at about two-thirds its length (Fig. 4a), when folded back reaches third dorsal fin ray base, reaching origin of soft dorsal fin in larger specimens; fourth dorsal spine absent; fifth dorsal spine relatively long, when folded back reaching base of third dorsal fin ray, reaching origin of soft dorsal fin in larger specimens (Fig. 5a); sixth dorsal spine very short, when folded back not reaching origin of dorsal fin, embedded under skin in larger specimens. Anal fin extending beyond caudal fin base in smaller specimens, reaching caudal fin base in larger specimens.

Coloration when fresh (Fig. 1). Based on the holotype and paratypes collected from Taiwan: reddish-brown background with diffuse orange yellowish patches on dorsal surface, those patches disappearing with time; ventral surface pale gray; illicium paler than surface; esca darker than dorsal surface, tip pale; pectoral fin tip pale, dorsal surface of fin as body color; some darker patches associated with spines, fin bases, and caudal peduncle; peritoneum black.

Coloration in life (Fig. 2). Based on a series of underwater photographs of a male specimen taken from Greenwell Point, New South Wales, Australia: dorsal surface pale brown with numerous medium-sized, diffuse light blue or gray patches; illicium paler; esca darker at base and paler at tip; some darker patches associated with head spines and upper jaw; pectoral fin margin pale, dorsal surface with some diffuse pale blue spots.

Coloration in preservative. Uniform gray to dark on dorsal surface, pale gray on ventral surface with some darker patches associated with spines, fin bases, and caudal peduncle; a pair of dark tendrils on the third dorsal spine; peritoneum black.

Size. Up to 380 mm SL (paratype, ASIZP 65426).

Distribution. *Lophiodes endoi* is widely distributed in the western Pacific (Fig. 7), from off Japan, Taiwan and Australia, at depths of 261–750 m. Specimens were collected from southeastern Japan (Okinawa trough, Tosa Bay, and Kyushu–Palau Ridge) at depth range 261–600 m. In Taiwanese waters this species is usually captured together with *Lophiodes mutilus* at depths of about 280–310 m, and some may range deeper. Specimens were collected

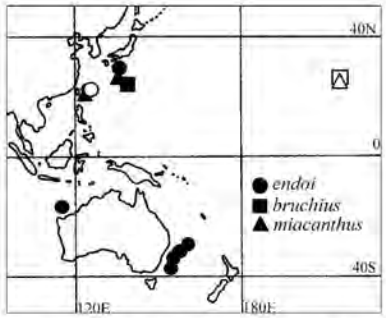


Fig. 7 Distribution map of three *Lophiodes* species from the western Pacific and central Pacific. *Open dots* mean the type localities. One symbol may represent more than one capture

from the Tasman Sea of southeastern Australia at depths of 300–750 m, and a series of photographs were taken of a specimen at a depth of 288 m at Greenwell Point, New South Wales, Australia, by an underwater vehicle (K. Aitken, personal communication, 20 March 2005). Two specimens were collected from the northwest shelf off Australia at depths of 492–520 m.

Etymology. *Lophiodes endoi* is named in honor of Dr. Hiromitsu Endo, Associate Professor of Faculty of Science, Kochi University, in recognition of his excellent work in ichthyology, his friendship, and for supplying specimens for this study.

Comparisons. *Lophiodes endoi* can be easily distinguished from *L. miacanthus* by having a pale illicium and a rounded esca (vs. a black illicium and a cirrus at tip of esca).

It is most similar to *L. bruchius* from the western and central Pacific in having a pair of dark tendrils on the third dorsal spine, but differs in having a shorter illicium (16.5–26.7% SL vs. 25.0–45.0% SL; Fig. 8), third dorsal spine relative short (30.0–42.3% SL vs. 27.8–62.6% SL; Fig. 9), a rounded esca with a paler tip (vs. darker tip with cirri; Fig. 3b), dark tendrils located at two-thirds of illicial length (vs. four-fifths to near the tip; Fig. 4b), and a longer fifth dorsal spine that reaches the base of first to third dorsal fin ray (vs. short and not reaching base of soft dorsal fin; Fig. 5b). In addition, the length of the third dorsal spine shows slightly negative allometric growth, but the slope is not steeper than that of *L. bruchius* (Fig. 9).

It is similar to *L. mutilus* of the Indo-West Pacific in having the inner frontal spine, but differs in having a shorter the third dorsal spine (30.0–42.3% SL vs. 50.0–55.7% SL in Ho and Shao 2007), a pair of dark tendrils on third dorsal fin spine (vs. more than 5 pairs) and a larger esca (>2 mm vs. <2 mm in diameter).

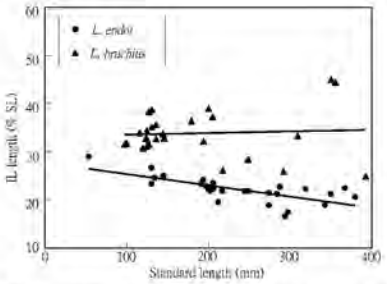


Fig. 8 Proportions of illicial length versus standard length for *L. bruchius* and *L. endoi* sp. nov

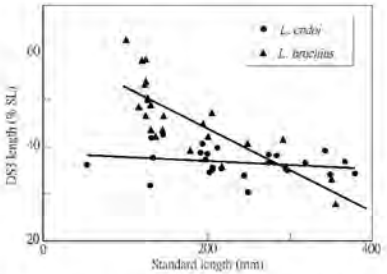


Fig. 9 Proportions of third dorsal spine length versus standard length for *L. bruchius* and *L. endoi* sp. nov

It is also similar to a fourth species, *Lophiodes monodi* Le Danios 1971, in the northwestern Atlantic in having a rounded esca, but differs in having a relatively short illicium (16.5–26.7% vs. 26.0–35.9% SL in Caruso 1981), a single pair of dark tendrils on the third dorsal spine (vs. two pairs; Fig. 4c), and anterior frontal spines enlarged (vs. relatively small; Fig. 6c).

Comments on *Lophiodes bruchius*. We examined 27 specimens (98–392 mm SL, listed below) collected from the Kyushu–Palau Ridge, southern Japan. *Lophiodes miacanthus* reported by Yamakawa (1982) and Nakabo (1984) is identified as *L. bruchius* by us. All characters and morphometrics of this species agreed well with the data provided by Caruso (1981) and the type specimens examined by the first author, except for the morphology of the esca and length of illicium.

Most specimens of *L. bruchius* examined by us have a rounded or elongated and cylindrical esca, instead of a leaf-like structure, usually bearing some cirri on its tip

分類学とは何か　用語の説明

- taxonomy と systematics, classification
- taxon と taxa
- Phylogeny, phylogenetics

種とは何か？

エルンスト・マイア（ドイツの鳥類学者）Ernst Walter Mayr（1904–2005)

「生物学的種」の概念を提唱

動物分類学を，アルファ分類学，ベータ分類学，ガンマ分類学に整理
その後，macrotaxonomy と microtaxonomy へ

動物分類学の3つの段階

- アルファ分類学　種の分類，記載，命名
- ベータ分類学　生物間の系統
- ガンマ分類学　種内の変異，種の実態，種分化

Myer and Ashlock (1991) Principles of systematic zoology

- Microtaxonomy 種レベルの分類学
- Macrotaxonomy 種レベルより上位の分類学

生物学的種概念

Biological species concept

マイア 「種とは，実際にも，可能性においても，お互いに交配しうる自然集団である．それは他のそのような集団から生殖の面で隔離されている」

生殖的隔離機構
（reproductive isolating mechanism)

種＝生物学的種であるが…

生物学的種概念の問題点

- 有性生殖生物にしか適用できない

  ＊生殖的に隔離された集団であるため，種間で遺伝的融合はない

  × 無性生殖生物

  × 雑種起源の植物の種

「種」の概念は？

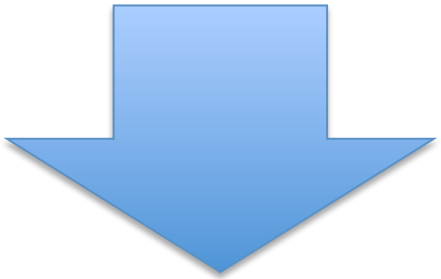
- Mayden (1997) によると22以上提唱された

- 生物学的種概念
- 遺伝学的種概念
- 進化学的種概念
- 系統学的種概念
- 形態学的種概念
- 類型学的種概念　学名のシステムに関係

形態学的種とは

Morphological species concept

形態のみにもとづき，その他の属性を考慮に入れない種概念

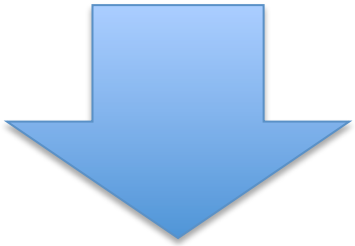


個体発生上や性的二形の差異はどうする？

類型学的種とは

Typological species concept

★二語名法による学名のシステム



厳密にはホロタイプとされた
１標本の形態に基づく

種とは？

- 直海（2008）
  「種とは“便宜的な分類単位”である」

  理想的な種概念はないであろう

- 三中（2008)
  「種問題を解決することは，もともと不可能である」

形質と変異

「形質」は種がもつ属性あるいは特徴

形態的，生化学的，遺伝的（分子的），

生態的…なもの何でも

生物には「変異」がある

種であれば，個体により差はあるが一定の範囲内に収まるハズ

形質の違いと程度

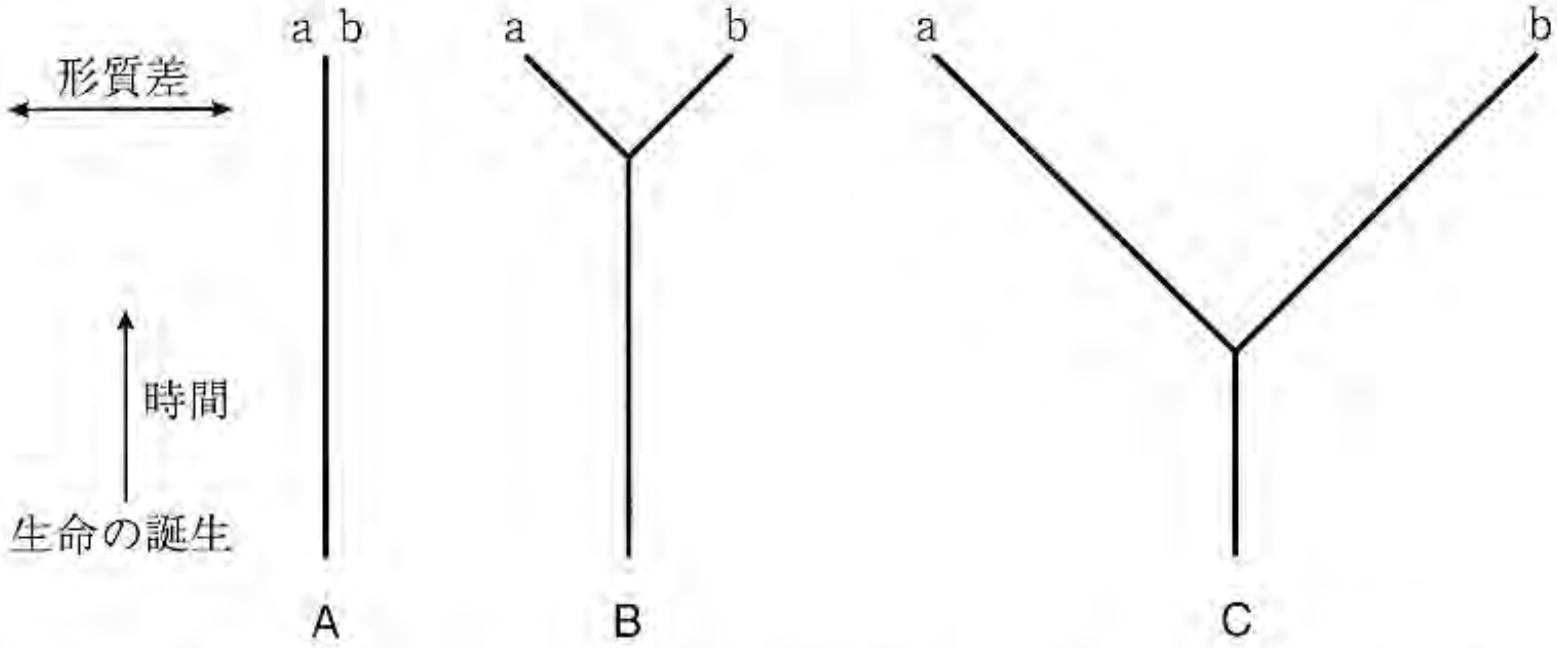


図 27.2　生物のもつ形質とそのたどってきた歴史の関係（馬渡，1994 a）
A：生命の誕生から今日まで，ほとんど同じ歴史をもつ二つの生物は同種．B：二つの生物がよく似ているのは，彼らが共通祖先から分かれて今日にいたるまでの時間が短いため．C：生物どうしが似ていないのは，彼らが共通祖先から分かれて今日にいたるまで長い時間がすぎているため．

馬渡（2006）より

共通形質は共通祖先由来か？

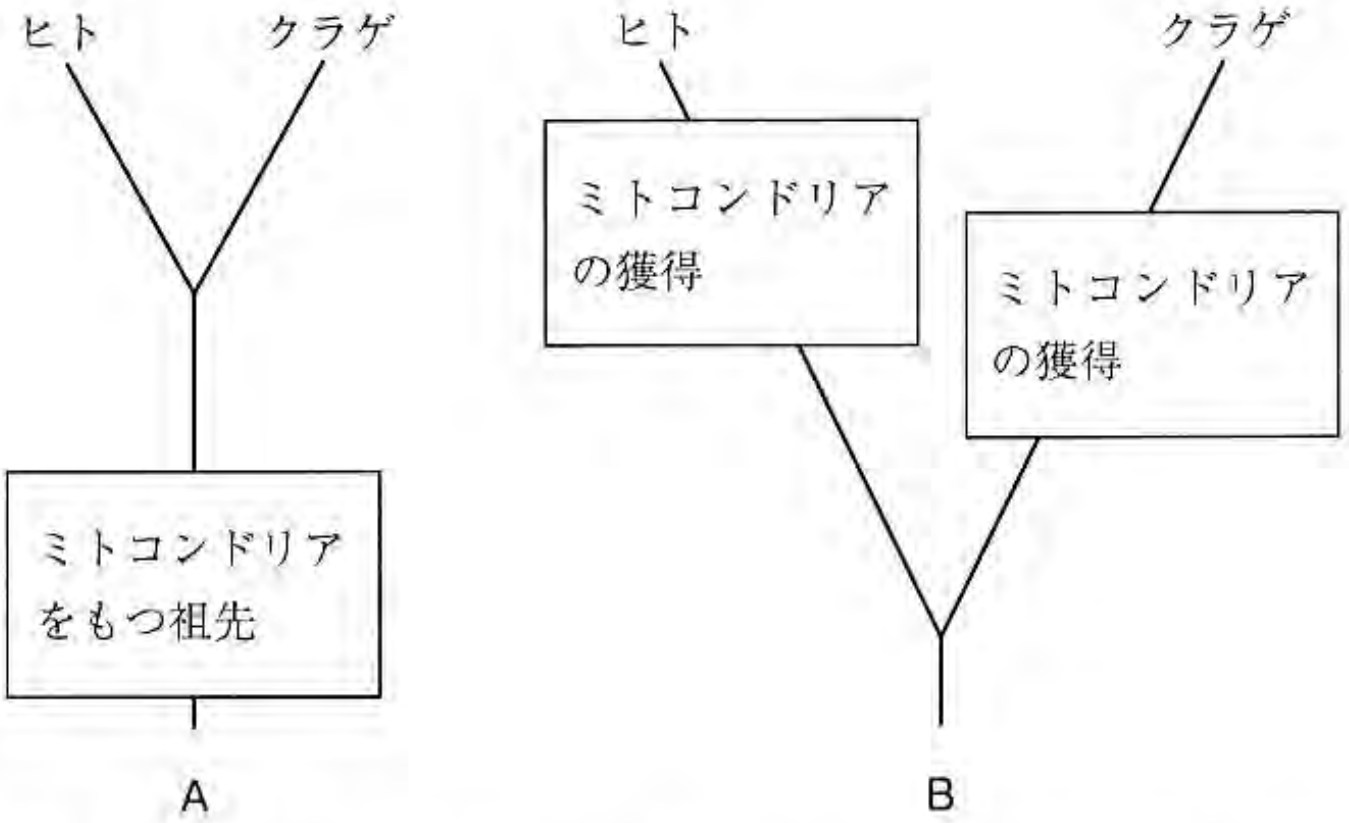
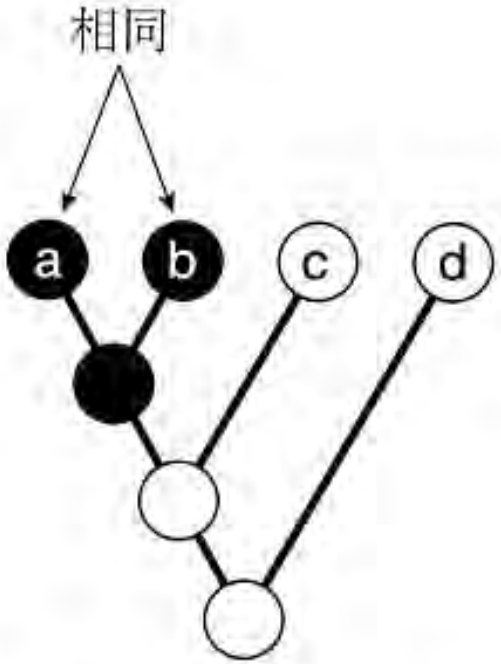


図 27.3　生物が共通形質をもつことの二つの意味（馬渡，1989）
A：共通形質を祖先共有の証拠とみた場合の系統図．B：共通形質を収斂の結果とみた場合の系統図．

馬渡（2006）より

同じようで同じではない形質

ホモロジー



ホモプラシー（非相同）

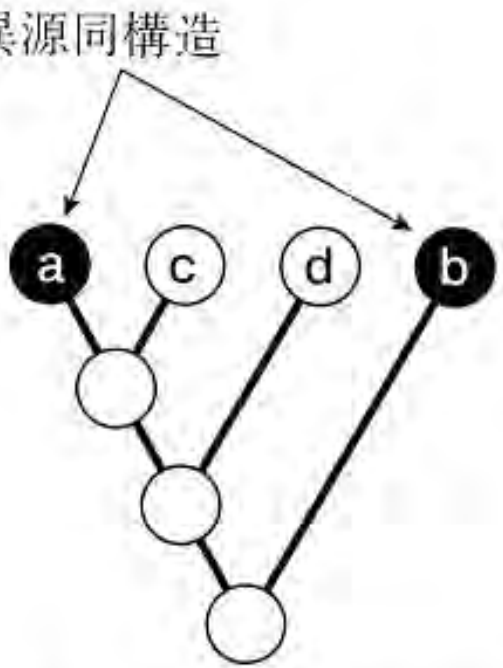


図 27.4　相同と異源同構造（Page and Holmes, 1998）

馬渡（2006）より

ホモロジーとホモプラシーの問題

実はかなりややこしい…

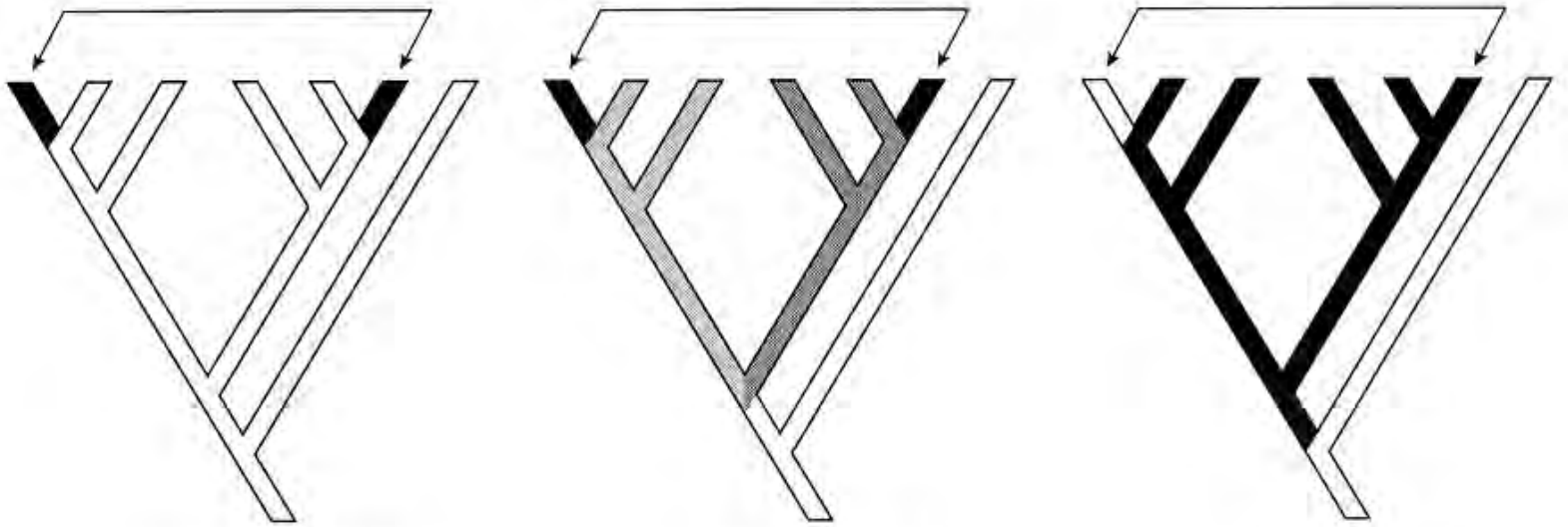


図 27.5 異源同構造の種類（Page and Holmes, 1998）
A. 平行進化：共通祖先形質状態から独立に同じ形質が進化．B. 収斂進化：異なる祖先形質状態から独立に同じ形質が進化．C. 先祖返り：一度失われた祖先形質状態が復活．

＊先祖返り　atavisim

馬渡（2006）動物分類学30講より

単系統，側系統，多系統

monophyly　paraphyly　polyphyly

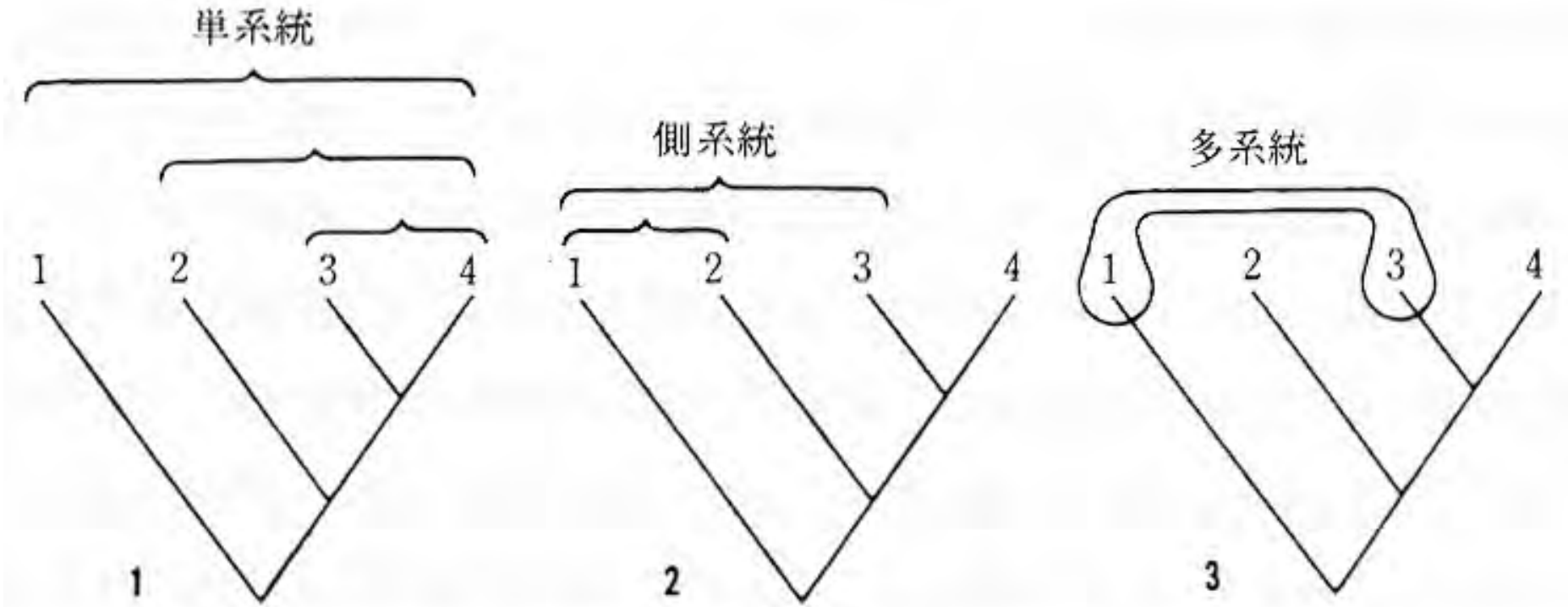
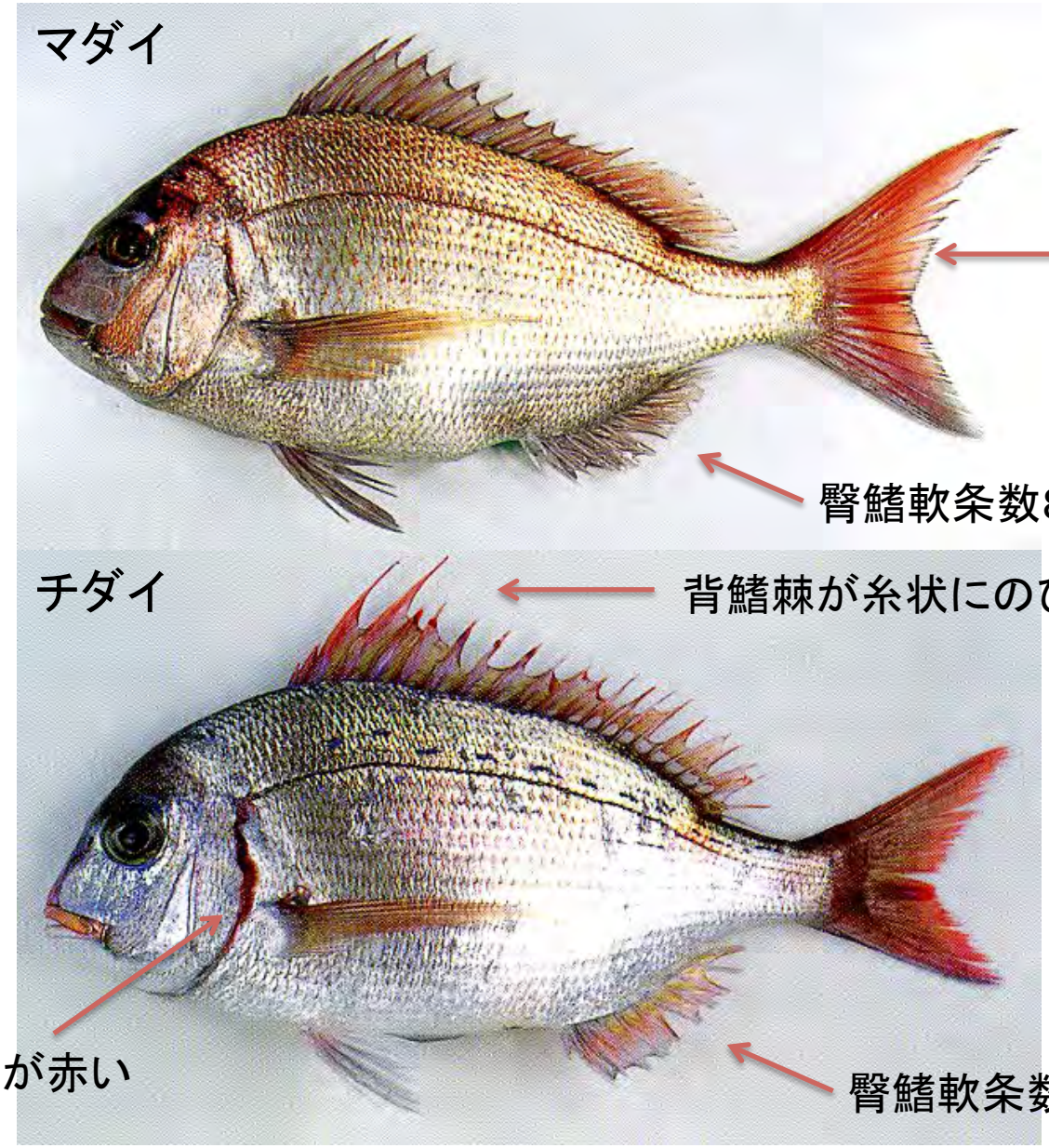


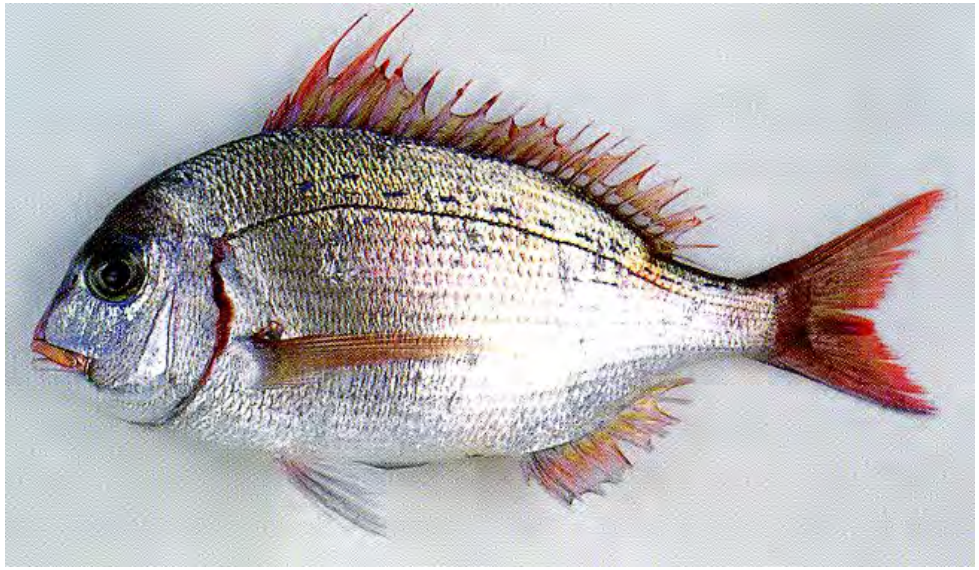
図 31　単系統，側系統，多系統の違い（Ridley, 1986 より）

馬渡（1994）より

マダイとチダイ



チダイの学名



Iwatsuki et al. (2007) により変更された

Evynnis japonicus Tanaka, 1931

Evynnis tumifrons (Temminck and Schlegel, 1843)

キダイの学名

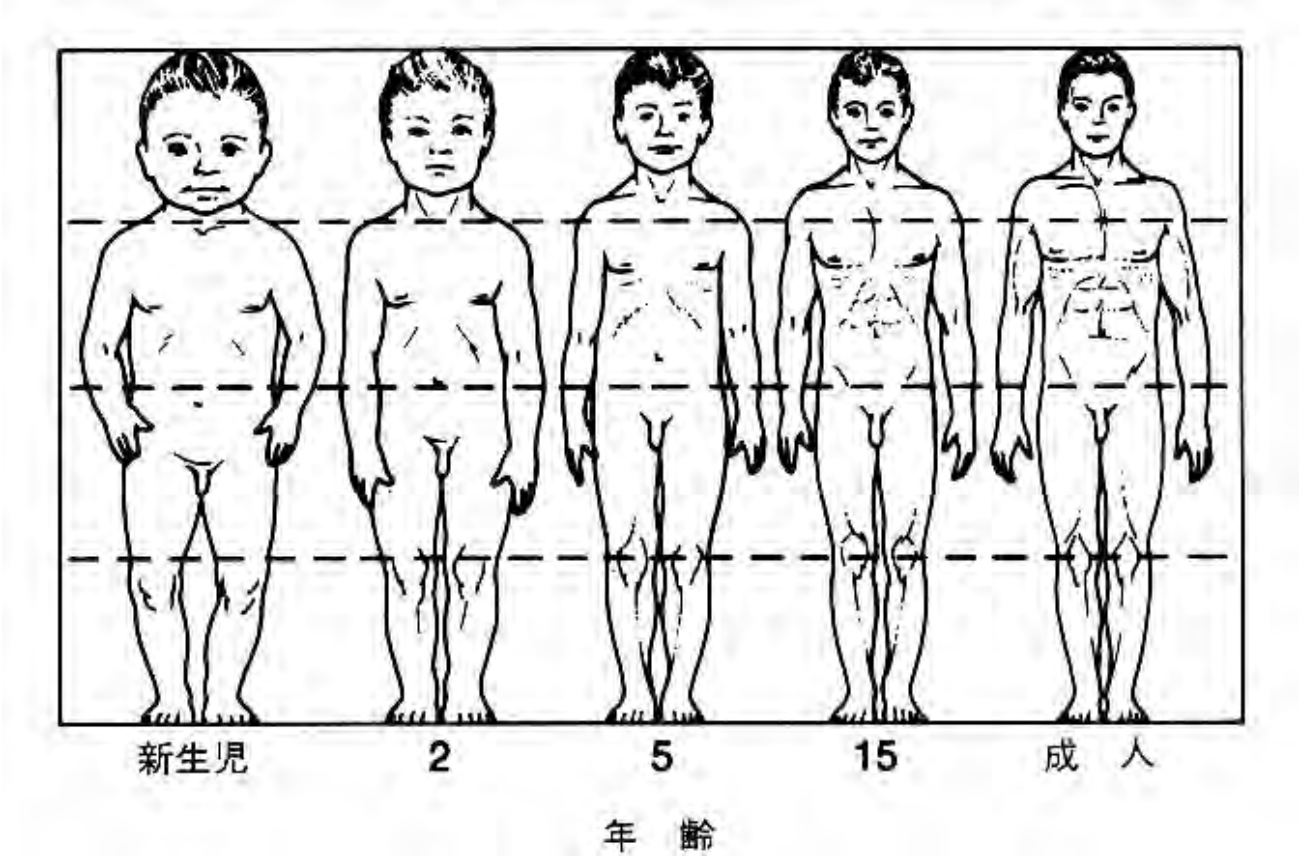
Iwatsuki et al. (2007) により変更された

Dentex tumifrons (Temminck and Schlegel, 1843)

Dentex hypselosomus Bleeker, 1854

ヒトにおける相対成長

成長や成熟は様々なホルモンの調節により制御される



個体発生によりプロポーションが変わる

フツイマ（1991）「進化生物学」より

キュウセンの雄と雌

キュウセン　25cm・雄。[佐渡，7m，田口]

キュウセン　20cm・雄。[伊豆半島，5m，吉野]

キュウセン　15cm・雌。[佐渡，7m，吉野]

キュウセン　20cm・雄。婚姻色。[佐渡，10m，吉野]

キュウセン　15cm・雌。砂潜り。[伊豆半島産，小林]

キュウセン　18cm・雌雄中間。[伊豆半島，15m，小林]

キュウセン　4cm。[伊豆半島，3m，小林]

キュウセン　15cm・雌。眠り。[伊豆半島産，小林]

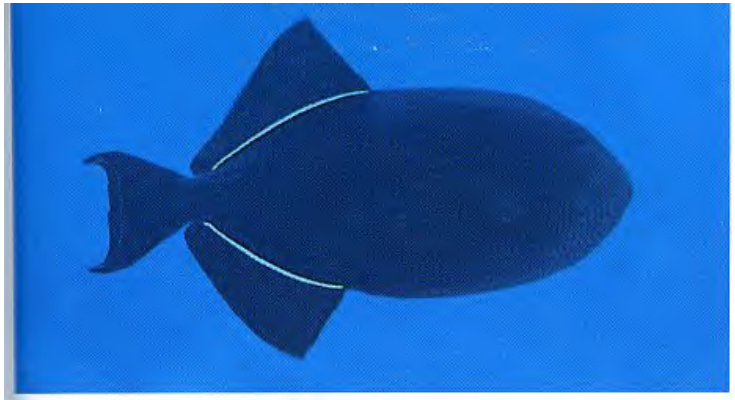
写真は岡村･尼岡，編．1993.「日本の海水魚」山と渓谷社より

フグ目モンガラカワハギ科

モンガラカワハギ

Photo by H. ENDO

クロモンガラ（左上を除く）



ソロイモンガラ　35cm。[西表島，7m，矢野]

クロモンガラ　18cm。[西表島，10m，矢野]

ソロモンガラ　12cm。[ポナペ，8m，小林]

クロモンガラ　25cm。[パラオ，15m，吉野]

モンガラカワハギ科ナメモンガラ属の分類学的再検討

BULLETIN OF MARINE SCIENCE, 28(4): 688–706, 1978 1978年

A REVISION OF THE TRIGGERFISH GENUS *XANTHICHTHYS*, WITH DESCRIPTION OF A NEW SPECIES

John E. Randall, Keiichi Matsuura, and Akira Zama

ABSTRACT

The balistid genus *Xanthichthys* is characterized by: convex dorsal and ventral profiles of head, a projecting lower jaw, three to six longitudinal grooves on side of head, a groove running anteriorly from eye, no osseous plates behind gill opening, a narrow caudal peduncle, and second dorsal and anal fins elevated anteriorly. It consists of five species: the Atlantic *X. ringens* (Linnaeus), the Indo-West-Pacific *X. lineopunctatus* (Hollard), *X. auromarginatus* (Bennett), and *X. caeruleolineatus* new species, and the Pacific *X. mento* (Jordan and Gilbert). *X. caeruleolineatus* is distinctive in its low dorsal soft-ray count (26 to 28), low anal-ray count (23 to 25), high number of head-scale rows (21 to 24), large size (attains more than 300 mm SL), and color pattern which features an irregular blue longitudinal line along the side of the body. *X. mento* and *X. auromarginatus* are sexually dichromatic.

The triggerfish genus *Xanthichthys* was established by Kaup in Richardson (1856). It is a well defined unit, and since its inception most species reported in the literature have been correctly allocated to the genus. the Atlantic, *lineopunctatus* (Hollard), Indo-Pacific, and *mento*, Pacific (the only species occurring in the eastern Pacific).

Klausewitz (1974) utilized the name *X. auromarginatus*; however, he stated that it

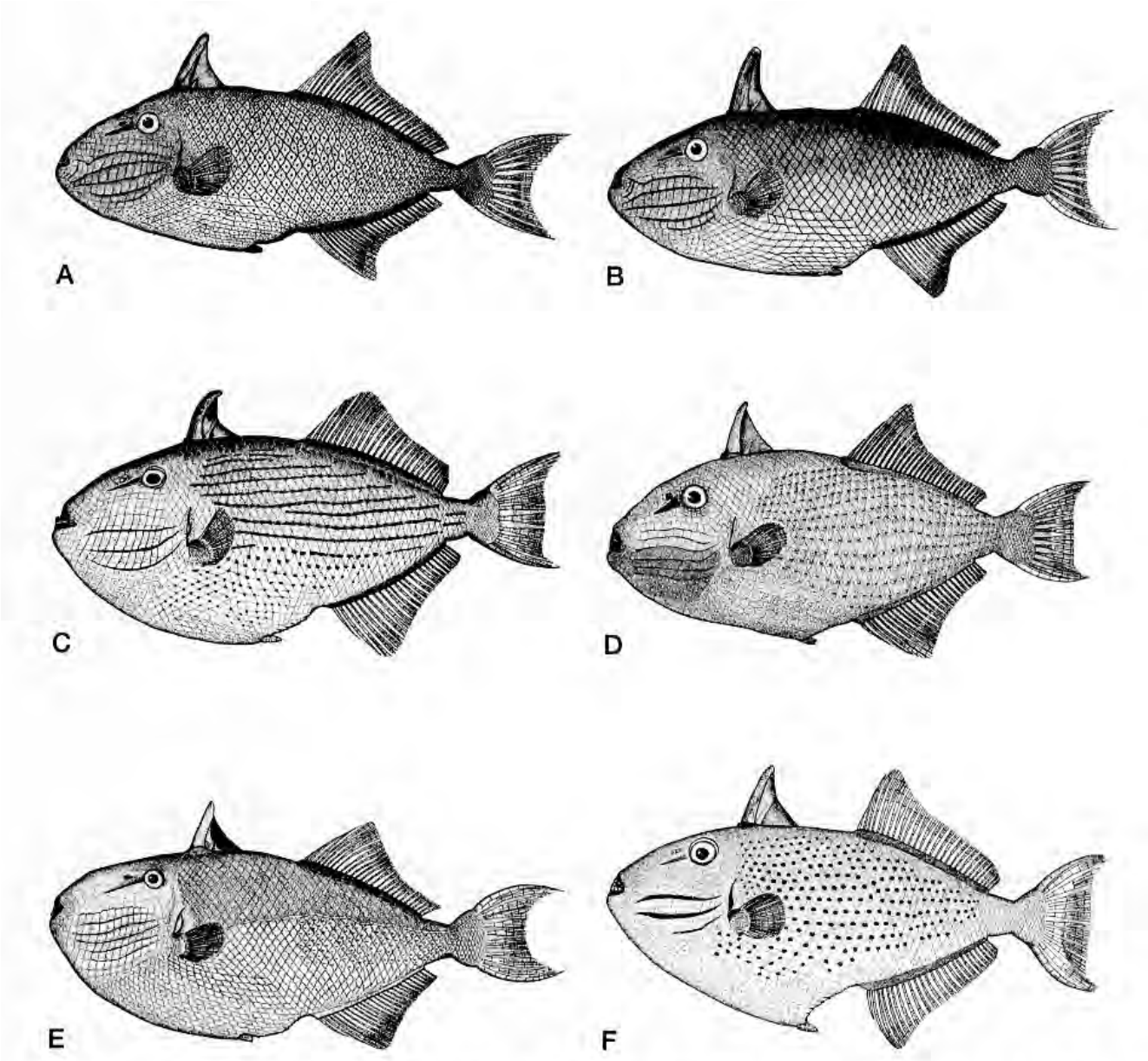


図2-6　ナメモンガラ属の５種．A：ナメモンガラ（オス），B：ナメモンガラ（メス），C：スジナメモンガラ，D：ホシモンガラ，E：アオスジモンガラ，F：*Xanthichthys ringens*.

松浦 (2009) より

ナメモンガラ属 *Xanthichthys* 5種

X. ringens
大西洋に分布

X. auromarginatus
ホシモンガラ♂

X. mento
ナメモンガラ♀

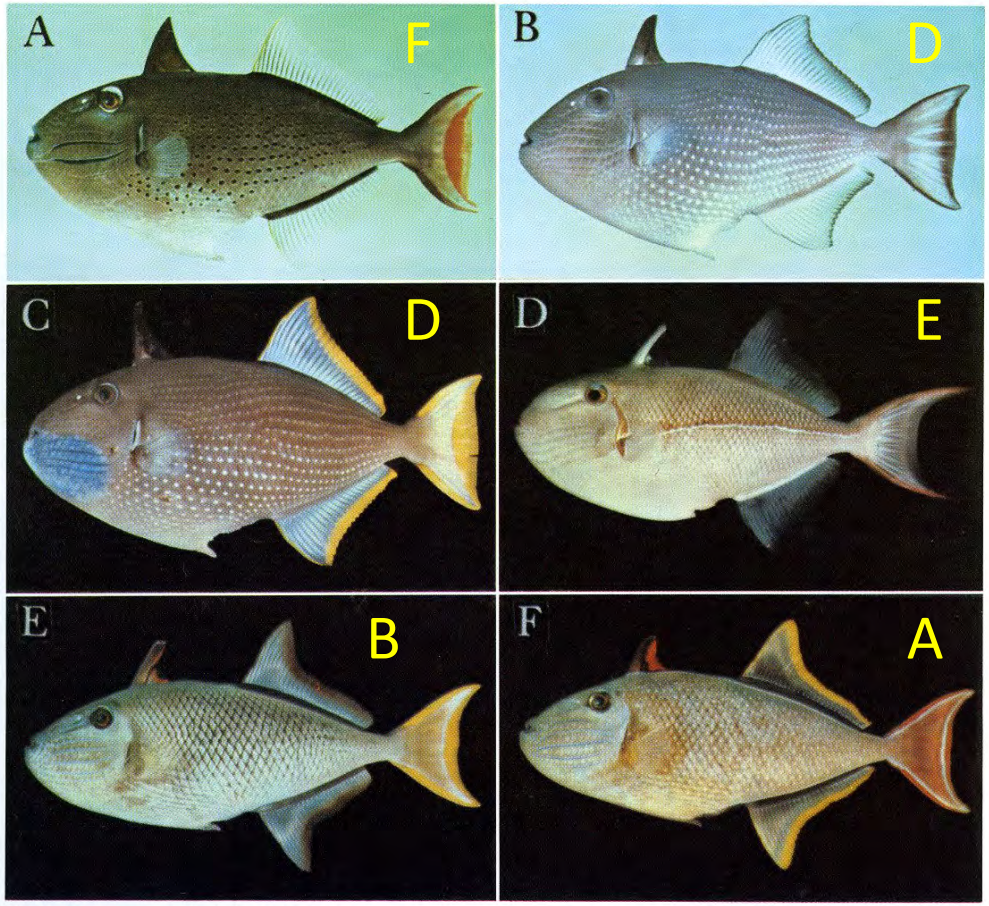


Figure 2. A. *Xanthichthys ringens*, 141 mm SL, Puerto Rico (specimen lost). B. *X. auromarginatus*, female, 113 mm SL, Mauritius, BPBM 20010. C. *X. auromarginatus*, male, 122 mm SL, Mauritius, BPBM 20010. D. Holotype of *X. caeruleolineatus*, male, 196 mm SL, Manihi, Tuamotu Archipelago, BPBM 13211. E. *X. mento*, female, 130 mm SL, Pitcairn, BPBM 16822. F. *X. mento*, male, 155 mm SL, Manihi, Tuamotu Archipelago, BPBM 13256.

X. auromarginatus
ホシモンガラ♀

X. caeruleolineatus
アオスジモンガラ
新種記載

X. mento
ナメモンガラ♂

インド–太平洋域のナメモンガラ属 *Xanthichthys*の４種

ホシモンガラ♂

ホシモンガラ　20cm・雄。[西表島，30m，矢野]

ホシモンガラ　20cm・雌。[西表島，30m，矢野]

ホシモンガラ♀

アオスジモンガラ

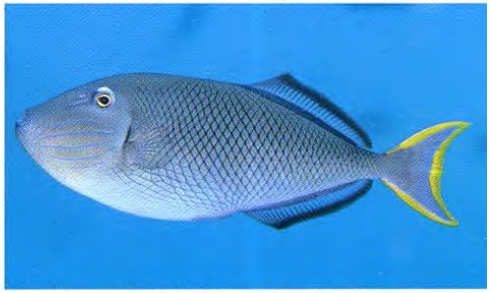
アオスジモンガラ　25cm。[小笠原諸島，20m，吉野]

スジナメモンガラ　20cm。[久米島，45m，坂本有正]

X. lineopunctatus
スジナメモンガラ

ナメモンガラ
♂の婚姻色なし

ナメモンガラ　20cm・雄。[小笠原諸島，20m，吉野]



ナメモンガラ　20cm・雌。[小笠原諸島，23m，吉野]

ナメモンガラ♀

ナメモンガラ
♂の婚姻色あり

ナメモンガラ　20cm・雄。婚姻色。[八丈島，15m，大方]

ナメモンガラ　5 cm。[八丈小島，5 m，吉野]

ナメモンガラ若魚

山渓「日本の海水魚」より

計数形質の変異幅

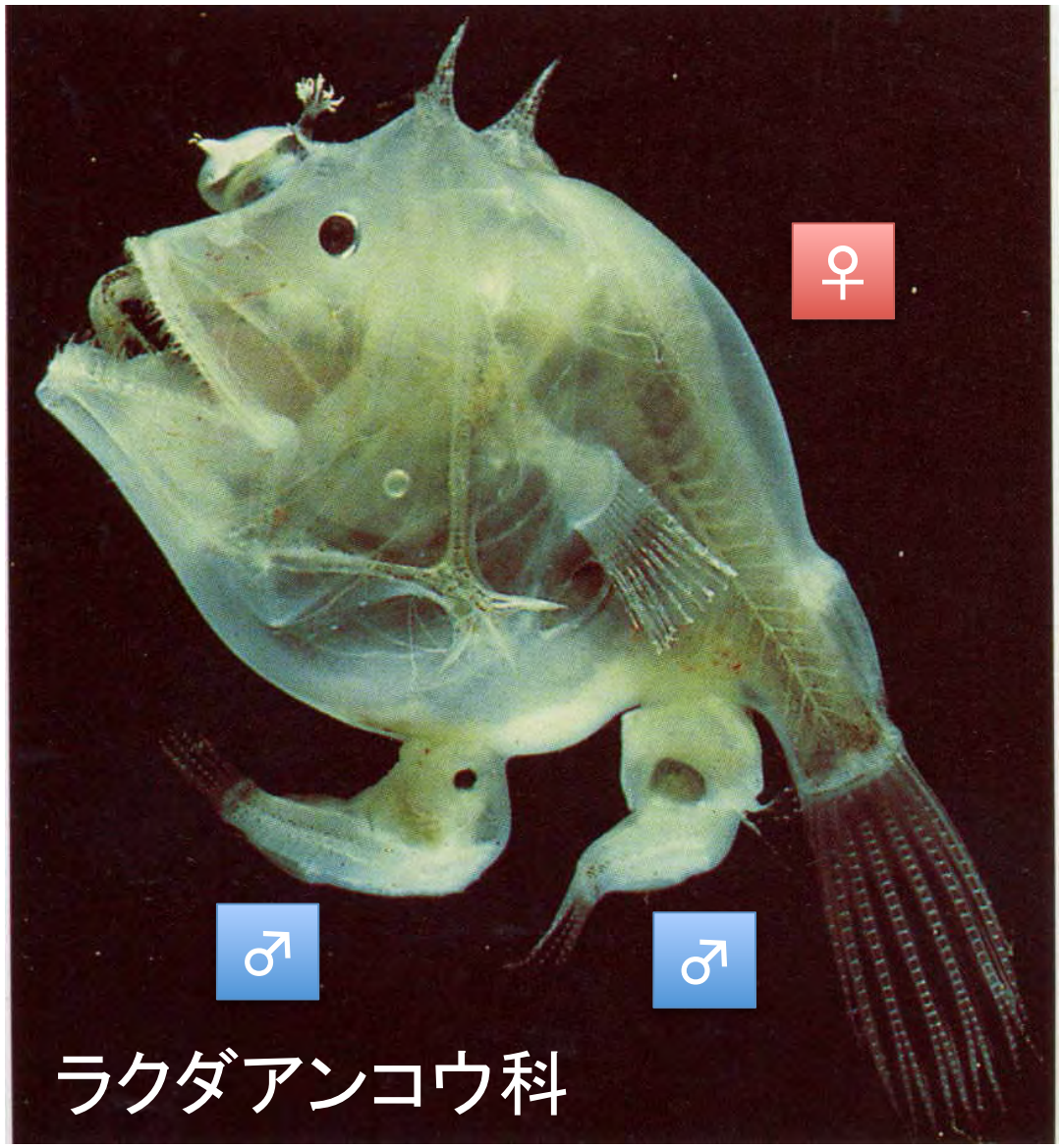
表2-1　ナメモンガラ属魚類の体側縦列鱗数の頻度分布.

種名	縦列鱗数											
	39	40	41	42	43	44	45	46	47	48	49	50
Xanthichthys ringens	3	7	11	11	5	3						
スジナメモンガラ						1	1	2	1	4	2	2
ホシモンガラ				1	4	8	3	2	1			
ナメモンガラ			1	1	2	7	10	5	3	1	2	1
アオスジモンガラ		1	2	5	1	2	3	2	1	1		

表2-2　ナメモンガラ属魚類の鰭条数の頻度分布.

種名	背鰭軟条数							臀鰭軟条数						
	26	27	28	29	30	31	32	23	24	25	26	27	28	29
Xanthichthys ringens	2	6	23	9				1	5	17	16	1		
スジナメモンガラ		1	6	6						5	7	1		
ホシモンガラ		5	7	6						7	10	12		
ナメモンガラ				4	17	11	1				1	15	16	1
アオスジモンガラ	4	13	1					1	14	1				

チョウチンアンコウ亜目の著しい性的二形



Paxton and Eschmeyer (1998) Encyclopedia of Fishes, 2nd ed. より

ヨゴレヘビギンポ（ヘビギンポ科）

アカネキンチャクダイ

高知県柏島で撮影

キンチャクダイとキヘリキンチャクダイ

キンチャクダイ　14cm。[高知県沖ノ島，20m，岡田]

キンチャクダイ 22cm。[伊豆半島, 20m, 小林]

キンチャクダイ　3 cm。[伊豆半島, 20m, 小林]

キンチャクダイ　4 cm。[伊豆半島, 18m, 吉野]

キンチャクダイ　4 cm。[伊豆半島, 10m, 田口]

キヘリキンチャクダイ　20cm。[トカラ列島，15m，吉野]

キヘリキンチャクダイ　6 cm。[伊豆半島，40m，御宿]

タテジマキンチャクダイ（キンチャクダイ科）

タテジマキンチャクダイ

タテジマキンチャクダイ

タテジマキンチャクダイ

タツノオトシゴの二型

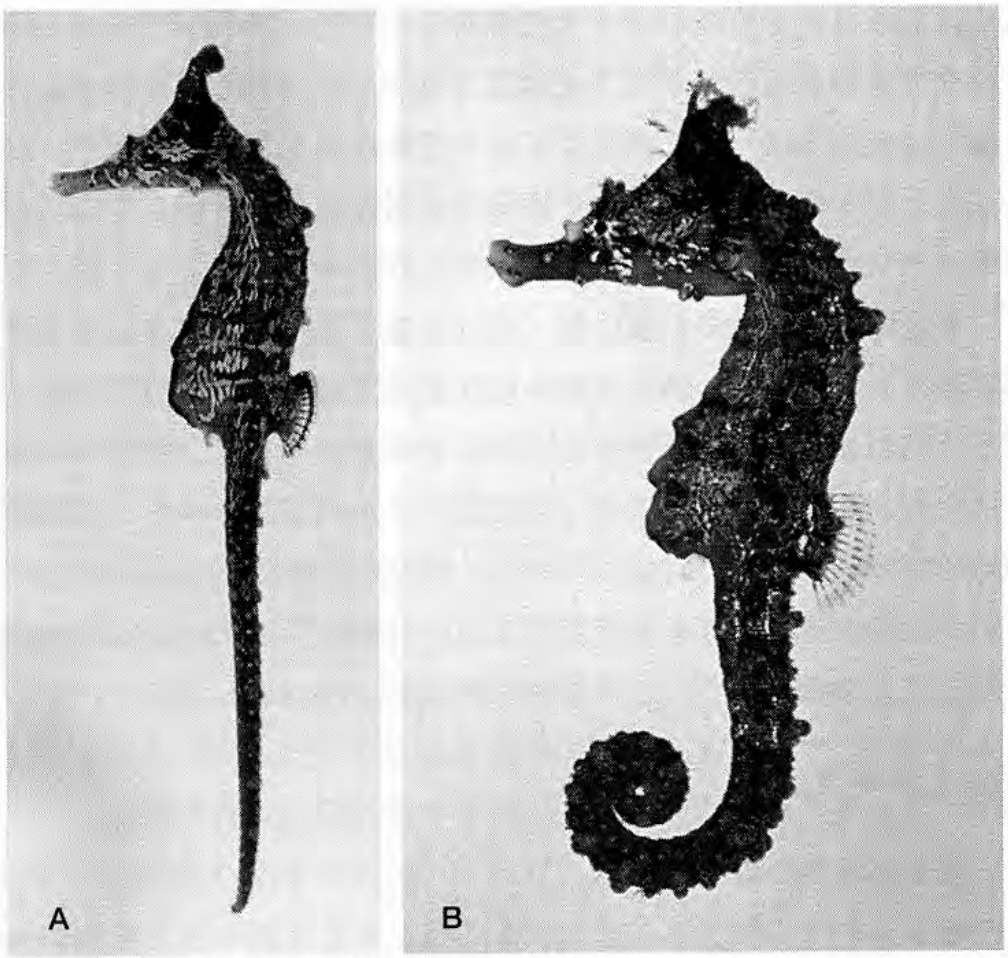


図 2-8　タツノオトシゴの二型．A：頭部の頂冠が高く吻が長いタイプ，B：頭部の頂冠が低く吻が短いタイプ．（写真：瀬能宏）

タツノオトシゴ二型の分子系統解析

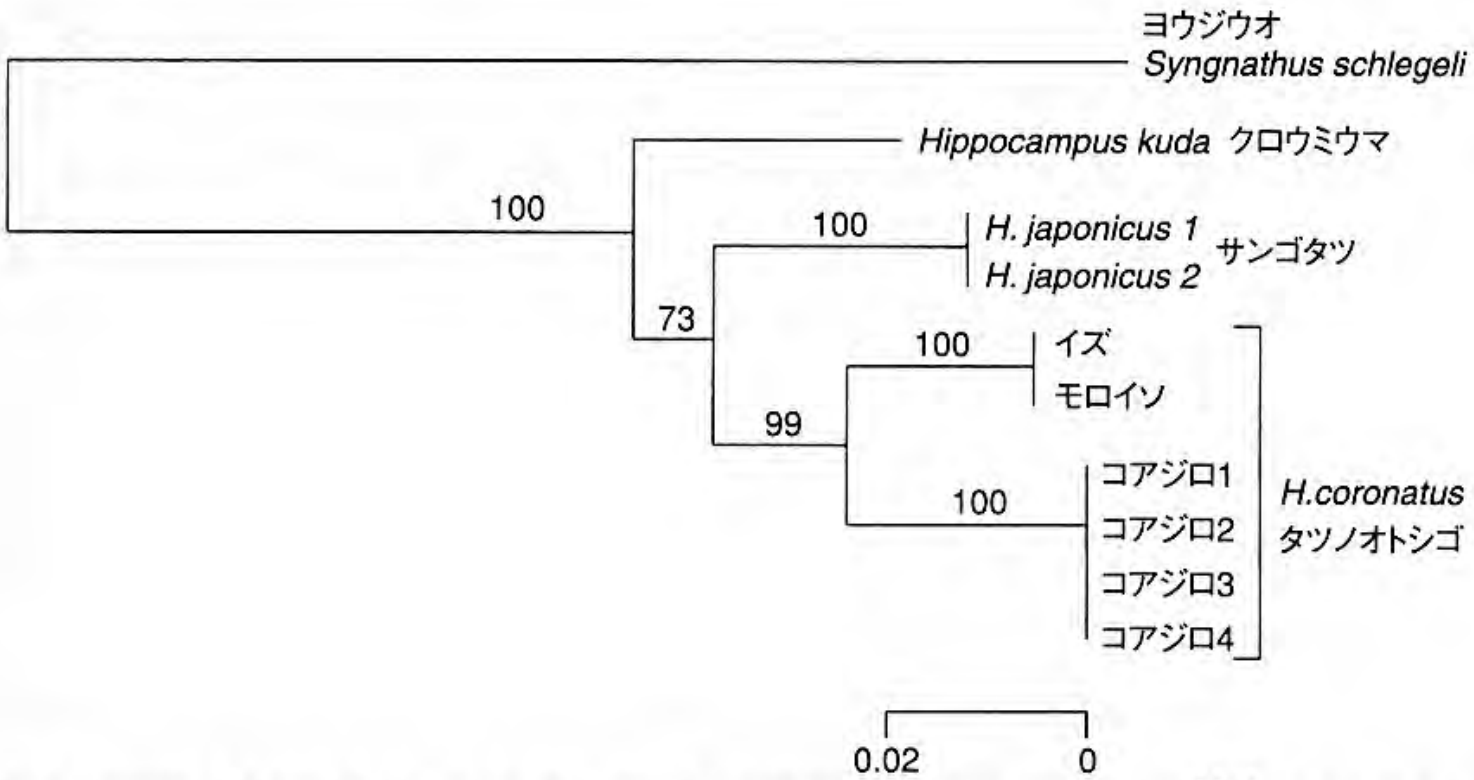
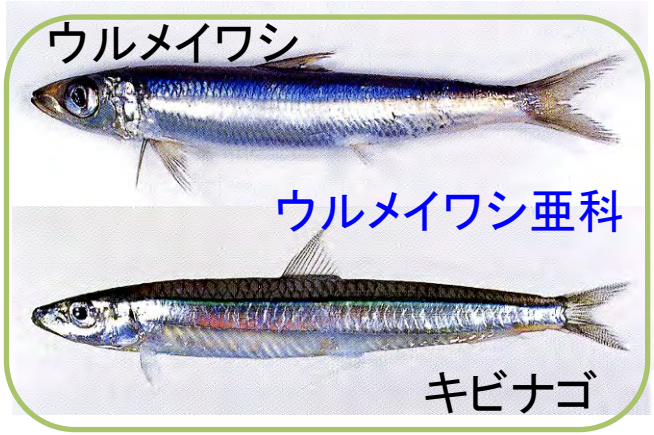
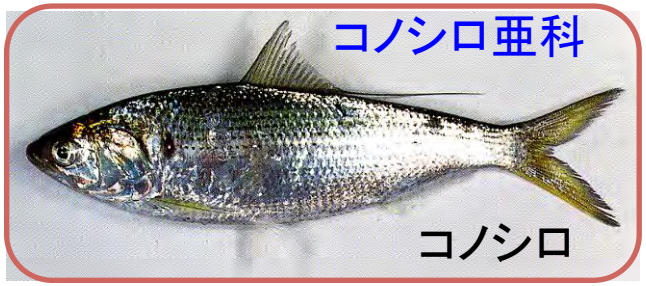


図 2-9　DNA 解析によるタツノオトシゴの二型の系統関係．伊豆（静岡県）と諸磯（神奈川県）の頂冠が高く吻が長いタイプと，小網代（神奈川県）の頂冠が低く吻が短いタイプに明瞭に分かれる．（向井ほか，2000 にもとづいて作図）

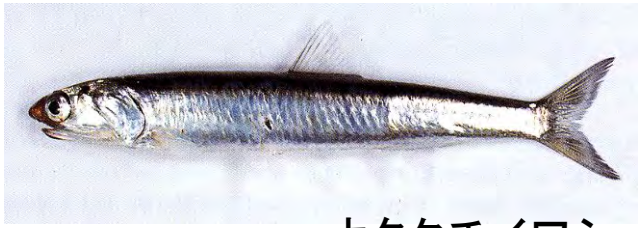
土佐清水市以布利に出現するニシン亜目魚類

ニシン科





カタクチイワシ科



土佐清水市以布利に出現するニシン亜目魚類

リンネ式階層分類体系にすると…　＊ただし，属のランクは省略

ニシン亜目
- ニシン科
  - ニシン亜科
    - マイワシ
    - オグロイワシ
  - ウルメイワシ亜科
    - ウルメイワシ
    - キビナゴ
  - コノシロ亜科
    - コノシロ
- カタクチイワシ科
  - カタクチイワシ