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SHORT COMMUNICATION KISA MAKALE

Monocularism (unilateral anophthalmia) in the Sea Toad (*Chaunax abei* Le Danois, 1978) from Suruga Bay, Japan

Kurbağa balığında (*Chaunax abei* Le Danois, 1978) Suruga Körfezi'ndeki (Japonya) tek gözlülük (tek taraflı anoftalmi)

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Abstract: The first case of monocularism (unilateral anophthalmia) was observed in a single specimen of *Chaunax abei* (Le Danois, 1978) during the seasonal trawl sampling in Suruga Bay in 2021. This occurrence marks the first reported incident of such an abnormality within the Chaunacid species. The monocularism was evidenced by photographs, and descriptive statistics of morphometric characters were presented.

Keywords: Abnormality, Chaunacidae, unilateral anophthalmia, one-eyed, Suruga Bay

Öz: 2021 yılında yapılan mevsimsel Suruga Körfezi'nde gerçekleştirilen trol örneklemeleri sırasında bir adet *Chaunax abei* (Le Danois, 1978) bireyinde ilk kez rapor edilmek üzere tek gözlülük (tek taraflı anoftalmi) gözlenmiştir. Bu rapor, Chaunacid türleri içinde böyle bir anormalliğin rapor edilen ilk vakasını işaret etmektedir. Tek gözlülük fotoğraflarla ortaya konulmuş ve morfometrik karakterlerin tanımlayıcı istatistikleri sunulmuştur.

Anahtar kelimeler: Anormallik, Chaunacidae, tek taraflı anoftalmi, tek gözlülük, Suruga Körfezi

INTRODUCTION

The family of Chaunacidae (sea toads or coffinfishes) has two genera, *Chaunacops* and *Chaunax* (Caruso, 1989; Ho and Shao, 2010) and there are 29 Chaunacid species distributed within three groups, *Chaunax fimbriatus* group, *Chaunax pictus* and *Chaunax abei* group (Caruso, 1989; Ho and Shao, 2010; Ho and McGrouther, 2015; Ho and Ma, 2016; Rajeeshkumar et al., 2020). Sea toads are bottom-dwelling species and distributed in Atlantic, Indian, and Pacific oceans, occurs between depths of 90 m to more than 2000 m (Caruso, 1989; Nelson et al., 2016). Over the last decades, studies about the Chaunacid species increased in the introduction of new species and revisions in systematic orders (Ho and Shao, 2010; Ho et al., 2013; Ho and Last, 2013; Ho and McGrouther, 2015; Ho et al., 2015; Ho et al., 2016; Ho and Ma, 2016). Also, the occurrence of new geographical expansion records of the specimens was reported (Quigley et al., 1996; Ragonese and Giusto, 1997; Kobayashi et al., 1999; Lee and Kim, 1999; Ragonese et al., 2001; Rajeeshkumar et al., 2020). However, no abnormality report has been documented and recorded in Chaunacids thus far.

Fish ophthalmology is relatively poorly studied, and few studies examining deformations or pathological changes in fish eye tissues (Dukes, 1975). Thus far, anophthalmia (the congenital anomaly of missing one or both eyes) in fish has been reported by some authors in *Oreochromis mossambicus* (Tave and Handwerker, 1998), in *Sperata seenghala* (Barman et al., 2016), in *Cyprinus carpio* (McElwain et al., 2013) in mostly on freshwater species. However, particularly among marine species, anophthalmia in anglerfishes (*Lophius budegassa* and *L. piscatorius*) has been well-documented in previous reports (Alonso-Allende, 1983; Bucke et al., 1994; Landa et al., 1998; Quigley, 2013; Colmenero et al., 2016; Şenbahar and Özaydın, 2019). Herein, we report the first case of unilateral anophthalmia observed in a sea toad, *C. abei*.

MATERIAL AND METHODS

In October 2021, one of the *C. abei* which have monocularism (unilateral anophthalmia) was obtained from a local fisherman in Heda Port (Numazu City, Shizuoka Prefecture) in Suruga Bay, Japan (34°58'18"N - 138°46'37"E) (Figure 1).

The body morphometric traits were measured following Negzaoui-Garali et al. (2008). The measurements were performed with a 1 mm precision with a digital caliper (Mitutoyo-CDS20C; Kanagawa, Japan). In the measure of the head length (*HL*), the following methodology of Caruso (1989) was used when it described the species of *Chaunax suttkusi*, as the informative definition; from the second neuro spine to the upper jaw (point to point). Fourteen morphometric characters were measured as follows: Total length (*TL*), standard length (*SL*), head length (*HL*) eye diameter (*ED*), pre-orbital length (*PrOL*), post-orbital length (*PsOL*), inter-orbital length (*IOL*), maxillary length (*ML*), pre-pectoral length (*PPecL*), pre-first dorsal fin length (*PD1*), pre-second dorsal fin length (*PD2*), pectoral length (*PecL*), Pre-pelvic length (*PPelvL*) and pre-anal length (*PAnL*).

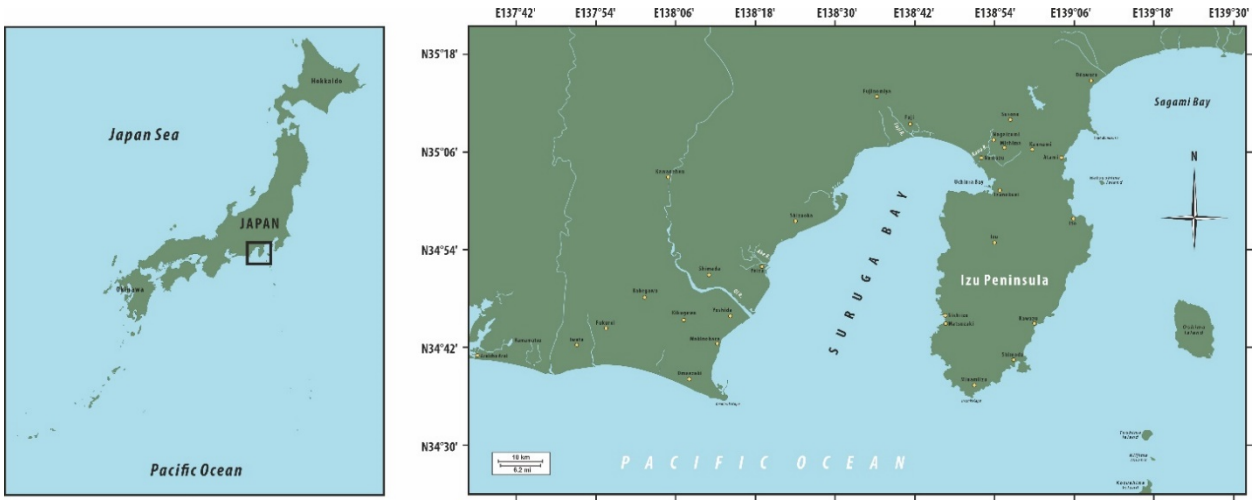

Figure 1. Sampling area

RESULTS AND DISCUSSION

Description: The body is globular and depressiform, the head is large and slightly compressed. Illicium is small and esca is oval-shaped. The surface of the body is a light reddish color with green-yellow dots. Lateral lines can easily be noticeable. The mouth is large and almost horizontal. Teeth of maxilla and mandible are small and sharp. There are numerous spikes/protrusions under the skin tissue. All the fin rays are soft, but the anal fin is branched.

Figure 2. Monocular abnormality in *C. abei* (unilateral absence of right eye), Suruga Bay, 2021

Evidently, an orbital cavity of the monocular specimen is discernible beneath the skin tissue, and the right eyeball's absence is visible in Figure 2. Other than being one-eyed, no distinct features were observed. Therefore, the etiology of monocularism in *C. abei* remains unresolved in this report. The morphometric measurements of the specimen are given in Table 1.

Table 1. Measurements (mm) of *C. abei*

Measurements (mm)	*Chaunax abei* (Monocular)
Number of specimens	1
Total length (*TL*)	182.56
Standard length (*SL*)	141.04
Head length (*HL*)	55.58
Pectoral length (*PecL*)	70.09
Pre-pectoral length (*PPecL*)	64.95
Pre-first dorsal fin length (*PD1*)	5.81
Pre-second dorsal fin length (*PD2*)	70.14
Pre-orbital length (*PrOL*)	5.21
Post-orbital length (*PsOL*)	42.91
Eye diameter (*ED*)	5.23
Maxillary length (*ML*)	39.45
Inter orbital length (*IOL*)	10.93
Pre-pelvic length (*PPelvL*)	40.92
Pre-anal length (*PAnL*)	100.79

Abnormality reports on morpho-anatomical, coloration (pattern or skin color), eye deformations, growths of tumors, body deformations, lesions and wounds can be seen in wild fish populations since the 1550s (Belon, 1553; Guillaume Rondelet, 1555 by Berra and Au, 1981, cites therein) and it is always referred as anomalies in fishes may be either genetic or epigenetic (Dahlberg, 1970). Besides, eye abnormalities include the following symptoms: exophthalmia, hemorrhaging not caused by trauma or injury, reduction in the size of the pupil, white spot over a pupil or opaque pupil, lack of iris, and a symptom best described as "collapsed" eye (Skinner and Kandrashoff, 1988). According to previous reports, the anglerfishes (Lophiiformes) have quite a proclivity toward eye deformations/abnormalities (Table 2).

Causal factors could be of environmental or biological origin. Examples include possible carnivore attacks, competitive feeding activity behaviors, genetic modifications occurring during embryonic eye development, or genetic mutations. Moreover, the impacts of pollution may be

associated with eye abnormalities. On the contrary, the critical concern regarding monocularism is the parasite effect, specifically *Spraguea lophii*, on the dynamics of the host population. Bucke et al. (1994) reported that *S. lophii* possibly causes severe infections in the nervous system, leading to neuropathy and impacting ocular tissues. However, the parasite *S. lophii* (Microsporidia) of the teleost fishes has not been previously documented in Asian anglerfish species thus far.

In future studies, histopathological examinations may be necessary to comprehend the microsporidian ecology in the marine environment, including *Spraguea* spp., especially in the case of a notable rise in reports concerning Chaunacid species.

Table 2. Eye abnormalities on anglerfish (Lophiiformes) species

Author	Alonso-Allende (1983)	Bucke et al. (1994)	Landa et al. (1998)	Quigley (2013)	Colmenero et al. (2016)	Şenbahar and Özaydın (2019)	Present study
Species	*Lophius budegassa*	*Lophius budegassa and L. piscatorius*	*Lophius budegassa*	*Lophius budegassa*	*Lophius budegassa*	*Lophius budegassa*	*Chaunax abei*
Area	Galician waters	Celtic Sea	Bay of Biscay	SE Irish Sea	NW Mediterranean Sea	Central Mediterranean Sea	Suruga Bay
Probable cause	Unresolved	*Spraguea lophii*	Unresolved	Unresolved	Unresolved/*S. lophii* observed	Unresolved	Unresolved
Status	No eye development	-	No eye development	No eye development	No eye development	No eye development	No eye development

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AUTHOR CONTRIBUTIONS

Ahmet Mert Şenbahar: conceptualization, formal analysis, writing—original draft, writing—review and editing. Akira Eto: resources and sampling. Masashi Yokota: methodology, formal analysis and editing.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts or competing interests.

ETHICS APPROVAL

No specific ethical approval was necessary, and no ethical contraventions occurred in this report.

DATA AVAILABILITY

No datasets were generated or analyzed during this report.

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