琉球大学学術リポジトリ

琉球列島近海におけるクロボシウミヘビの生息情報とハビタットについて

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Notes on the occurrence and habitat of *Hydrophis ornatus* (Gray, 1842) (Reptilia: Squamata: Elapidae) in the Ryukyu Islands, Japan

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Abstract. We provide a list of *Hydrophis ornatus* (Gray, 1842) observed during occasionally conducted field works between 2002 and 2014 in the Ryukyu Islands. Stomach contents of two snakes were also examined. Most of the snakes were observed from relatively enclosed bay-like waters with muddy to sandy substratum. Results of our surveys suggest that *H. ornatus* is more common than previously thought. It was also observed that *H. ornatus* often crawled into a burrow at the bottom by their head. One of the captured snakes contained a small goby, *Oplopomus oplopomus* (Valenciennes, 1837), in its stomach, which inhibits in muddy and sandy bottom of the sea. The habitat of *H. ornatus* appears to be related to its dietary habits.

Introduction

Hydrophis ornatus (Gray, 1842) is widely distributed from the Arabian Gulf to India, Thailand, Vietnam, China, the Ryukyu Islands, the Philippines, Indonesia, New Guinea, Australia, and New Caledonia (Smith 1926; Mittleman 1947; Cogger 1975; Rasmussen 1989; Toriba 1994; Rasmussen et al. 2011). The Ryukyu Islands represent the northern limit of the distributional range of the species (Toriba & Nakamoto 1991). Although Heatwole (1999) noted that *H. ornatus* is eurytopic and its habitats include coral reefs, turbid inshore waters and estuaries, it has been recognized as "relatively rare" species in these regions due to limited information (Toriba 1994). Ota & Masunaga (2005) pointed out that *H. ornatus* is likely to be abundant in the Ryukyu Islands and that the habitats of populations from the region are mainly shallow water areas with muddy and/or sandy substrata, but without detailed information. Knowledge about the life history of *H. ornatus* is also scarce; there is only limited information about

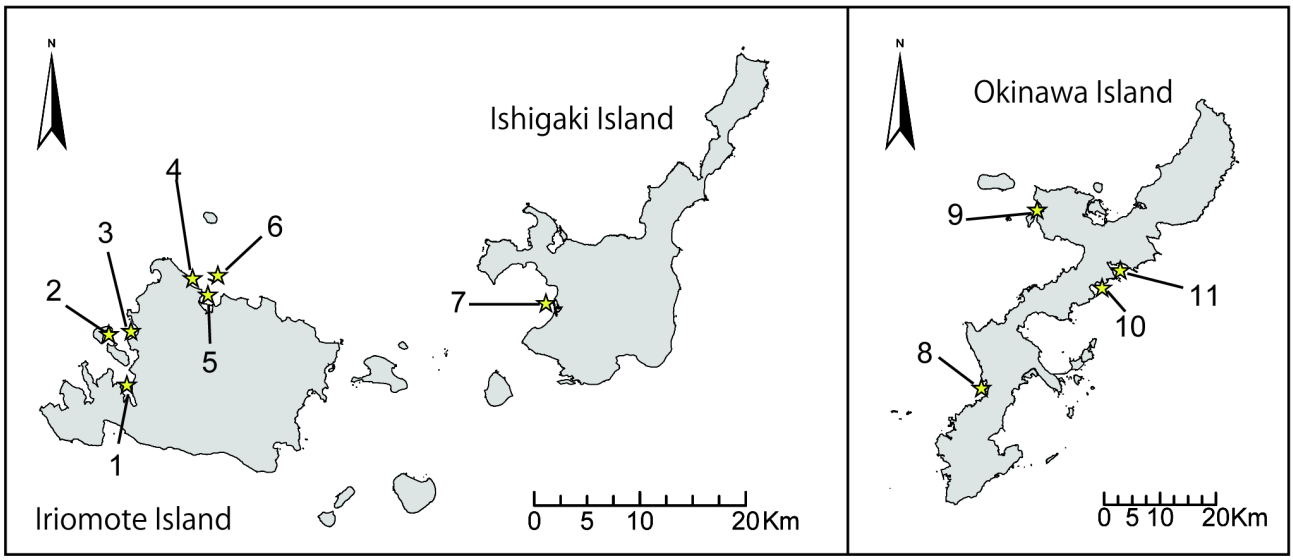

Fig. 1. Localities of *Hydrophis ornatus* (Gray, 1842) observed in the sea around the Ryukyu Islands. a, Yaeyama Islands; b, Okinawa Island. Site numbers correspond with those in Table. 1.
図 1. 琉球列島 (a, 八重山諸島; b, 沖縄島) 周辺の浅海域においてクロボシウミヘビが観察された地点. 図中に示された数字は表 1 の調査地番号と共通する.

its feeding habit (Dunson & Minton 1978; Glodek & Voris 1982; Voris & Voris 1983; Rasmussen 1989).

During various field works around the Ryukyu Islands, we observed a fair number of *H. ornatus.* Here we briefly report on our observations of the species with references to its habitat, and also record a prey fish of *H. ornatus* from the Ryukyu Islands for the first time.

Material and methods

Records of the occurrences of *Hydrophis ornatus* were collected around the Ryukyu Islands during occasionally conducted surveys including SCUBA diving as well as searching from a floating raft, and from quays at ports from the period of 2002 to 2014. Observed individuals were photographed if possible, but not handled in most cases. There are three species of the genus *Hydrophis* recorded from the Ryukyus, *H. ornatus, H. melanocephalus* (Gray, 1849), and *H. cyanocinctus* (Daudin, 1803) (Toriba 1994). Following Toriba (1994), *H. ornatus* is distinguished from the other two species by the

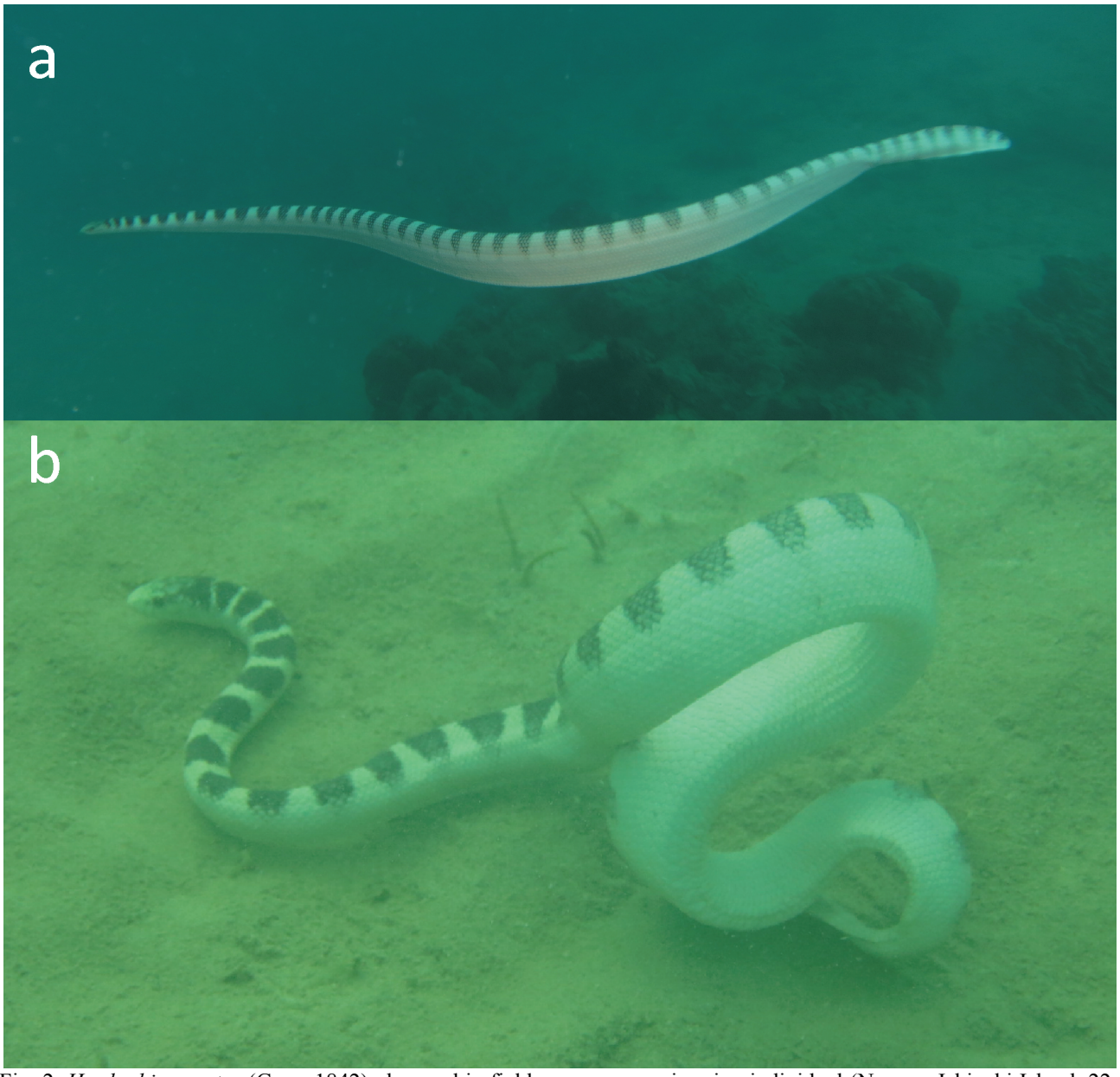

Fig. 2. *Hyrdophis ornatus* (Gray, 1842) observed in field surveys. a, swimming individual (Nagura, Ishigaki Island, 22 Jan. 2013); b, a resting individual on muddy substratum (Oura Bay, Okinawa Island, 28 May 2013).
図 2. 石垣島名蔵湾 (a, 2013 年 1 月 22 日) と沖縄島大浦湾 (b, 2013 年 5 月 28 日) にて観察されたクロボシウミヘビ.

following morphological characters: 1) Dark bands on the body extend to mid-lateral portion; and 2) robust body with relatively large and elongated head. Two individuals of the observed snakes were captured, measured from the tip of the snout to the cloaca (snout-vent length), and dissected to check their stomach contents. These specimens were deposited in the Ryukyu University Museum, Fujukan (RUMF), University of the Ryukyus, Japan.

Results and Discussions

Habitat. In total, 26 individuals of *Hydrophis ornatus* were observed at eleven sites of Iriomote, Sotobanare I., Ishigaki, and Okinawa islands (Table 1, Fig. 1). Most of snakes observed during SCUBA stayed near the bottom. During one-hour dives at Sotobanare I. and Midara sites (both 30 Apr. 2013), we observed four and five snakes, respectively.

Most of the snakes were observed at relatively enclosed bay-like waters with muddy to sandy substrata (Table 1, Figs. 2–4). The habitats were usually more or less turbid. One of us (DU) observed an individual of *H. ornatus* at a depth of 20 m off Sunabe, Okinawa Island. This point is not like the typical habitats of *H. ornatus* as the point is more open with better visibility and rough sandy substratum. DU and TN have dived at Sunabe many times, but the occurrence of *H. ornatus* at this site is very limited. It is probable that the population density of *H. ornatus* around Sunabe is low and it may be inhibited mainly a long way off shore where muddy-sandy substratum exists. Overall, these field observations suggest that *H. ornatus* in the Ryukyus prefers relatively bay-like calm and turbid waters with muddy to sandy substrata.

Takahashi (1984) conducted field surveys on the relative abundance of sea snakes by skin diving in the Ryukyu Islands. Although more than 140 individuals of five species, *H. melanocephalus*, *Emydochephalus iijimae* (Stejneger, 1898), *Laticauda semifasciata* (Reinwardt, 1837), *L. laticaudata* (Linnaeus, 1758) and *L. colubrina* (Schneider, 1799) were recorded, no individuals of *H. ornatus* were included. Takahashi (1984) did not mention about the detailed environments of where he surveyed, but since the former five species are relatively common around coral reefs and nearby sandy areas with clear water (Kidera unpublished data), his field surveys might have been conducted in more open waters than the sites where we have noticed *H. ornatus*.

Feeding habit and behavior. Two male *H. ornatus* were captured at Midara (snout-vent length, 555 mm) and Uehara (snout-vent length, 426 mm) sites. The stomach of the former snake contained a small goby, *Oplopomus oplopomus* (Valenciennes, 1837) (Fig. 5), which lives in burrows that it constructs itself in muddy and sandy substrata (Syms & Jones 2004). The smaller *H. ornatus* individual contained parts of small fish bones, but they were too digested to be identified.

Feeding behavior of at least six individuals of *H. ornatus* was observed in the field. The observed snakes crawled into a burrow at the bottom headfirst and they appeared to be foraging for food

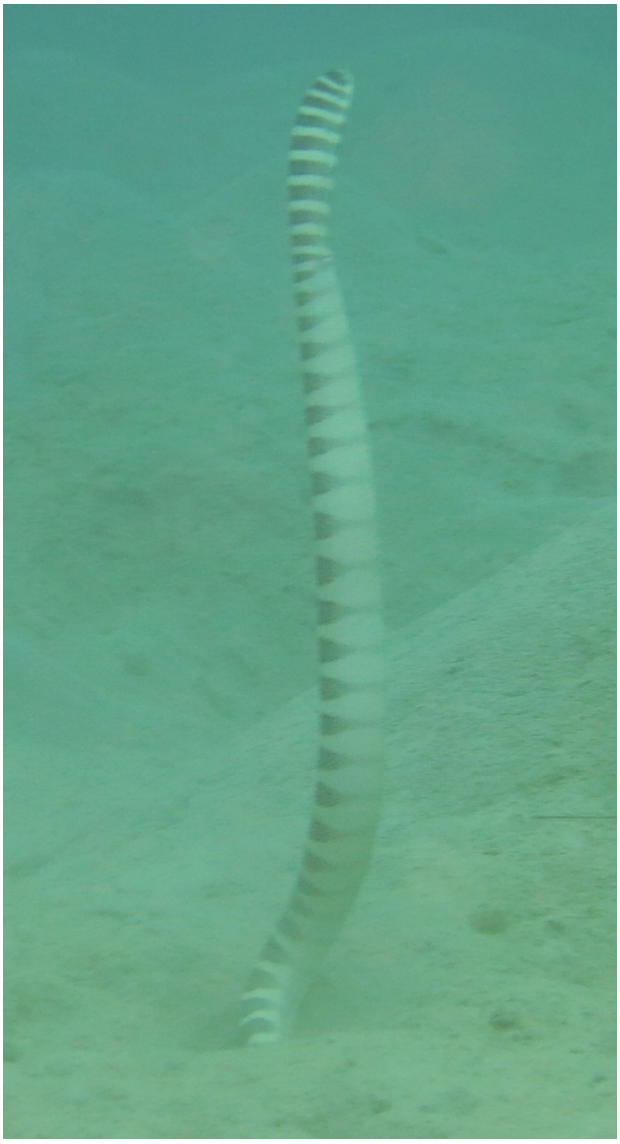

Fig. 3. *Hyrdophis ornatus* (Gray, 1842) appearing to forage at Midara, Iriomote Island on 30th Apr. 2013.
図 3. 採餌行動中と思われるクロボシウミヘビ (西表島美田良, 2013 年 4 月 30 日).

Table 1. List of *Hydrophis ornatus* (Gray, 1842) observed in the ocean around the Ryukyu Islands. Site numbers correspond with those in Fig. 1. The depths indicate the water depths at which *H. ornatus* was observed. RUMF represents Ryukyu University Museum, Fujukan. The number of feeding snakes observed represents individuals confirmed by photographs later. Actual numbers of feeding behavior are much higher than in this table.
表１．琉球列島周辺の浅海域で観察されたクロボシウミヘビの観察リスト．調査地番号は図１で示された数字と共通する．深さはクロボシウミヘビが観察された深度を示す. RUMF は琉球大学風樹館の略称を示す．採餌行動が観察された個体数は，論文執筆時に写真記録より確認された件数であり，実際の採餌行動数は表より多い.

Site no. サイト番号	Site name サイト名	Date (day-month-year) 観察日(日-月-年)	Time 観察時間	Number of snakes 観察個体数	Bottom 底質	Depth (m) 観察深度	Observation methods 観察方法	Observer 観察者	Note 備考
1	Amitori 網取	20-viii-2014	13:00-14:00	2	Sandy-muddy and sandy 砂泥質・砂質	4–10	Diving 潜水	Naruse 成瀬	Two individuals were observed feeding. 2 個体の摂餌行動が観察された.
2	Sotobanare I. 外離島	30-iv-2013	Morning 午前中	4	Muddy 泥質	＜12	Diving 潜水	Uyeno 上野	
2	Sotobanare I. 外離島	21-x-2013	15:10	1	Muddy 泥質	7	Diving 潜水	Naruse 成瀬	
3	Midara 美田良	30-ix-2013	14:00-15:00	5	Muddy 泥質	10–15	Diving 潜水	Kidera & Naruse 木寺・成瀬	One specimen of the obeserved snake is preserved in RUMF. Three individuals were observed feeding. 観察された個体の内 1 個体を採集し琉球大学風樹館に保管した. 3 個体の摂餌行動が観察された.
3	Midara 美田良	8-vi-2013	20:15-21:15	2	Muddy 泥質	3–11	Diving 潜水	Naruse 成瀬	
4	Uehara 上原	19-v-2012	Night 夜間	1	Sandy 砂質	0	Searching at port 港での探索	Miyaoka 宮岡	One specimen is preserved in RUMF.観察個体を採集し琉球大学風樹館に保管した.
5	Funaura 船浦	10-x-2010	Night 夜間	1	Sandy or muddy 砂質 / 泥質	0	Searching at port 港での探索	Kidera 木寺	
6	Daikupee ダイクピー	4-iv-2014	10:00-11:00	3	Muddy 泥質	19–0	Diving 潜水	Naruse 成瀬	One individual was observed feeding. 1 個体の摂餌行動を観察.
7	Nagura 名蔵	22-i-2013	14:38	1	Muddy 泥質	10	Diving 潜水	Naruse 成瀬	

Continued

Site no. サイト番号	Site name サイト名	Date (day-month-year) 観察日(日-月-年)	Time 観察時間	Number of snakes 観察個体数	Bottom 底質	Depth (m) 観察深度	Observation methods 観察方法	Observer 観察者	Note 備考
8	Sunabe 砂辺	?-viii-2002	Daytime 日中	1	Sandy 砂質	20	Diving 潜水	Uyeno 上野	
9	Toguchi 渡久地	27-x-2012	Night 夜間	1	unknown 不明	0	Searching by floating raft 筏からの探索	Kidera 木寺	
10	Kushi 久志	14-viii-07	Daytime 日中	1	Beach 海岸	0	Beachcombing 海岸の散策	Uyeno 上野	One alive and stranded individual on the beach after a typhoon. 台風通過後に浜に打ち上げられた生体を目撃した.
11	Oura Bay 大浦湾	28-v-2013	11:08	1	Muddy 泥質	17	Diving 潜水	Naruse 成瀬	
11	Oura Bay 大浦湾	28-v-2013	14:41	1	Muddy 泥質	6	Diving 潜水	Naruse 成瀬	
11	Oura Bay 大浦湾	14-v-2013	13:50	1	Muddy 泥質	20	Diving 潜水	Uyeno 上野	

(Figs. 3, 4). This behavior was repeated a few times. Apparently, the habitat of *H. ornatus* with muddy and sandy substratum is related to their dietary habits.

Dunson & Minton (1978) described that *H. ornatus* from the Philippines exclusively feeds on catfishes of the genus *Plotosus*, which are benthic fishes in sandy bottom area. Glodek & Voris (1982) reported a burrowing goby, *Trypauchen* sp. and *Plotosus canius* (Plotosidae) from stomach contents of two different individuals of *H. ornatus* from the Malay Peninsula. On the other hand, Rasmussen (1989) recorded that stomach contents of *H. ornatus* from Phuket, Thailand, included fish species belonging to six families, Apogonidae, Holocentridae, Labridae, Leiognathidae, Nemipteridae, and Scaridae, suggesting a wide range of diet. These fish are generally free-swimming and inhabit relatively close to more open waters. Although our observations are very limited, it may be that the prey fish type of the Ryukyu Islands population differs from that of the Phuket population.

Heatwole (1999) noted that *H. ornatus* occupies a wide range of habitats including coral reefs, turbid inshore waters and estuaries. On the other hand, our results suggest that the habitats of the population from the Ryukyu Islands are restricted to muddy and sandy bottoms. The inconsistency might result from habitat variation in different regions as well as prey type differences among populations.

Interestingly, Zimmerman & Heatwole (1990) suggested that the olive sea snake, *Aipysurus laevis* (Lacepede, 1804), may possess cutaneous photoreceptions in its tail, because *A. laevis* exposes its tail more frequently when it rests during night time than in the day time, and also because that a very limited part of the tail tip shows high sensitivity to light. In contrast to the negative reaction to light by *A. laevis*, Dunson & Minton (1978) noted that many individuals of *H. ornatus* were caught by dip netting under the light at night in the Philippines. We also observed that *H. ornatus* came across to the water surface at ports when we shined lights on the surface, although we were not sure whether they were attracted by small fishes that were drawn to the light or directly attracted by the lights.

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Fig. 4. *Hyrdophis ornatus* (Gray, 1842) appearing to forage at Daikupee, Iriomote Island on 4th Apr. 2014.
図 4. 採餌行動中と思われるクロボシウミヘビ (西表島ダイクピー, 2014 年 4 月 4 日).

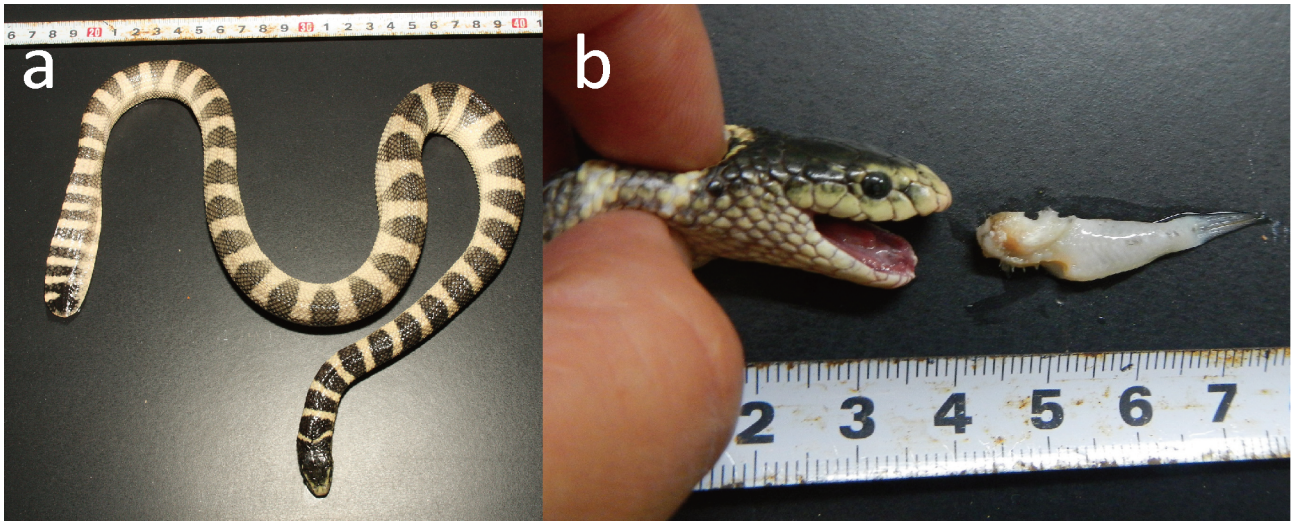

Fig. 5. A captured specimen of *Hyrdophis ornatus* (Gray, 1842) from Midara, Iriomote Island. a, habitus; b, head with *Oplopomus oplopomus* (Valenciennes, 1837) extracted from its stomach.
図5. 西表島美田良より採集されたクロボシウミヘビの標本 (a, 標本全体; b, 標本個体の胃内から得られたケショウハゼと標本頭部).

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琉球列島近海におけるクロボシウミヘビの生息情報とハビタットについて

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要旨. 琉球列島近海で多数のクロボシウミヘビが観察された．そのほとんどは外海に面したサンゴ礁周辺ではなく，泥底や砂底の浅海域で目撃された．また，捕獲された標本の胃内から砂泥環境に生息するケショウハゼ 1 個体が得られた．クロボシウミヘビの琉球列島における生息はこれまで稀であると認識されてきたが，本調査結果から，本種は砂泥底質の浅海域を主なハビタットとして生息し，その生息密度はさほど小さくないことが示唆された．

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