Herpetological Conservation and Biology 12(2):384–393.
Submitted: 30 May 2016; Accepted 27 May 2017; Published: 31 August 2017.

Sea Snakes of Bangladesh: A Preliminary Survey of Cox's Bazar District With Notes on Diet, Reproduction, and Conservation Status

Mohammad Abdur Razzaque Sarker[1,4], Kate L. Sanders[2], Kanishka D.B. Ukuwela[3], and Mohammad Firoj Jamam[1]

[1]*Department of Zoology, Faculty of Biological Science, University of Dhaka, Dhaka-1000, Bangladesh*
[2]*School of Biological Sciences, The University of Adelaide, Adelaide, South Australia 5000, Australia*
[3]*Department of Biological Sciences, Faculty of Applied Sciences, Rajarata University of Sri Lanka, Mihinthale 50300, Sri Lanka*
[4]*Corresponding author, e-mail: razzaqsciencebd@gmail.com*

***Abstract.*—We present baseline ecological and distributional data that will contribute to assessments of conservation status of the sea snakes (Elapidae: Hydrophiinae) of Cox's Bazar District, Bangladesh. We collected 48 specimens comprising five species (*Hydrophis cyanocinctus*, *H.* [*Enhydrina*] *schistosus*, *H. caerulescens*, *H.* [*Lapemis*] *curtus*, *H.* [*Pelamis*] *platurus*) off the coast of the Bay of Bengal as open ocean and coastal fisheries bycatch from August 2012 to December 2013. With the exception of *H. cyanocinctus*, all of these are first records for the species in this coastal harbor. The diversity of sea snakes reported here constitute nearly half (five of 13) of the sea snake fauna documented in the waters of the Bay of Bengal; however, DNA confirmation is needed to further confirm the species identification and examine phylogenetic and biogeographic patterns. In addition, information on the diet and reproductive biology of *H. schistosus* and *H. caerulescens* are reported based on specimen dissections. The information on the reproduction of *H. caerulescens* provided here is the first for the South Asian region.**

Key Words.—Bay of Bengal; Bangladesh; conservation; natural history; sea snakes; taxonomy

Introduction

Sea snakes are marine reptiles in the family Elapidae that have secondarily adapted to marine life (Heatwole 1999). There are two groups of marine elapids: eight species of oviparous sea kraits and almost 70 species of viviparous sea snakes (De Silva 1994; Heatwole 1999; Sanders et al. 2008). These marine reptiles are distributed in shallow waters throughout the tropical and subtropical regions of the Indian and Pacific oceans from the east coast of Africa to the Gulf of Panama with peak diversity in the Indo-Australian Archipelago (De Silva 1994; Rasmussen 1997; Heatwole 1999; Sanders et al. 2008; Elfeset al. 2013). Sea snake show many adaptations to marine life, including laterally flattened bodies, paddle shaped tails, dorsally positioned nostrils with valves, sublingual salt excreting glands, and the capability to dive to at least 100 m (Heatwole and Seymour 1975; Rubinoffet al. 1986; Heatwole 1999; Brischoux and Lillywhite 2011). Many of the marine habitats occupied by sea snakes suffer from destructive fishery and coastal land-use practices to meet the daily need for growing human populations and tourism (Hossain 2001). These activities have significantly threatened sea snake populations in many regions (Wassenberg et al. 1994; Heatwole 1997). A recent Red List of the International Union for the Conservation of Nature (IUCN) listed two sea snake species as Critically Endangered (CR) due to severe population declines, while 34% of sea snakes were listed as Data Deficient (DD; Elfes et al. 2013). Thus, adequate knowledge on life histories, taxonomy, and distribution of these medically important and vulnerable species are necessary to implement conservation measures.

After independence in 1971, no comprehensive study has been undertaken to evaluate the status of sea snakes of Bangladesh (IUCN-Bangladesh 2000; Asmat and Hannan 2007; Kabir et al. 2009; Khan 2010). Most research on sea snakes in Bangladesh was reported in the British colonial period (pre 1947) and Pakistan occupation (pre 1971; Smith 1926). Post colonial and sub-continental information available for Bangladesh is based on opportunistic collections made from a few scattered localities along the coast (Smith 1926; Minton 1975; Khan 1987; Rasmussen 1994; Leviton et al. 2003). Thus, knowledge of sea snake species diversity, distribution, abundance, ecology, and phylogenetic relationships is lacking for Bangladesh.

The total number of species of sea snakes in Bangladesh is uncertain. Khan (2010) and Sarker and Sarker (1988) reported 13 species of sea snakes (Elapidae), Asmat and Hannan (2007) reported 14 species and two subspecies,

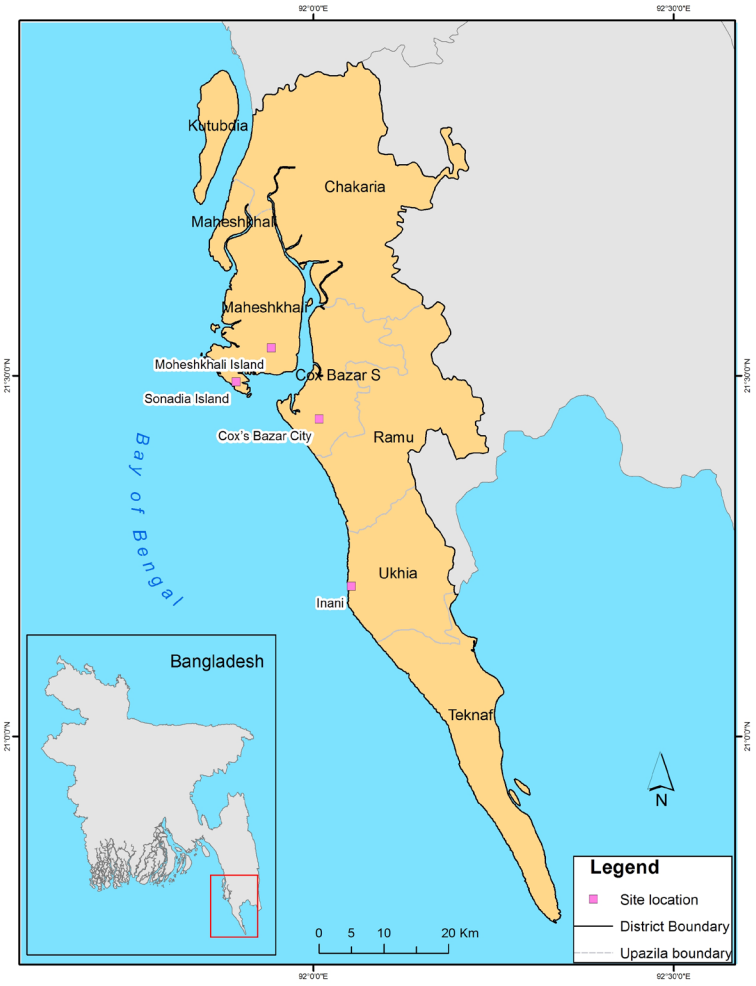


Figure 1. Collection sites at Cox's Bazar District in Bangladesh. (Source: Digital Map, Local Government Engineering Department, Bangladesh).

and Kabir et al. (2009) reported 12 species of sea snakes occurring in Bangladesh. Further, Heatwole (1999) reported 12 species of marine snakes. Viperine Sea Snakes (*Hydrophis* [*Thalassophina*] *viperina*) and Marine File Snakes (*Acrochordus granulatus*) have not been included in the sea snake checklists of Bangladesh published by different authorities after establishment of Bangladesh in 1971, but Heatwole (1999) included these species in his list. Thus, a detailed study is needed to revise the checklist of Bangladeshi sea snakes. Although uncertain, we assumed 13 species of sea snakes belonging to family Elapidae (11 viviparous sea snakes and two sea kraits) to be present in Bangladesh. In addition to the elapid sea snakes, three species of mud snakes (Homalopsidae) occur in coastal marine habitats in Bangladesh (Kabir et al. 2009).

The IUCN-Bangladesh (2000) assessment placed Daudin's Sea Snakes (*Hydrophis nigrocinctus*) and Collard Sea Snakes (*H. stricticollis*) in the DD category, and all other true sea snakes and sea kraits as Least Concern (LC). Crab-eating Water Snakes (*Fordonia leucobalia*) and Gerard's Water Snakes (*Gerarda prevostiana*) were listed as DD and Dog-faced Water Snakes (*Cerberus rynchops*) as Vulnerable (VU). A lack of scientific information currently precludes detailed assessment of the conservation status of sea snakes in Bangladesh. We carried out a survey to assess the diversity and basic ecology of sea snakes in the Cox's Bazar District of Chittagong Division of Bangladesh. Here, we provide the first checklist along with basic descriptions of diet and reproductive biology of the viviparous sea snakes that were sampled from the coast of the Cox's Bazar District. This report will contribute to baseline conservation assessments and serve as an identification guide for coastal conservation managers and researchers in this area.

Materials and Methods

Cox's Bazar is one of the districts situated in the southeastern corner in Bangladesh facing the Bay of Bengal (Fig. 1). It is famous for marine fisheries

Table 1. Site names, fishing ports, nearest fishing site, number of snakes collected per site (n; 48 total snakes), and number of fishing boats and trawlers (Number of Vessels) in the winter season (maximum number) and in the rainy season (minimum number) for this study of sea snakes from Cox's Bazar District, Bangladesh. For nearest fishing sites, position from the site and depth of water is given in parentheses, and the word Dar is a local term that means particular sites in the open ocean where the fishermen set their fishing gear to catch fish.

				Number of Vessels	
Site names	Fishing Ports	Nearest Fishing Site	n	Winter	Rainy
Cox's Bazar City (21.43N, 92.01E, elevation 4.27 m)	BFDC (Bangladesh Fisheries Development Corporation), Najirtek Fisheries landing port	Noya Dar (2 km west,76 m), Mohipur Chata (13 km west, 14 m), near Indian Border (west side)	25	300–350	150–200
Moheshkhali Island (21.54N, 91.94E, elevation 9.75 m)	Jailla Para, Ghoti Bhangha, Bot-tali, Dhalghata, Matarbari, Jailla Para etc	Nora Dar (49 km west,61 m), Bor Dar (15 km west,76 m), Sathria (75 km north,46 m), Gulir Dar (80 km west north,183 m), Jalchiya (49 km west, 61 m)	16	70–80	40–50
Sonadia Island (21.49N, 91.89 E; elevation 3.05 m)	Not a specific port	Baro Biayar Dar (16 km north,23 m), Hatdiyar Dar (13 km west,46 m)	7	80–90	30–40
Inani (21.22N, 92.05E; elevation 18 m)	Not a specific port	—	—	30–40	—

resources and is one of the most important fishing ports in Bangladesh. It is located 150 km south of Chittagong District and situated between 20°43' and 21°56' N latitudes and in between 91°50' and 92°23' E longitudes, and has an area of 2,491.86 km². Cox Bazar is bounded by Chittagong District in the north, Bay of Bengal in the south and west, and Bandarban District in the east (Fig. 1). Major rivers include Matamuhuri, Bakkhali, Reju Khal, Naf River, and Moheshkhali and Kutubdia channels. The main city of Cox's Bazar occupies an area of 6.85 km² and has a population of 51,918. It is also known for its wide and long sandy beach (120 km), considered to be the longest natural sandy sea beach in the world (Hossain 2012).

To collect baseline data on the sea snake diversity in the Cox's Bazar District, we collected bycatch specimens by cooperating with local fishermen who incidentally catch sea snakes in their fishing gear. We selected four main fishing ports including different Dar's (fishing sites) for collecting sea snake specimens (Fig. 1; Table 1). Fishermen initially stored the specimens in ice when they were collected at the sea. Then upon reaching the shore, we extracted liver and muscle tissues and stored them in 90% ethanol for future molecular analysis. We later fixed the specimens and stored them in a 10% formalin solution. We deposited the voucher specimens (Appendix 1) in the Kazi Zaker Hussain Zoological Museum, Department of Zoology, University of Dhaka, Bangladesh.

We followed Rasmussen (2001, 2011) for identification of specimens and morphological examinations and Sanders et al. (2013) for nomenclature. We used a magnifying glass to count body scales and maxillary teeth. We measured to the nearest 1 mm snout to vent length (SVL), length from the tip of snout to posterior margin of anal plate and tail length (TAL), and the length from posterior margin of anal plate to tip of tail using a measuring tape and digital vernier caliper. We took photographs using Canon 550D camera with a 50 mm prime lens (Canon, Inc., Selangor, Malaysia). We dissected preserved specimens to examine gut contents, and to determine sex and reproductive condition. We determined the reproductive condition by the presence of eggs, embryos, or vitellogenic follicles in the oviducts of females.

Results

Sampling from fisheries bycatch yielded 48 individuals that comprised five species of viviparous sea snakes. Snout to vent length, tail length, scale counts, number of teeth behind fangs, and bands on the body of each collected species corresponded well with the data given for the species description by Smith (1926) and Rasmussen (2001, 2011; Fig. 2 A–E, Appendix 2). Of the 48 individuals collected, we identified 34 (71%) as *H. caerulescens*, nine (19%) as *H. schistosus*, two as *H. cyanocinctus*, two as *H. platurus*, and one as *H. curtus*.

In two (*H. caerulescens* and *H. schistosus*) of the five species observed in the study, we found undigested or partially digested food items in their gut contents. In 34 of the collected specimens (71%), we found no undigested or partially digested or digested food items. Of the remaining 14 specimens (29%), we could identify food items to the species level in 11 specimens, and three specimens contained fully digested contents that we could not identify (Table 2). We found identifiable food items only in *H. caerulescens*, and these were all

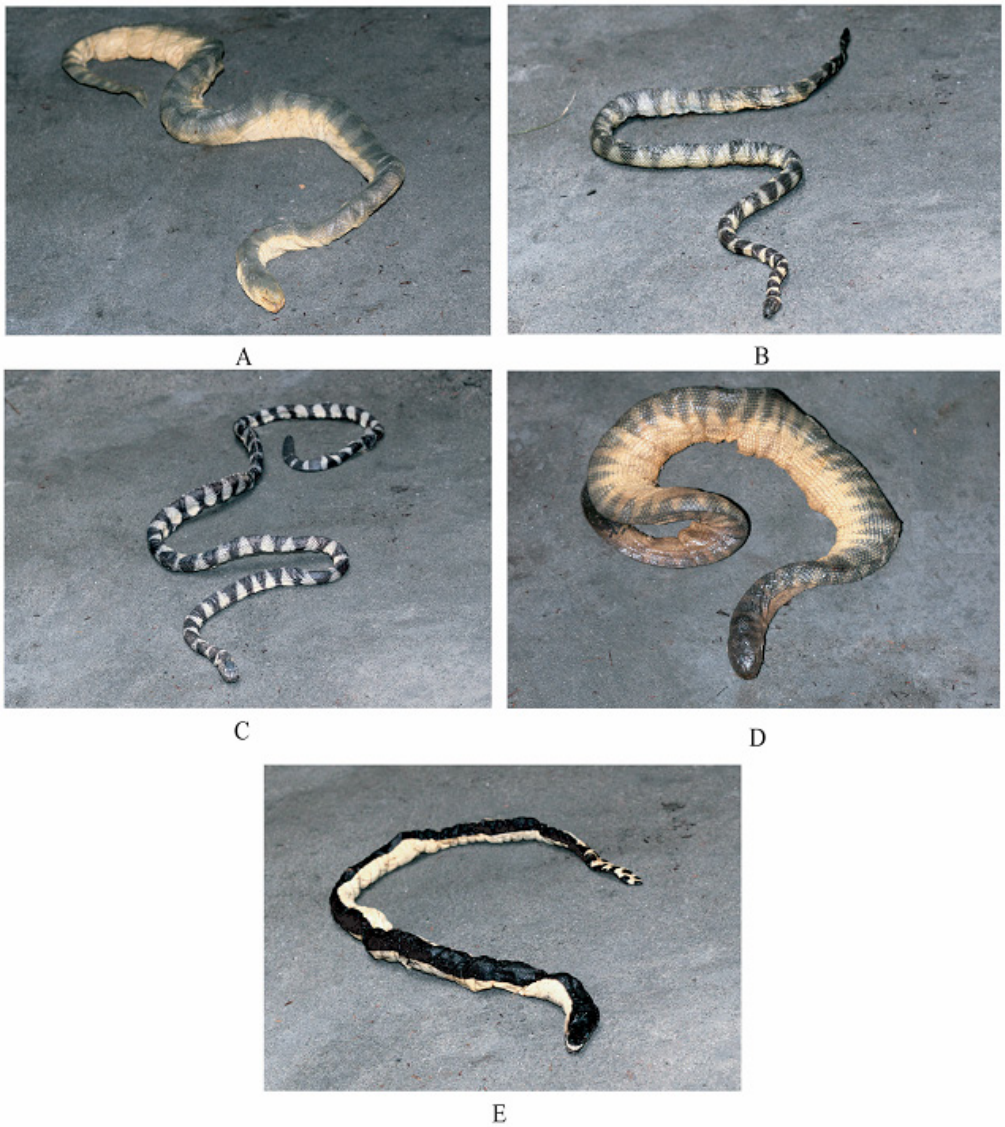


Figure 2. A) *Hydrophis schistosus* (Beaked Sea Snake), B) *H. caerulescens* (Dwarf Sea Snake), C) *H. cyanocinctus* (Annulated Sea Snakes), D) *H. curtus* (Shaw's Sea Snakes), E) *H. platurus* (Yellow-bellied Sea Snake). (Photographed by Mohammad Abdur Razzaque Sarker).

Rubicundus Eelgoby (*Odontamblyopus rubicundus*; Fig. 3A, B). In *H. schistosus*, we found a stony object (Fig. 3C).

Of the five species we observed in this study, only *H. caerulescens* (19 gravid individual females) and *H. schistosus* (one gravid individual female) were in active reproductive condition (Table 3). Of the 48 samples across all species, 95.8% (n = 46) were females and 4.17% (n = 2) were males. Among the females, 29 (63%) were adults and 17 (37%) were juveniles. Among the adult females, 20 (69%) were gravid. We found only eggs in the gravid females; no embryos or vitellogenic follicles were found. It was not possible to distinguish between turgid and flaccid testes and identify sperm in the efferent ducts of males because due to logistical constraints as these were fixed in ethanol immediately after collection (prior to dissection).

Of the nine females of *H. schistosus* collected, we found only one (Field No: MHLB–0002) in active reproductive condition. We found 10 eggs (Fig.4A, Table 3) and the total length (TL) of the individual was 111.5 cm. This observation is consistent with the findings of De Silva et al. (2011b) who reported the presence of 10 and 11 vitellogenic follicles in two specimens respectively and 7–16 eggs in another five specimens of this species from Sri Lanka.

Of the 34 female *H. caerulescens*, we found that 19 were in active reproductive stage. The total number

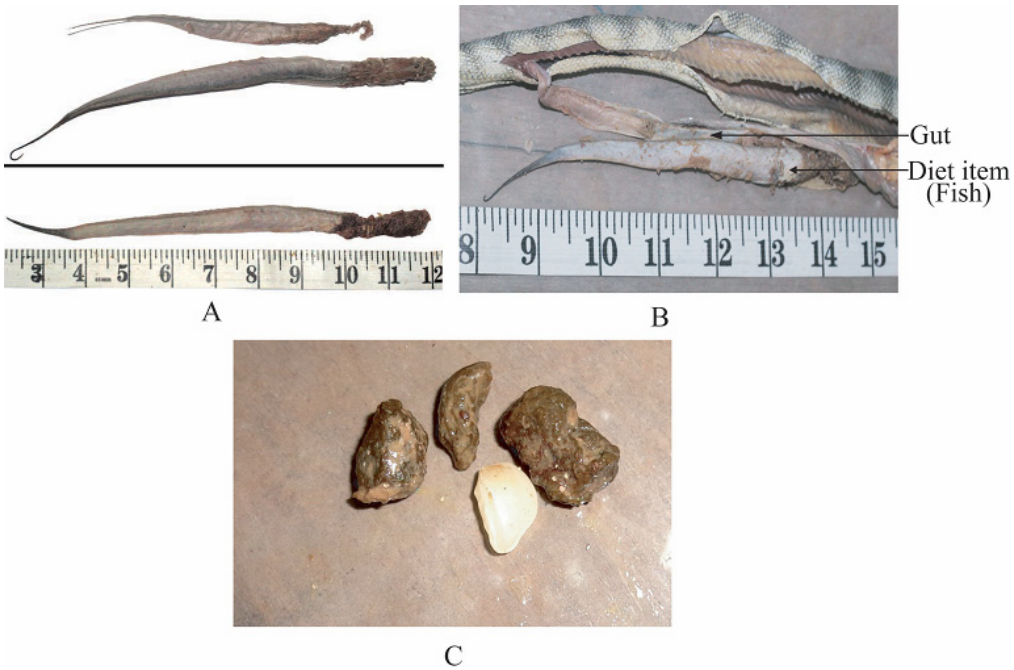


Figure 3. Food items we observed in sea snakes: A) Eel-shaped Goby (*Odontamblyopus rubicundus*), B) Unidentified fish item in the gut of *Hydrophis caerulescens*, and C) Stony objects found in *H. schistosus*. (Photographed by Mohammad Abdur Razzaque Sarker).

of eggs found in these individuals ranged from 7–20 (Fig.4B, Table 3). The total length of the gravid individuals ranged from 620–828 mm with a mean value of 744 mm.

Discussion

This study provides the first baseline data on sea snakes of the Cox Bazar District in Bangladesh. We confirm the presence of five species in the waters of Bay of Bengal, specifically in the coastal waters of Cox's Bazar District, which will help to update the current sea snake checklist for Bangladesh and for this region generally. The most common species collected during the study was *H. caerulescens* (34 of 48 individuals) followed by *H. schistosus* (nine individuals). *Hydrophis cyanocinctus* was recorded in a previous study by Rahman and Reza (2013) but the other four species (*H. schistosus*, *H. caerulescens*, *H. curtus*, and *H. platurus*) represent the first confirmed records from this area. Yellow-lipped Sea Kraits (*Laticaudata colubrina*) and Blackbanded Sea Kraits (*L. laticauda*) are also thought to occur on St. Martin's Island, near Teknaf Upazila of Cox's Bazar District in Bangladesh (Kabir et al. 2009). The possibility of occurrence of other new species are also likely. We also present information on the areas that support the high abundance of sea snakes, which will further assist in future scientific collections of sea snakes. Of the 10 fishing sites, sea snakes were abundant in the Gulir Dar, Noya Dar, and the coast alongside the Indian Border near Sundarban Mangrove Forest region.

Table 2. Diet information of sea snakes from Cox's Bazar District, Bangladesh.

Species Name	Specimens Examined	Food absent	Food present	Digested item
Hydrophis schistosus	9	8	0	1
H. caerulescens	34	21	11	2
H. cyanocinctus	2	2	0	0
H. curtus	1	1	0	0
H. platurus	2	2	0	0
Total	48	34	11	3

We recognize that data on diet and reproduction in our study is inadequate to evaluate detailed feeding and breeding patterns of sea snakes in the region because of the short time interval, but these data are the first such reported for Bangladeshi sea snakes. Literature records of diets in marine snakes found in the waters of Bay of Bengal are rare (Kabir et al. 2009). A few anecdotal reports (Wall 1918) and recent records are available for nearby Indian waters (Lobo et al. 2005; Aaron Savio Lobo, unpubl. report) and Sri Lankan waters (Sivaruban and Kuganathan 2008; De Silva et al. 2011a), but nothing has been reported for the sea snakes of Bangladesh. Here, we provided feeding data of *H. caerulescens* with its specific diet item (*O. rubicundus*). Glodek and Voris (1982) reported *H. caerulescens* as a burrowing, goby fish eater but there is no record of specific fish species reported in the diet. The fish *O. rubicundus* (Gobiidae) is a benthopelagic and amphidromous fish found in tropical tidal rivers, estuaries, and coastal waters of the

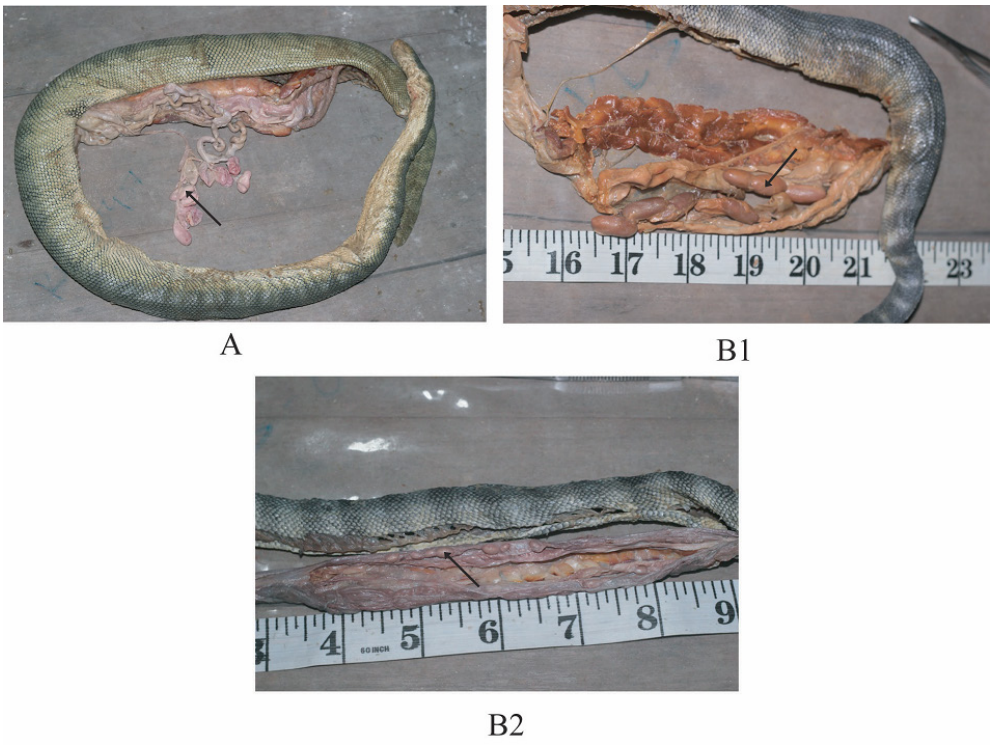


Figure 4. Eggs (black arrows) in A) *Hydrophis schistosus* and B1, B2) *H. caerulescens*. (Photographed by Mohammad Abdur Razzaque Sarker)

Table 3. Field number, date of capture, number of eggs (n) and the range (mm) of widths and lengths (± 2 mm) of eggs found inside gravid female sea snakes from Cox's Bazar District, Bangladesh.

Species Name	Field No	Capture Time	n	Width (mm)	Length (mm)
Hydrophis schistosus	MHLB–0002	September-October 2013	10	9–16	18–25
H. caerulescens	KLS–0308	July-August 2013	8	6–8	16–18
	KLS–0410	October-November 2013	9	2–3	3–6
	KLS–0412	October-November 2013	12	1–3	3–6
	KLS–0414	October-November 2013	15	2–4	3–6
	KLS–0415	October-November 2013	19	1–3	2–6
	KLS–0416	October-November 2013	13	1–2	2–5
	KLS–0418	October-November 2013	13	2–3	3–5
	MHLB–0001	October-November 2013	10	0.9–3	2–5
	MHLB-0003	October-November 2013	15	1–3	2–5
	MHLB–0006	October-November 2013	15	1–3	2–5
	MHLB–0013	October-November 2013	18	1 –3	1–6
	MHLB–0016	October-November 2013	20	3–7	2–4
	MHLB–0019	October-November 2013	12	1–3	2–5
	MHLB–0020	October-November 2013	11	1–3	1–6
	MHLB–0027	October-November 2013	15	1–3	2–6
	MHLB–0030.2	October-November 2013	7	1–3	2–4
	MHLB–0037	October-November 2013	13	1–3	2–5
	MHLB-0039	October-November 2013	8	1–2	3–5
	MHLB–0040	October-November 2013	19	1–2	2–4

Indian Ocean (Siddiqui et al. 2009). However, further details are required in the waters of Bay of Bengal to understand the trophic ecology of sea snakes to address the possible conservation issues.

The reproductive biology of viviparous sea snakes is also poorly known (Voris and Jayne 1979; Lemen and Voris 1981; Burns and Heatwole 2000; Ward 2001; Karthikayan et al. 2008). From Bangladesh, there are only a few anecdotal notes and brief accounts of sea snake reproductive biology by Wall (1921a, b) and some reports in the nearest vicinity of Indian and Sri Lankan sea snakes (De Silva et al. 2011b; Lobo 2005). Our findings on the reproductive status of *H. caerulescens* provide the first such reports for the South Asian region. Further collection of samples in different months is required to determine reproductive seasonality.

Although preliminary, our study of sea snake species diversity, diet and reproduction contributes rare observations of the natural history of sea snakes of Bangladesh. Recent human exploitation and unmanaged tourism in Cox's Bazar has posed a significant threat to biodiversity in the region, and is responsible for the destruction of sea snake habitats in the coastal areas. We also observed illegal and unmanaged fishing practices in the Bay of Bengal. An immediate priority for conservation is to increase awareness of threats to sea snakes among fishermen, as well as encourage safe removal of captured snakes from their fishing gear without unnecessary killing. The data from this preliminary study on sea snake diversity will form a baseline for further studies on the diversity, distribution abundance, population sizes, and fisheries related mortality. Such data are essential to enable reliable assessment the conservation status and to design and implement effective conservation strategies.

The current study reports five (38%) of the 13 species of sea snakes assumed to be present in Bangladesh. A long term study is needed to confirm the continued presence of the other eight species previously recorded from the waters of the Bay of Bengal and determine the possible occurrence of new species. To this end, we recommend a thorough study in the other parts of the coastal fisheries landing ports, such as Sundarbans Mangrove Forest areas, Chittagong, and coastal areas of the southern part that comprises different islands and islets (e.g., Sandwip, Nijhum Dwip, Hatia Island, etc). Our identification of species on the basis of external features is preliminary. Therefore, molecular studies will be very helpful to confirm the species identification in addition to understanding the geographic genetic structure and evolutionary history of the sea snakes of the Bay of Bengal.

Acknowledgments.—We thank the Bangladesh Forest Department for the research permit (memo no: 22.01.000.01.23.2012.2159) especially to Dr. Tapan Kumar Dey, Ms. Rukshana Sultana and Md. Golam Rabbi. This work was supported by an Australian Research Council (ARC) Discovery grant to Kate Sanders and Explorer Club Youth Activity grant to Abdur Razzaque. We are grateful to Momin Mehedi Selim and Dr. Abu Hasan Lavlu for their assistance during field work. We are also thankful to Md. Salauddin (Geography, Jagannath University) for helping with the map. Thanks to Professor Dr. Mokshed Ali Howlader for departmental (Zoology, University of Dhaka) assistance during the research work.

Literature Cited

Asmat, G.S.M., and M.A. Hannan.2007. Bangladesher Bonnya Pranir Talika (Checklist of Wild Animals of Bangladesh).Gazi Publisher, Dhaka, Bangladesh.

Brischoux, F., and H.B. Lillywhite.2011. Light- and flotsam-dependent 'float-and-wait' foraging by Pelagic Sea Snakes (*Pelamis platurus*). Marine Biology 158:2343–2347.

Burns, G., and H. Heatwole. 2000. Growth, sexual dimorphism, and population biology of the Olive Sea Snake, *Aipysurus laevis*, on the Great Barrier Reef of Australia. Amphibia-Reptilia 21:289–300.

De Silva, A. 1994. An account of the sea snakes (Serpentes:Hydrophiidae) of Sri Lanka. Pp. 234–249 *In* Sea Snake Toxinology. Gopalakrishnakone, P. (Ed.). National University Press, Singapore.

De Silva, A., A. Sivaruban, K.D.B. Ukuwela, A.R. Rasmussen, and K.L. Sanders. 2011a. First record of a sea snake (*Lapemis curtus*) feeding on a Gastropod. Herpetology Notes 4:373–375.

De Silva, A., K.D.B. Ukuwela, A. Sivaruban, and K.L. Sanders. 2011b. Preliminary observations on the reproductive biology of six species of Sri Lankan sea snakes (Elapidae:Hydrophiinae). Salamandra 47:193–198.

Elfes, C.T., S.R. Livingstone, A. Lane, V. Lukoschek, K.L. Sanders, A.J. Courtney, J.L. Gatus, M. Guinea, A.S. Lobo, D. Milton, et al. 2013. Fascinating and forgotten: the conservation status of the world's sea snakes. Herpetological Conservation and Biology 8:37–52.

Glodek, G.S., and H.K. Voris. 1982. Marine snake diets: Prey composition, diversity and overlap. Copeia 1982:661–666.

Heatwole, H. 1997. Marine snakes: are they a sustainable resource? Wildlife Society Bulletin 25:766–772.

Heatwole, H.1999. Sea Snakes. Krieger Publishing Company, Malabar, Florida, USA.

Heatwole, H., and R. Seymour.1975. Diving physiology. Pp. 289–327 *In* The Biology of Sea Snakes. Dunson, W.A. (Ed). University Park Press, Baltimore, Maryland, USA.

Hossain, M.S. 2001. Biological aspects of the coastal and marine environment of Bangladesh. Ocean & Coastal Management 44:261–282.

Hossain, M. 2012. Cox's Bazar District. Pp. 146–149 *In* Banglapedia: National Encyclopedia of Bangladesh 3. 2nd Edition. Islam, S., and A.A. Jamal (Eds.). Asiatic Society of Bangladesh, Dhaka, Bangladesh.

International Union for Conservation of Nature (IUCN)-Bangladesh. 2000. Red Book of Threatened Amphibians and Reptiles of Bangladesh, IUCN-The World Conservation Union, Bangladesh. https://portals.iucn.org/library/node/7788.

Kabir, S.M.H., M. Ahmed, A.T.A. Ahmed, A.K.A. Rahman, Z.U. Ahmed, Z.N.T. Begum, M.A. Hassan, and M. Khondker (Eds.). 2009 Encyclopedia of Flora and Fauna of Bangladesh: Amphibians and Reptiles 25. Asiatic Society of Bangladesh, Dhaka, Bangladesh.

Karthikayan, R., S. Vijayalakshmi, and T. Balasubramanian.2008. Feeding and parturition of female Annulated Sea Snake *Hydrophis cyanocinctus* in captivity. Current Science 95:660–664.

Khan, M.A.R. 1987.Bangladesher Banyaprani (In Bangla) 1. Bangla Academy, Dhaka, Bangladesh.

Khan, M.A.R. 2010.Wildlife of Bangladesh: A Checklist (From Amphibiato Mammalia) with Bengali Names. ShahityaPrakash, Dhaka, Bangladesh.

Lemen, C.A., and H.K. Voris.1981.A comparison of reproductive strategies among marine snakes. Journal of Animal Ecology 50:89–101.

Leviton, A.E., G.O.U. Wogan, M.S.Koo, G.R. Zug, R.S. Lucas, and J.V. Vindum. 2003. The dangerously venomous snakes of Myanmar. Illustrated checklist with keys. Proceeding of the California Academy of Science 54:407–462.

Lobo, A.S. 2005. Sea snakes of Goa. Pp. 123–136 *In* Know Our Shore. Untawale, A.G. (Ed.). World Wide Fund for Nature (India), Goa state office, Goa, India.

Lobo, A.S., K. Vasudevan, and B. Pandav. 2005. Trophic Ecology of Lapemis curtus (Hydrophiinae) along the Western Coast of India. Copeia 2005:637–641.

Minton, S.A. 1975. Geographic distribution of sea snakes. Pp. 21–31 *In* The Biology of Sea Snakes. Dunson, W.A. (Ed.). University Park Press, London, UK.

Rahman, S.C., and A.A.H.M. Reza. 2013. Geographic Distribution: *Hydrophis cyanocinctus* (Annulated Sea Snake). Herpetological Review 44:109.

Rasmussen, A.R. 1994. A cladistic analysis of *Hydrophis* subgenus *Chitulia* (McDowell, 1972) (Serpentes, Hydrophiidae). Zoological Journal of the Linnean Society 111:161–178.

Rasmussen, A.R.1997. Systematics of sea snakes: a critical review. Symposium of the Zoological Society of London 70:15–30.

Rasmussen, A. R. 2001. Sea snakes. Pp. 3987–4000 *In* Living Marine Resources of the Western Central Pacific. Carpenter, K.E., and V.H. Niem (Eds.). Food and Agriculture Organization, Rome, Italy.

Rasmussen, A.R., L. Elmberg, P. Gravlund, and I. Ineich. 2011. Sea snakes (Serpentes: subfamilies Hydrophiinae and Laticaudinae) in Vietnam: a comprehensive checklist and an updated identification key. Zootaxa 2894:1–20.

Rubinoff, I., J.B. Graham, and J. Motta. 1986. Diving of the sea snake *Pelamis platurus* in the Gulf of Panama. Dive depth and duration. Marine Biology 91:181–191.

Sanders, K.L., M.S.Y. Lee, R. Leys, R. Foster, and J.S. Keogh. 2008. Molecular phylogeny and divergence dates for Australasian elapids and sea snakes (Hydrophiinae): evidence from seven genes for rapid evolutionary radiations. Journal of Evolutionary Biology 21:682–695.

Sanders, K.L., A.R. Rasmussen, J. Elmberg, A. Silva, M.L. Guinea, and M.S. Lee. 2013. Recent rapid speciation and ecomorph divergence in Indo-Australian sea snakes. Molecular Ecology 22:2742–2759.

Sarker, M.S.U., and N.J.Sarker.1988. Wildlife of Bangladesh: A Systematic List with Status, Distribution and Habitat. The Rico Printers, Dhaka, Bangladesh.

Siddiqui, K.U.,M.A. Islam, S.H.M. Kabir, A.T.A. Ahmed,A.K.A. Rahman, E.U. Haque, Z.U. Ahmed, Z.N.T. Begum, M.A. Hasan, M. Khondker, and M.M. Rahman. (Eds). 2007. Encyclopedia of Flora and Fauna of Bangladesh: Fresh Water Fishes 23. Asiatic Society Bangladesh, Dhaka, Bangladesh.

Sivaruban, A., and S. Kuganathan. 2008. Feeds observed in the stomach of three marine snakes of Jaffna waters. Fifteenth Annual Sessions of Jaffna Science Association 15:23.

Smith, M.A. 1926. Monograph of the sea-snakes (Hydrophiidae). Trustees of the British Museum (Natural History), London, England.

Voris, H.K., and B.C. Jayne. 1979. Growth, reproduction and population structure of a marine snake, *Enhydrina schistosa* (Hydrophidae). Copeia1979:307–318.

Wall, F.1918. Notes on a collection of sea snakes from Madras. Journal of the Bombay Natural History Society 25:599–607.

Wall, F. 1921a. OphidiaTaprobanica or the Snakes of Ceylon. Governmental Press, Colombo, Sri Lanka.

Wall, F.1921b. Notes on some Ceylon snakes recently acquired by the Colombo Museum. SpoilaZeylanica11:405–406.

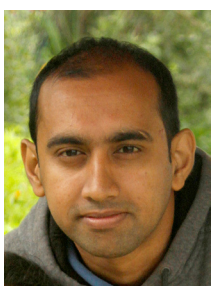
Ward, T.M. 2001. Age structures and reproductive patterns of two species of sea snakes, *Lapemis hardwickii* Grey (1836) and *Hydrophis elegans*

(Grey 1842), incidentally captured by prawn trawlers in northern Australia. Marine & Freshwater Research 52:193–203.

Wassenberg, T.J., J.P. Salini, H. Heatwole, and J.D. Kerr. 1994. Incidental capture of sea-snakes (Hydrophiidae) by prawn trawlers in the Gulf of Carpentaria, Australia. Australian Journal of Marine and Freshwater Research 45:429–443.

Mohammad Abdur Razzaque Sarker is a young researcher in herpetology based in Bangladesh. He received a B.Sc. (hons.) in Zoology and a M.Sc. in Wildlife Biology from University of Dhaka, Bangladesh. His research mainly focuses on taxonomy, ecology, diversity, and conservation of amphibians and reptiles of Bangladesh. There has never been any formal systematic study on sea snakes of Bangladesh; Abdur has taken the first initiative and has been dedicatedly working on biodiversity and conservation of Sea Snakes of Bangladesh for more than five years. He is also conducting research on urban herpetology in Bangladesh. (Photographed by Momin Mehedi Selim).

Kate Sanders is a Senior Lecturer at the University of Adelaide, Australia. Her research focuses primarily on the evolution and conservation of viviparous sea snakes. She also co-chairs the IUCN/SSC Sea Snake Specialist Group. (Photographed by Julian Schwerdt).



Kanishka D.B. Ukuwela is currently a Senior Lecturer in Zoology at the Rajarata University of Sri Lanka. He holds a B.S. (Hons) degree in Zoology from the University of Peradeniya, Sri Lanka and a Ph.D. in Evolutionary Biology from the University of Adelaide, Australia. His current research is focused on the origins, evolution, systematics, and conservation of the South Asian herpetofauna. (Photographed by Isuri Jayawardena).

M. Firoj Jaman is a Professor at the University of Dhaka, Bangladesh. He is a prominent wildlife and conservation biologist based in Bangladesh. His research primarily focuses on behavior, ecology, socio-economic structure, and conservation of primates and other wildlife. He obtained two master degrees; one in Wildlife Biology from the University of Dhaka and another one in Primatology from the Primate Research Institute (PRI), Kyoto University, Japan and later was awarded his Ph.D. in the field of Primatology from PRI of Kyoto University. He has been involved in research and teaching for more than 22 y in the Department of Zoology, University of Dhaka. He is a regular member of many subject related societies and associations. (Photographed by Lokman Hossain).

Appendix 1. Specimens examined during the study from Cox's Bazar District, Bangladesh.

Hydrophis schistosus (Daudin, 1803)

Field No: KLS–0302, KLS–0411, MHLB–0002, MHLB–0004, MHLB–0009, MHLB–0012, MHLB–0014, MHLB–0015, MHLB–0029

H. caerulescens (Shaw, 1802)

Field No: KLS–0303, KLS–0305, KLS–0308, KLS–0309, KLS–0410, KLS–0412, KLS–0413, KLS–0414, KLS–0415, KLS–0416, KLS–0417, KLS–0418; MHLB–0001, MHLB–0003, MHLB–0005, MHLB–0006, MHLB–0007, MHLB–0008, MHLB–0010, MHLB–0013, MHLB–0016, MHLB–0017, MHLB–0018, MHLB–0019, MHLB–0020, MHLB–0021, MHLB–0026, MHLB–0027, MHLB–0030.1, MHLB–0037, MHLB–0038, MHLB–0039, MHLB–0040 and MHLB–0030.2

H. cyanocinctus (Daudin, 1803)

Field No: KLS–0307, KLS–0310

H. curtus (Shaw, 1802)

Field No: MHLB–0001

H. platurus (Linnaeus, 1766)

Field No: KLS–0300.1and KLS–0064

Appendix 2. Sex, snout-vent length (SVL), tail length (TAL), total length (TL), number of ventral scutes (Vs), Dorsal scale rows on neck (DN), dorsal scales rows at midbody (DM), number of supralabial scales (Left [L]/Right [R]), number of infralabial scales, number of teeth behind fang (Teeth), and number of cross bands including tail (CB). The number of supralabial scales touching the eye are in parentheses.

	H. schistosus	*H. caerulescens*	*H. cyanocinctus*	*H. curtus*	*H.platurus*
Trait	MHLB-0002	MHLB-0016	KLS-0307	MHLB-0001	MHLB-0300
Sex	F	F	M	M	F
SVL	996	754	783	775	467
TAL	143	74	84	90	56
TL	1138	828	866	865	523
Vs	297–306	307–308	243–360	170–171	357–370
DN	46–48	40–45	30–31	29–31	50–52
DM	54–58	53–54	38–43	33–37	58–63
SL(L/R)	7/7; (3 & 4)	6/6 or 7/7; (3,4)	7/7; (3,4,5; 2 & 3)	7/7; (3 & 4)	7/7; (4)
IL(L/R)	5	4	5	4	5
Teeth	11	14 to 15	9 to 10	-	10 to 11
CB	Absent	46	56	53	Absent