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Sea snake occurrences along the Mainland Indian coastline in two decades –a preliminary study using citizen-science photo posts

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ABSTRACT

We analysed the sea snake posts in iNaturalist from the mainland Indian coasts. We found a total of 319 posts representing 14 species, across a 20-year period from 2006 to 2025. Many species were rarely represented with singletons (n=5 spp.) and doubletons (n=3 spp.). The commonest species in the dataset was *Hydrophis schistosus*, amounting to 63.32% of total posts. The Maharashtra coast emerged as the most dominant in terms of posts, amounting to 48.58% of total posts. The recent five years (2021-25) logged as much as 73.58%, and the post-monsoon season recorded the highest seasonal frequency (36.67%).

Keywords: Dominant species, states, posts, rank abundance, relative abundance, season

1. INTRODUCTION

Sea snakes, or marine elapids, remain an understudied group of venomous snakes on Indian coasts (Ganesh et al. 2019), particularly regarding occurrence records of most species—only a handful are regularly reported (Kannan & Rajagopalan, 2008). Museum voucher collections, both historical and recent (Mondal et al., 2022; Mondal et al., 2023), suggest that some uncommon species remain underreported. Few Indian coastal areas have a comprehensive sampling of sea snake taxa (Lobo, 2006). Recent monitoring efforts raise conservation concerns about population declines (Auliya et al. 2024; Dsouza & Rao 2021; Dsouza et al. 2021; Rao et al., 2021; Venkatraman et al., 2015; Ganesh, 2025), likely tied to fishing practices. This study evaluates how citizen-science data from iNaturalist can provide new baseline information on sea snake occurrences along the Indian mainland coastline, aiming to address existing knowledge gaps and enhance future research and conservation.

2. METHODOLOGY

We downloaded verified occurrence records of true sea snakes (i.e. marine elapids) from the mainland Indian coastline in the iNaturalist portal, as of 03 January 2026, using in-built taxonomic (Hydrophiinae) and geographic (India) filters. Though many public data portals like Global Biodiversity Information Facility (GBIF), India Biodiversity Portal (IBP), Vertnet, Herpmapper exist, they were not considered as

independent, as photo-verification of the posted species was not always possible in those portals. The raw data that was downloaded were later uploaded into Microsoft Excel and arranged aspect-wise for analysis. Absolute values and their relative abundance (%) among total counts were tabulated both species-wise and state-wise. The year-wise and season-wise break-up of data was tabulated based on the sighting dates of the posts. Since one species was highly dominant in the dataset (read below), two analyses were conducted, one exclusive of the dominant species and another on all of the remaining species. Seasons were designated as: winter (December, January, and February), summer (March, April, and May), south-west monsoon (June, July and August) and north-east monsoon (September, October and November). Yearly break-up was done based on a class interval with a class size of 5 years. Lengths of coastlines in km were adopted from GoI (2025).

3. RESULTS

A total of 319 citizen-science posts representing 14 species of true sea snakes (*Hydrophis, Microcephalophis*) were recorded. The snake species recorded were *Hydrophis schistosus, H. cyanocinctus, H. curtus, H. platurus, H. caerulescens, H. spiralis, H. fasciatus, H. lapemoides, H. stokesii, H. viperinus, H. obscurus, H. ornatus, Microcephalophis gracilis* and *M. cantoris. The* posts were present on the coasts of all the states of the Indian Peninsula, from Gujarat in the west, to Tamil Nadu in the south and to West Bengal in the east. The posts were present in all years of the past two decades and across all seasons, as detailed below.

Taxonomic break-up (Table 1):

Hydrophis schistosus was the most frequently sighted species with 202 posts (63.32%). Secondly, *H. cyanocinctus* and *H. curtus* were recorded 31 (9.71%) and 30 (9.40%) times, respectively. Uncommon species were *H. platurus, H. caerulescens* and *H. spiralis* with 18 (5.64%), 15 (4.70%) and 12 (3.76%) posts, respectively. The following eight species, viz. *M. cantoris, H. viperinus, H. obscurus, H. ornatus, H. fasciatus, M. gracilis, H. stokesii,* and *H. lapemoides* were recorded only 1–2 times over the past two decades with a relative abundance range of 0.31–0.62%. Overall, the data showed a strongly skewed abundance pattern, with *H. schistosus* dominating the citizen-science records.

Geographic break-up (Table 2; Fig. 1):

Standardised against the coastline length, Goa exhibited the highest relative abundance per coastal kilometre (29.38%), followed by Maharashtra (17.65%). Species richness was highest in Maharashtra with a total of 9 species recorded, with a Relative abundance of 64.28%, followed by Gujarat and Tamil Nadu with 6 species each and a species relative abundance of 42.85%, and Goa and Andhra Pradesh (5 species each; 35.71%). Odisha recorded the lowest species diversity (1 species; 7.14%). Maharashtra accounted for the highest number of posts (155 posts; 48.58%), followed by Goa (57 posts; 17.87%) and Tamil Nadu (42 posts; 13.16%). Gujarat logged 28 posts (8.78%), while Andhra Pradesh (13 posts; 4.07%) and Kerala (12 posts; 3.76%) showed mild representation. Karnataka (4 posts; 1.25%), West Bengal (5 posts; 1.56%), and Odisha (2 posts; 0.62%) had far fewer records.

Temporal (yearly, seasonal) break-up (Table 3):

There is a sharp rise in the posting frequency over the past two decades, particularly in the most recent five-year span. Only two posts have been logged in the period of 2006–2010. During 2011–2015, there was rather minimal activity with only 9 posts (2.82%). From 2016–2020, post frequency increased manifold, with 69 posts (21.63%). And, in the final period of 2021–2025, as many as 234 posts (73.58%) were recorded. Seasonal analysis showed that the majority of records were documented during the post-monsoon period (117 posts; 36.67%). Both the south-west monsoon and north-east monsoon contributed equally (70 posts each; 21.94%). Summer accounted for 58 posts (18.18%), while 4 posts (1.25%) were categorised as unknown, as the observation date is unclear.

4. DISCUSSION

There were 14 species of true sea snakes represented in iNaturalist records that forms 77.77% of the total (18) species known in mainland Indian coasts (Ganesh et al. 2019). *Hydrophis jerdoni, H. mamillaris, H. stricticollis* and *H. nigrocinctus* are the missing species. All these are rare species in India (Mondal et al., 2023). *Hydrophis jerdoni* was known from Kerala (Kannan & Rajagopalan, 2008), Tamil Nadu, *H. mamillaris* from Maharashtra and Bengal, *H. nigrocinctus* from Bengal and *H. stricticollis* from Odisha, Bengal coasts (Mondal et al., 2023), but our compilation lacks these species. Our compilation is similar to published reports where *H. schistosus* consistently remains the most dominant species (Kannan & Rajagopalan, 2008; Venkatraman et al., 2015; Ganesh, 2025).

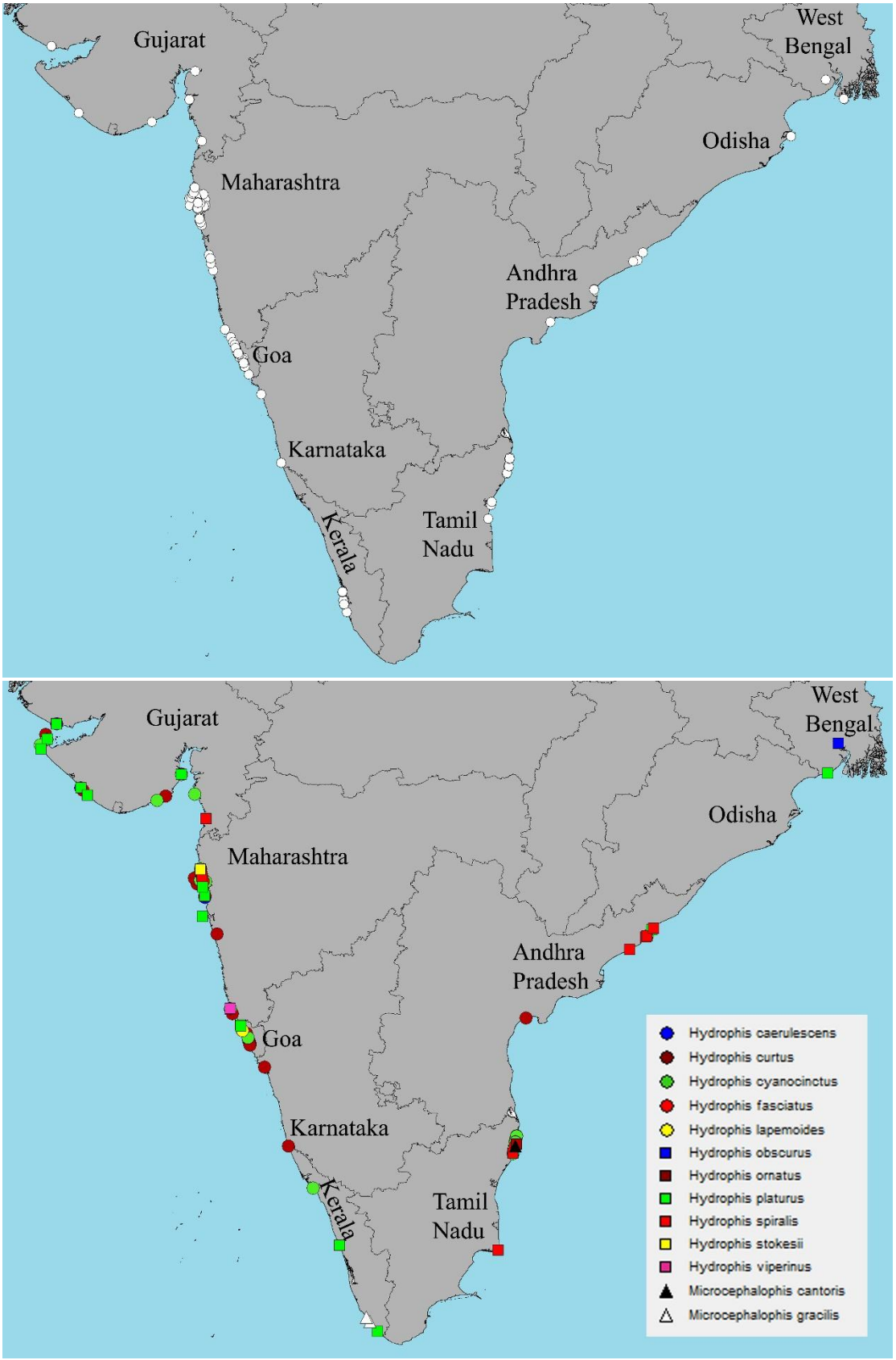

Figure 1. Posts of *Hydrophis schistosus* marked by white symbols (top panel) and posts of all other sea snakes marked by colour-coded dots as in legend (above) in mainland Indian coast.

Table 1. Rank abundance (%) of the 14 sea snake species posts in the mainland Indian coast.

Rare Sea Snake Species	No. of Posts	% Relative Abundance	Common Sea Snake Species	No. of Posts	% Relative Abundance
M. cantoris	1	0.31	*H. spiralis*	12	3.76
H. stokesii	1	0.31	*H. caerulescens*	15	4.70
H. viperinus	1	0.31	*H. platurus*	18	5.64
H. obscurus	1	0.31	*H. curtus*	30	9.40
H. ornatus	1	0.31	*H. cyanocinctus*	31	9.71
H. fasciatus	2	0.62	*H. schistosus*	202	63.32
H. lapemoides	2	0.62			
M. gracilis	2	0.62			

Table 2. State-wise Distribution of Sea Snake Occurrence Along the Peninsular Indian Coastline: Coastline Length, Species Richness, and Relative Abundance.

States with a coastline	Coast in km	% Relative Abundance	No. of Species	Spp. Relative Abundance %	No. of Posts	Posts Relative Abundance %
Andhra Pradesh	1053.07	1.23 %	5	35.71 %	13	4.07 %
Goa	193.95	29.38 %	5	35.71 %	57	17.87 %
Gujarat	2340.62	1.19 %	6	42.85 %	28	8.78 %
Karnataka	343.3	1.16 %	2	14.28 %	4	1.25 %
Kerala	600.15	1.99 %	4	28.57 %	12	3.76 %
Maharashtra	877.97	17.65 %	9	64.28 %	155	48.58 %
Odisha	574.71	0.34 %	1	7.14 %	2	0.62 %
Tamil Nadu	1068.69	3.93 %	6	42.85 %	42	13.16 %
West Bengal	721.02	0.69 %	3	21.42 %	5	1.56 %

Table 3. Temporal (five-year class interval) and seasonal distribution of sea snake occurrence records along the mainland Indian coastline (2006–2025).

Years, class interval (class size: 5 years)	No. of Posts	% Relative Abundance	Seasonal break-up (months merged)	No. of posts	% Relative Abundance
2006-2010	2	0.62 %	Post monsoon	117	36.67 %
2011-2015	9	2.82 %	SW monsoon	70	21.94 %
2016-2020	69	21.63 %	NE monsoon	70	21.94 %
2021-2025	234	73.58 %	Summer	58	18.18 %
Unknown	4	1.25 %	Unknown	4	1.25 %

Targeted surveys with deliberate efforts to find sea snakes over many years outperform the present compilation in terms of the number of snake records. Venkatraman et al., (2015) reported 209 snake records of nine species from 2009 to 2013 from Tamil Nadu. Tambre et al., (2020), Dsouza & Rao (2021), Dsouza et al., (2021), and Rao et al., (2021) surveyed the Goa-Maharashtra coasts for 2-4 years and recorded from 400 to over 1000 snakes, though of much lower richness, often just 2 to 4 species. Compared to those studies, the present compilation, which is a summation of multi-user chance encounters sightings over 20 years, resulting in 319 records of 14 species. Of all these, one very important post in the dataset is that of *H. stokesii* from the Maharashtra coast, which further substantiates an old voucher record on the Kerala coast (Ganesh, 2025). This is the first attempt at amassing sea snake records in India based on a citizen-science dataset.

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Author contributions

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Informed consent

Not applicable.

Ethical approval & declaration

Not applicable. This article does not contain any studies with human participants or animals performed by any of the authors.

Data and materials availability

All data associated with this study will be available based on the reasonable request to corresponding author.

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