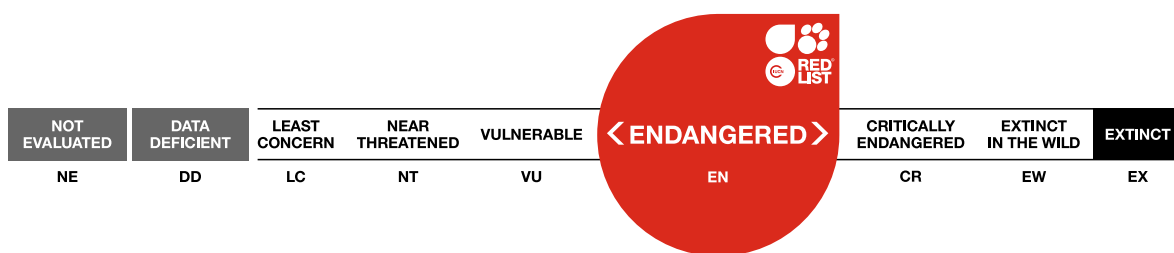


Hydrophis platurus ssp. xanthos, Yellow Sea Snake

Assessment by: Bessesen, B., Udyawer, V., Crowe-Riddell, J.M., Lillywhite, H. & Sanders, K.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Squamata	Elapidae

Scientific Name: *Hydrophis platurus ssp. xanthos* Bessesen & Galbreath, 2017

Parent Species: See [Hydrophis platurus](#)

Common Name(s):

- English: Yellow Sea Snake, Golfo Dulce Sea Snake
- Spanish; Castilian: Serpiente Marina Amarilla (de Golfo Dulce), Xanthos

Taxonomic Source(s):

Uetz, P., Freed, P., Aguilar, R., Reyes, F. and Hošek, J. (eds). 2023. The Reptile Database (May 2023 update). Available at: <http://www.reptile-database.org>. (Accessed: 7 May 2023).

Taxonomic Notes:

The Golfo Dulce Yellow Sea Snake represents a geographically confined breeding population found only in Costa Rica. It was conservatively described as a subspecies based on distinctive morphological characters, including monochromatic coloration and reduced body size, which present alongside apparent adaptive behaviors (Bessesen and Galbreath 2017). Further examination of the population's taxonomic distinctiveness through molecular and morphological analyses is currently underway, which may result in an elevation to the rank of species (Bessesen 2022).

Identification Information:

The Golfo Dulce Yellow Sea Snake represents a geographically confined breeding population found only in Costa Rica. It was conservatively described as a subspecies based on distinctive morphological characters, including monochromatic coloration and reduced body size, which present alongside apparent adaptive behaviors (Bessesen and Galbreath 2017). Further examination of the population's taxonomic distinctiveness through molecular and morphological analyses is currently underway, which may result in an elevation to the rank of species (Bessesen 2022).

Taxonomic Source: P. Uetz, P. Freed, R. Aguilar and J. Hosek 2022 *Hydrophis platurus* LINNAEUS, 1766: Synonym *Hydrophis platurus xanthos* BESSESEN & GALBREATH 2017. The Reptile Database. Available at <http://www.reptile-database.org>. Last accessed 10 April 2023

Assessment Information

Red List Category & Criteria: Endangered B1ab(iii)+2ab(iii) [ver 3.1](#)

Year Published: 2024

Date Assessed: April 10, 2023

Justification:

The Yellow Sea Snake is endemic to Golfo Dulce, Costa Rica. This allopatric population maintains site fidelity to the embayment's inner basin, geographically separated from conspecifics outside the embayment (Solórzano 2011, Bessesen 2012, Lillywhite *et al.* 2015, Bessesen 2022). It exists in only one location, confined to an extremely narrow extent of occurrence (EOO=282 km²) and area of occupancy (AOO=260 km²; Bessesen *et al.* 2023). Moreover, the quality of its habitat has been decreasing (Spongberg *et al.* 2011, Fournier *et al.* 2019, Bessesen and González-Suárez 2021), a trend that is predicted to continue due to anthropogenic impacts, including marine traffic, water contamination, and climate change (Bessesen 2022). Recognition of *H. p. xanthos* as a discrete taxon by the IUCN Red List may initiate its protection given that the assessment for this isolated subpopulation warrants a conservation status of Endangered.

Geographic Range

Range Description:

The Yellow Sea Snake is an obligate resident of the inner basin of Golfo Dulce, Costa Rica. While the embayment is approximately 50 km long and 10–15 km wide, with a total surface area of about 750 km² (Wolff *et al.* 1996), the Yellow Sea Snake is confined to the area having the deepest waters in the northern region. The population appears allopatric (Sheehy *et al.* 2012) and distribution maps show it spatially divided from the Pelagic Sea Snake, *Hydrophis platurus*, by a gap of ~22 km (Bessesen 2012, 2022). Using a minimum-convex polygon of Yellow Sea Snake sightings records (n=764 by BLB between 2010–2021), extent of occurrence (EOO) was measured at 282 km² with a 260-km² contiguous area of occupancy (AOO; Bessesen *et al.* 2023). A few all-yellow specimens have been recorded off Central America, with counts inversely related to distance from Golfo Dulce (Voris *et al.* 1970, Kropach 1971, Bolaños *et al.* 1974, Tu 1976). Since data suggest Yellow Sea Snakes may be occasionally carried out of the gulf by storms or currents (Bessesen 2015, 2022), occurrences in the broader Pacific Ocean may be considered vagrancies.

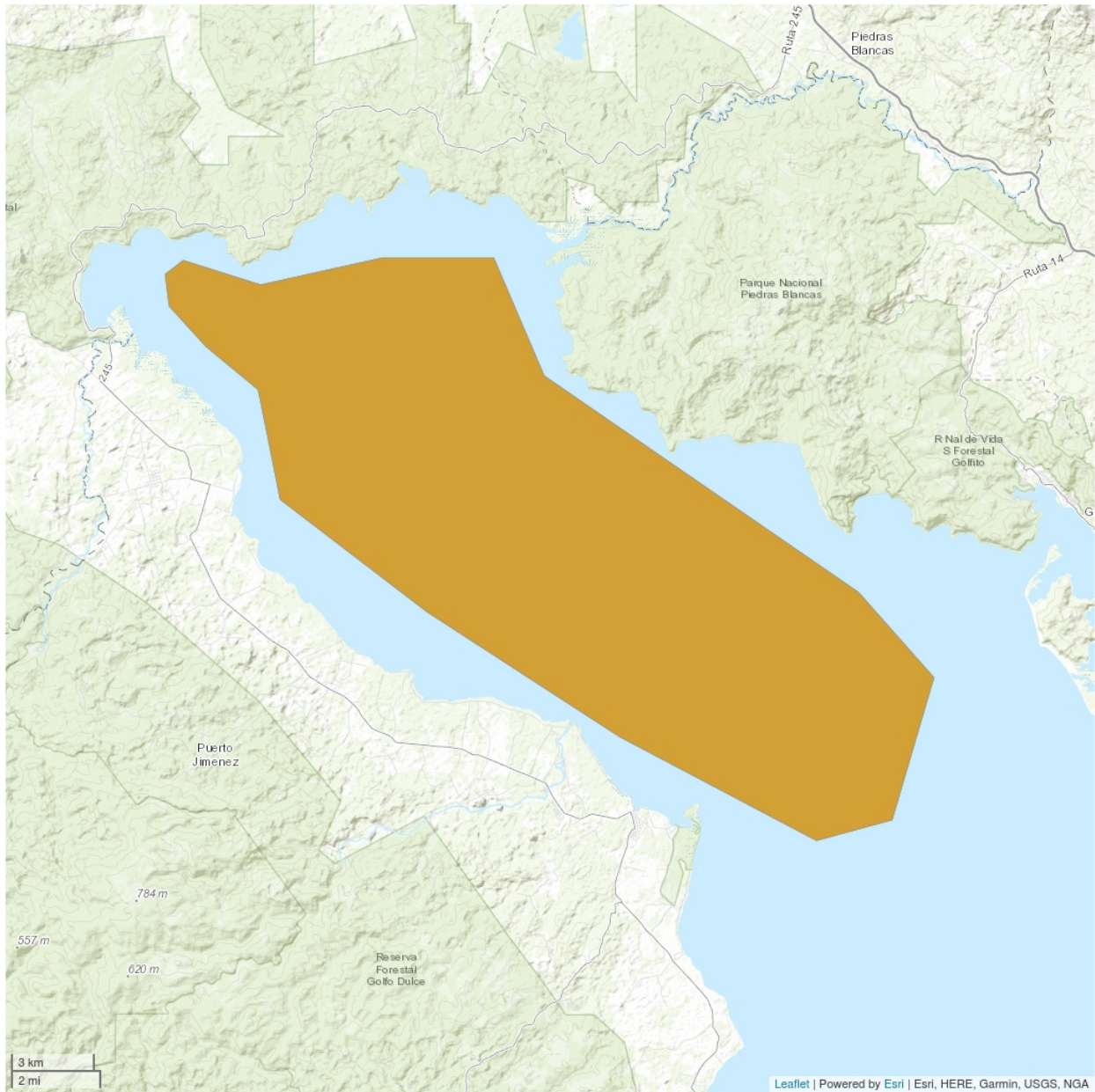
Country Occurrence:

Native, Extant (resident): Costa Rica (Costa Rica (mainland))

FAO Marine Fishing Areas:

Native: Pacific - eastern central

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by:

IUCN SSC Sea Snake Specialist Group 2024



The boundaries and names shown and the designations used on this map do not imply any official endorsement, acceptance or opinion by IUCN.

Population

The global population of this isolated taxon is estimated at less than 30,000 individuals (95% CI, range=20,104–44,115), with a relatively low density of 76 Yellow Sea Snakes/ km² (Bessesen *et al.* 2022). These figures were established through robust distance sampling methods and serve as a baseline for future trend assessment. The current population trend is unknown. Marine biodiversity surveys conducted in Golfo Dulce in 2010, 2011, and 2020, showed an increase in recorded individuals (Bessesen 2012, 2015, 2022), however this could be related to improved survey methods and detectability through the years, rather than an increased abundance of the population. If the increase in abundance is genuine, it may represent a recovery rather than positive population growth because semi-industrial trawlers, which historically plied the waters of Golfo Dulce, were bought out in 2010 (Fargier *et al.* 2014), the same year as the first survey. If the population was depleted in trawl fishery bycatch (as are sea snakes in other countries; Fry *et al.* 2015), an increase in the following decade would be expected. A repeated distance sampling study in the future will be critical to establish a reliable trend direction. Demographic details of the population are yet unknown.

For reference, *Hydrophis platurus xanthos* has historically fallen under the assessment of the *H. platurus* (Pelagic Sea Snake), which is a species of Least Concern on the IUCN Red List (Guinea *et al.* 2017). The Pelagic Sea Snake is considered the most widely ranging snake in the world with waif dispersal across the Indian and Pacific Oceans (Lillywhite *et al.* 2018). Although global size of its population is unknown, Kropach (1973) estimated up to a million or more Pelagic Sea Snakes in the Gulf of Panama alone. Other studies (Tu 1976, Lillywhite *et al.* 2015) recorded hundreds to thousands of individuals aggregated in drift lines off Costa Rica. Such high counts sharply contrast the population abundance estimates of the Yellow Sea Snake and highlight the importance of this subpopulation assessment.

Current Population Trend: Unknown

Habitat and Ecology (see Appendix for additional information)

Yellow Sea Snakes are adapted to water conditions quite different from their pelagic conspecifics. Golfo Dulce is a semi-closed embayment positioned in the tropical zone between 8° 22'–45' N and 83° 06'–29' W (Hebbeln *et al.* 1996) and has low-saline waters that are relatively warm. Surface salinity within the suitable range of the Yellow Sea Snake averages <31 ppt due to freshwater drainage from several rivers (Bessesen *et al.* 2023), and sea surface temperatures can reach 32.5 °C (Rincón-Alejos and Ballestero-Sakson 2015), approaching the maximum thermal tolerance for the species (Dunson and Ehlert 1971). Considered a rare “tropical fiord,” Golfo Dulce has a 215-m inner basin protected by a 60-m sill and shallow outer basin that limit free exchange with the Pacific coastal masses. Such bathymetry renders its deepest interior layers anoxic. Concentrations of dissolved oxygen near the surface (0–20 m depth) can fall below 4 mg/L (Quesada-Alpizar and Morales-Ramírez 2004, Acuña-González *et al.* 2006). Levels that low can alter the behaviour of marine vertebrates (Carson and Parsons 2001, Burke *et al.* 2021) and likely influence the vertical range of the Yellow Sea Snake. While the inner basin is relatively calm with currents generally less than 5 cm/ s. the outer basin is marked by strong currents associated with tidal cycles (Svendsen *et al.* 2006, Morales-Ramírez *et al.* 2015) that may contribute to the partitioning of the Americas’ two sea snake taxa. In Golfo Dulce, readings of pH can be as low as 7.9 (Richards *et al.* 1971), but suitable habitat for the Yellow Sea Snake is closer to the historical oceanic level of 8.2 (Bessesen *et al.* 2023). In addition to its xanthic (all-yellow) coloring and short stature (40–59 cm), the Yellow Sea Snake exhibits behaviors that are distinctive from the Pelagic Sea Snake, including a nocturnal diel cycle

(Bessesen and González-Suárez 2022). As a float-and-wait predator that feeds on young and larval fish at the sea surface, the snake's activity pattern may be related to temperature: both air and water are warmer during the day, and light skin and eyes also risk damage from solar radiation (Bessesen and González-Suárez 2022). Nighttime waters are often turbulent, so the Yellow Sea Snake assumes a unique sinusoidal ambush posture that appears stabilizing in the waves (Bessesen and Galbreath 2017). The Yellow Sea Snake also exhibits a divergent disassociation with drift lines, commonly used by the Pelagic Sea Snake for passive transport, further limiting any potential for long-distance migration for the Golfo Dulce population (Bessesen 2022).

For further information about this species, see [Supplementary Material](#).

Systems: Marine

Use and Trade (see Appendix for additional information)

There is no known use or trade of this taxon.

Threats (see Appendix for additional information)

Amidst widespread biological loss, Pimm *et al.* (1995) found endemic populations to be at the highest risk of extinction, and sea snakes as a faunal group appear in precipitous worldwide decline (see Udyawer *et al.* 2018 for a review). If the Yellow Sea Snake is like its pelagic conspecifics, it exhibits k-selected traits (Heatwole 1999), including a lengthy gestation period (6-8 months: Savage 2002), small litter size (1-6: Visser 1967), and short life expectancy (<10 years: Brischoux *et al.* 2016), which can reduce resistance to negative environmental impacts (Rao *et al.* 2021). Such impacts include marine traffic, water degradation, and climate change. The paucity of life-history data for this species makes assessment of population stability difficult in light of localised threatening processes.

Yellow Sea Snakes are vulnerable to boat strikes when surfacing to feed and breathe. Since 2010, cruise liners and cargo ships have started entering Golfo Dulce and local boat captains also report a substantial increase in tour boats and sport-fishing vessels (Bessesen and González-Suárez 2021). Large ships impose an additional hazard: oil spillage, known to have catastrophic effects on sea snakes (Yaghmour *et al.* 2022). A single large-scale event could cause mass mortality, potentially wiping out the xanthic population. Other chemical contaminants have already been identified in Golfo Dulce, mostly deriving from agriculture (especially palm oil plantations) and community runoff: numerous biocides, especially clomazone (Spongberg *et al.* 2011; Fournier *et al.* 2019) DDT and BHC compounds (Spongberg and Davis 1998), PCBs, and pharmaceuticals and personal care products, PPCPs, like antibiotics, NSAIDs, and even caffeine (Spongberg *et al.* 2011). While the effects of such chemicals on hydrophiids are unknown, studies have shown bioaccumulation of environmental pollutants to cause metabolic disturbances and degrade body condition in wetland Hydrophiinae (Lettoof *et al.* 2022, 2023). The destabilizing effects of climate change, especially increasing temperatures, deoxygenation, and acidification pose additional and pressing threats to the Yellow Sea Snake (Bessesen *et al.* 2023). Unable to migrate away from Golfo Dulce where rising sea surface temperatures have been reported (Murayama *et al.* 2018), this geographically bound population faces a high risk of extinction. Elevated water temperatures can increase sea snake metabolism and decrease dive time (Udyawer *et al.* 2016). If the Yellow Sea Snake has already adapted to its warm environment with lighter skin that minimizes daytime solar heat accumulation when floating at the surface to rest, breath, or feed (Solórzano 2011, Bessesen 2012), as

well as a greater surface-area-to-volume ratio for cooling, and a primarily nocturnal activity pattern (Bessesen and González-Suárez 2022), the population is unlikely to withstand further warming. Rainwater lenses that form at the ocean surface are critical for sea snake hydration, so extended, or unexpected periods of drought could also negatively affect survival (Lillywhite *et al.* 2019, Rash and Lillywhite 2019). Furthermore, as the habitat of the Yellow Sea Snake is already deficient in oxygen due to limited water circulation (Acuña-González *et al.* 2006), climate-change induced ocean deoxygenation (Breitburg *et al.* 2018) and/or ocean acidification (Raven *et al.* 2005) could impose sufficient habitat compression to render a healthy population unsustainable.

Conservation Actions (see Appendix for additional information)

Efforts are needed to ensure the future of the only sea snake endemic to the Americas. To date, no conservation actions have been taken to specifically address the Yellow Sea Snake, and its deep-water habitat is not currently protected. Two existing conservation management policies in Golfo Dulce offer some degree of benefit to the taxon. Firstly, Piedras Blancas National Park along the northeastern shoreline of the embayment includes 13.2 km² of marine protected area (Alvarado *et al.* 2012), which does not appreciably overlap the Yellow Sea Snake's AOO but offers a legal precedent for protection and could be extended. Secondly, when Golfo Dulce became a Marine Area of Responsible Fishing in 2010, commercial shrimp trawlers were abolished in the embayment, effectively eliminating any risk of Yellow Sea Snake bycatch in those fisheries (Fargier *et al.* 2014). More generally, Golfo Dulce is considered a biodiversity hotspot (Quesada and Cortés 2006) falling within the Ecologically or Biologically Significant Area (EBSA) known as 'Corredor Marino del Pacífico Oriental tropical' (CBD 2022). Golfo Dulce has also been designated an Important Marine Mammal Area (IMMA; Oviedo *et al.* 2022), a candidate Whale Heritage Site (World Animal Protection 2023), a sanctuary for juvenile scalloped hammerhead sharks, *Sphyrna lewini* (Zanella and López-Garro 2019), as well as a Hope Spot by oceanographer Sylvia Earle (Mission Blue 2019). These special designations benefit Golfo Dulce fauna by raising public awareness and perceived value of the marine environment. Given Costa Rica's growing focus on marine protection, we hope this conservation status assessment for the Yellow Sea Snake inspires preservation of its unique inner-basin habitat with immediate action to mitigate the effects of climate change and other human-induced impacts. A future distance-sampling survey is required to determine the abundance trend of this singular subpopulation.

Credits

Assessor(s): Bessesen, B., Udyawer, V., Crowe-Riddell, J.M., Lillywhite, H. & Sanders, K.

Reviewer(s): Lillywhite, H., Crowe-Riddell, J.M. & Sanders, K.

Facilitator(s) and Compiler(s): Udyawer, V.

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External Resources

For [Supplementary Material](#), and for [Images and External Links to Additional Information](#), please see the Red List website.

Appendix

Habitats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Habitat	Season	Suitability	Major Importance?
9. Marine Neritic -> 9.1. Marine Neritic - Pelagic	Resident	Suitable	Yes

Threats

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Threat	Timing	Scope	Severity
4. Transportation & service corridors -> 4.3. Shipping lanes	Ongoing	Whole (>90%)	Causing/could cause fluctuations
	Stresses:	2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.2. Species disturbance	
9. Pollution -> 9.2. Industrial & military effluents -> 9.2.1. Oil spills	Ongoing	Whole (>90%)	Slow, significant declines
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 2. Species Stresses -> 2.1. Species mortality	
11. Climate change & severe weather -> 11.3. Temperature extremes	Future	Whole (>90%)	Rapid declines
	Stresses:	1. Ecosystem stresses -> 1.2. Ecosystem degradation 1. Ecosystem stresses -> 1.3. Indirect ecosystem effects 2. Species Stresses -> 2.1. Species mortality 2. Species Stresses -> 2.3. Indirect species effects -> 2.3.7. Reduced reproductive success -> 2.3.8. Other	

Conservation Actions in Place

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action in Place
In-place research and monitoring
Action Recovery Plan: No
Systematic monitoring scheme: No

Conservation Actions Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Conservation Action Needed	Notes
1. Land/water protection -> 1.1. Site/area protection	-
2. Land/water management -> 2.3. Habitat & natural process restoration	-

Research Needed

(<http://www.iucnredlist.org/technical-documents/classification-schemes>)

Research Needed	Notes
1. Research -> 1.3. Life history & ecology	-
1. Research -> 1.5. Threats	-
2. Conservation Planning -> 2.2. Area-based Management Plan	-
3. Monitoring -> 3.1. Population trends	-
3. Monitoring -> 3.4. Habitat trends	-

Additional Data Fields

Distribution
Estimated area of occupancy (AOO) (km ²): 260
Continuing decline in area of occupancy (AOO): Unknown
Extreme fluctuations in area of occupancy (AOO): Unknown
Estimated extent of occurrence (EOO) (km ²): 282
Continuing decline in extent of occurrence (EOO): Unknown
Extreme fluctuations in extent of occurrence (EOO): Unknown
Number of Locations: 1
Continuing decline in number of locations: Unknown
Extreme fluctuations in the number of locations: Unknown
Lower depth limit (m): 0
Upper depth limit (m): 50
Population
Number of mature individuals: 29,781
Continuing decline of mature individuals: Unknown
Extreme fluctuations: Unknown
Population severely fragmented: No
Continuing decline in subpopulations: Unknown
Extreme fluctuations in subpopulations: Unknown
All individuals in one subpopulation: Unknown

Habitats and Ecology
Continuing decline in area, extent and/or quality of habitat: Yes
Generation Length (years): 7-10
Movement patterns: Unknown

The IUCN Red List Partnership



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