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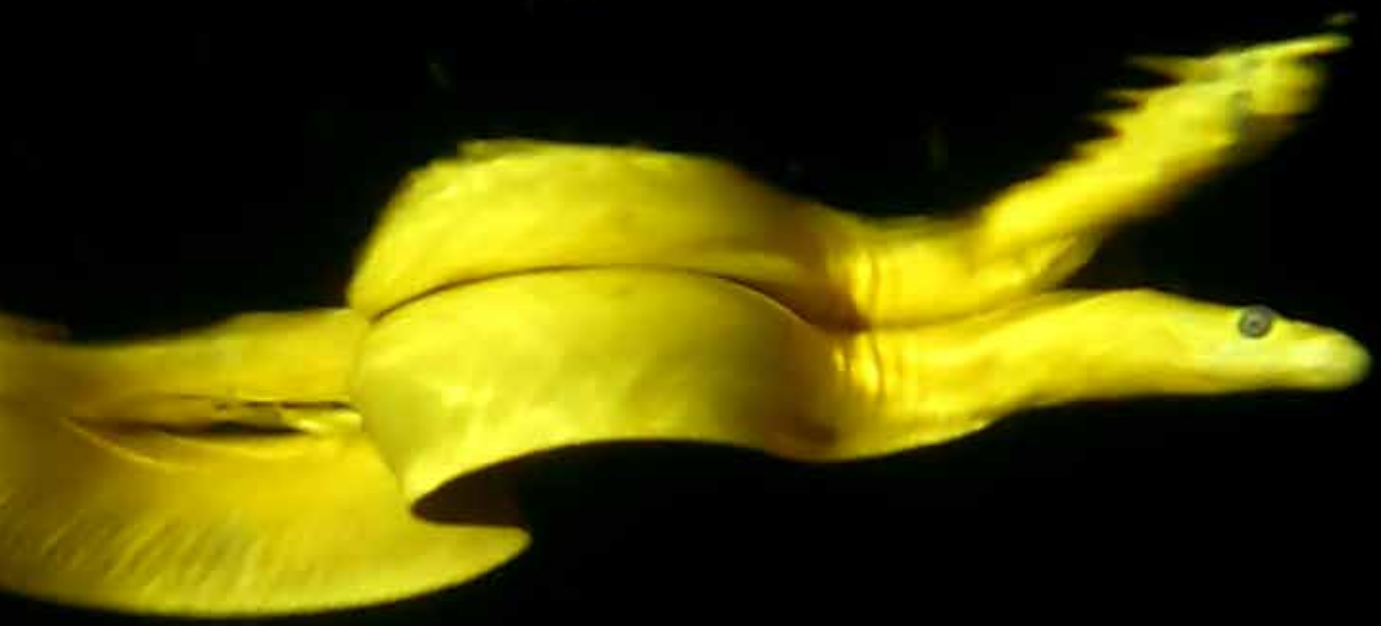
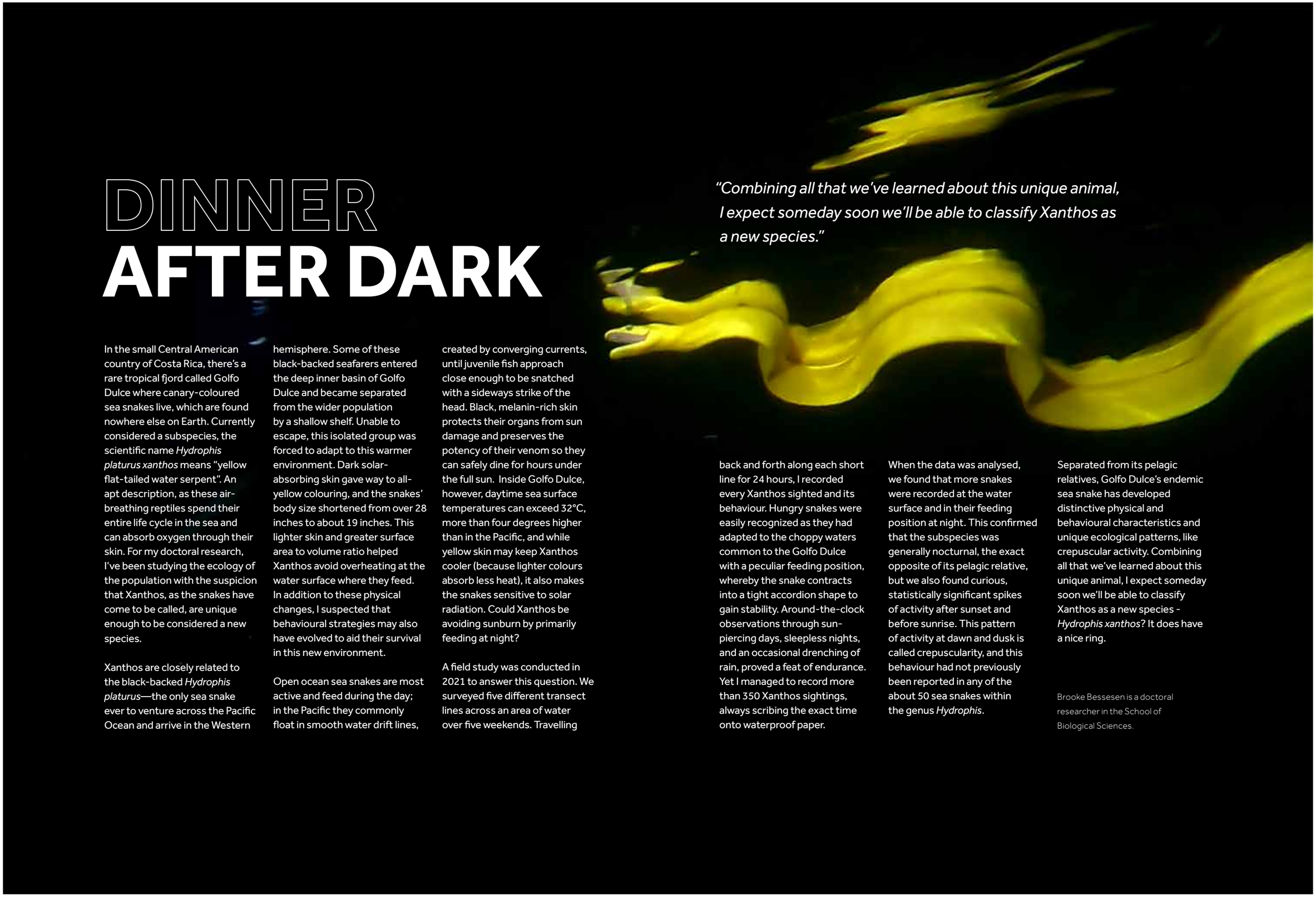
Doctoral Research Highlights 2021



DINNER AFTER DARK



"Combining all that we've learned about this unique animal, I expect someday soon we'll be able to classify Xanthos as a new species."

In the small Central American country of Costa Rica, there's a rare tropical fjord called Golfo Dulce where canary-coloured sea snakes live, which are found nowhere else on Earth. Currently considered a subspecies, the scientific name *Hydrophis platurus xanthos* means "yellow flat-tailed water serpent". An apt description, as these air-breathing reptiles spend their entire life cycle in the sea and can absorb oxygen through their skin. For my doctoral research, I've been studying the ecology of the population with the suspicion that Xanthos, as the snakes have come to be called, are unique enough to be considered a new species.

Xanthos are closely related to the black-backed *Hydrophis platurus*—the only sea snake ever to venture across the Pacific Ocean and arrive in the Western hemisphere. Some of these black-backed seafarers entered the deep inner basin of Golfo Dulce and became separated from the wider population by a shallow shelf. Unable to escape, this isolated group was forced to adapt to this warmer environment. Dark solar-absorbing skin gave way to all-yellow colouring, and the snakes' body size shortened from over 28 inches to about 19 inches. This lighter skin and greater surface area to volume ratio helped Xanthos avoid overheating at the water surface where they feed. In addition to these physical changes, I suspected that behavioural strategies may also have evolved to aid their survival in this new environment.

Open ocean sea snakes are most active and feed during the day; in the Pacific they commonly float in smooth water drift lines, created by converging currents, until juvenile fish approach close enough to be snatched with a sideways strike of the head. Black, melanin-rich skin protects their organs from sun damage and preserves the potency of their venom so they can safely dine for hours under the full sun. Inside Golfo Dulce, however, daytime sea surface temperatures can exceed 32°C, more than four degrees higher than in the Pacific, and while yellow skin may keep Xanthos cooler (because lighter colours absorb less heat), it also makes the snakes sensitive to solar radiation. Could Xanthos be avoiding sunburn by primarily feeding at night?

A field study was conducted in 2021 to answer this question. We surveyed five different transect lines across an area of water over five weekends. Travelling back and forth along each short line for 24 hours, I recorded every Xanthos sighted and its behaviour. Hungry snakes were easily recognized as they had adapted to the choppy waters common to the Golfo Dulce with a peculiar feeding position, whereby the snake contracts into a tight accordion shape to gain stability. Around-the-clock observations through sun-piercing days, sleepless nights, and an occasional drenching of rain, proved a feat of endurance. Yet I managed to record more than 350 Xanthos sightings, always scribing the exact time onto waterproof paper.

When the data was analysed, we found that more snakes were recorded at the water surface and in their feeding position at night. This confirmed that the subspecies was generally nocturnal, the exact opposite of its pelagic relative, but we also found curious, statistically significant spikes of activity after sunset and before sunrise. This pattern of activity at dawn and dusk is called crepuscularity, and this behaviour had not previously been reported in any of the about 50 sea snakes within the genus *Hydrophis*.

Separated from its pelagic relatives, Golfo Dulce's endemic sea snake has developed distinctive physical and behavioural characteristics and unique ecological patterns, like crepuscular activity. Combining all that we've learned about this unique animal, I expect someday soon we'll be able to classify Xanthos as a new species - *Hydrophis xanthos*? It does have a nice ring.

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