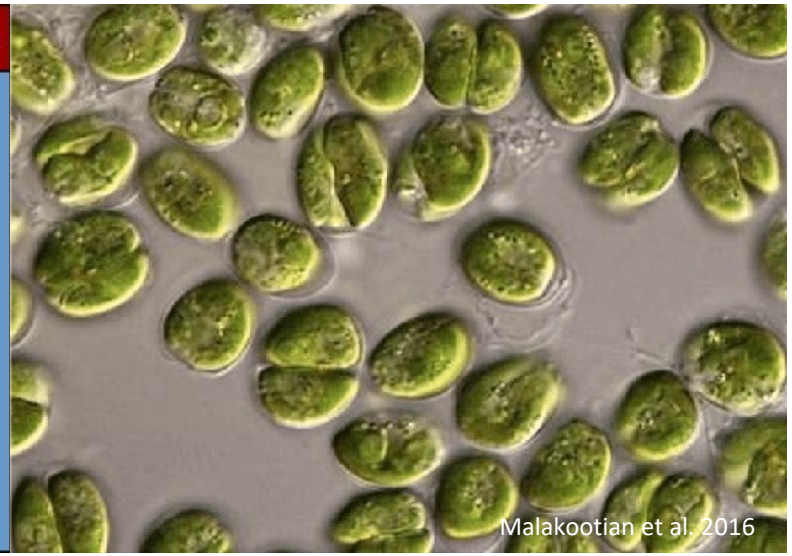
Tentative results of transport vector and species risk assessments


Adrian Pingstone


Malakootian et al. 2016

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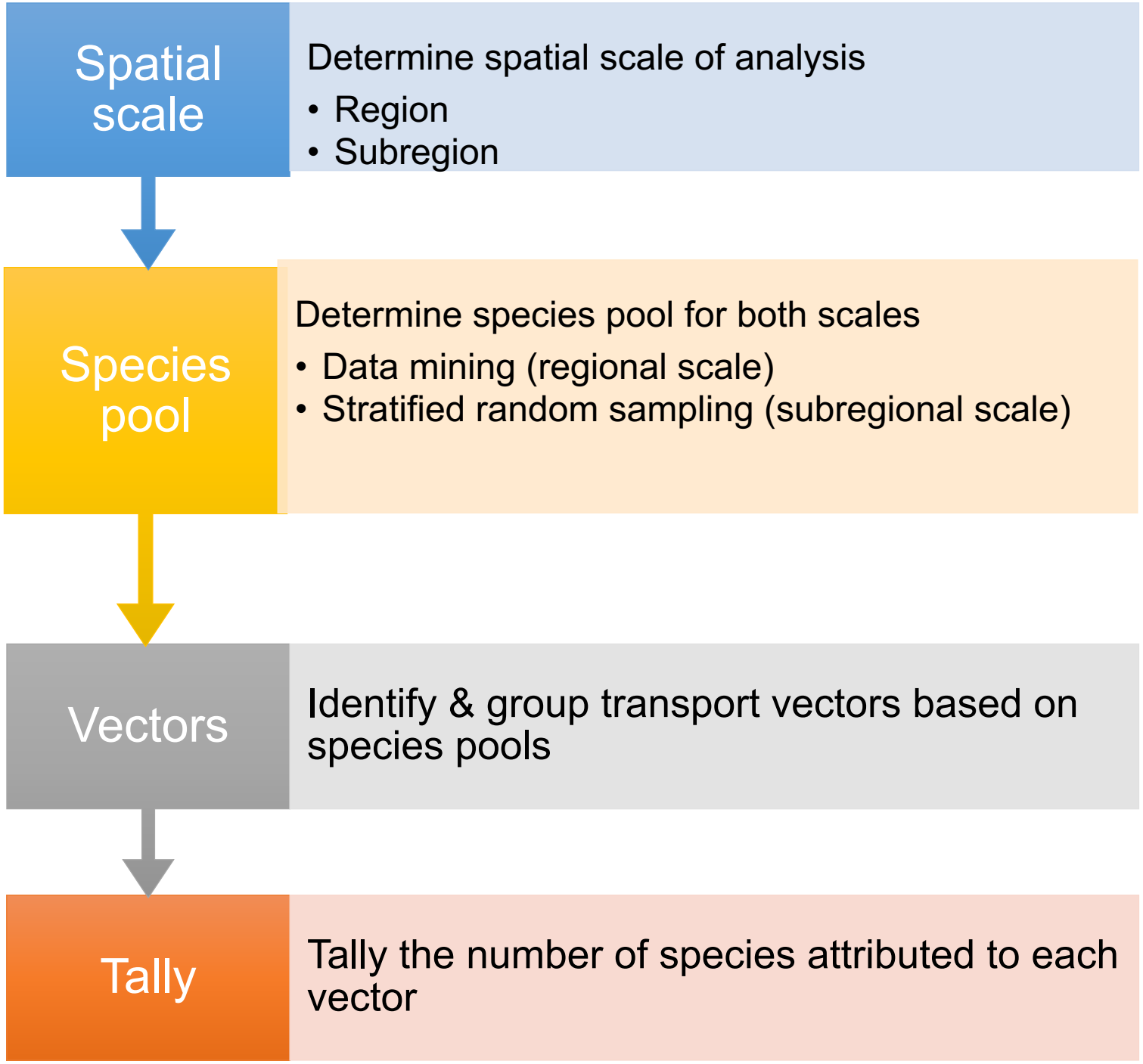
Transport vectors

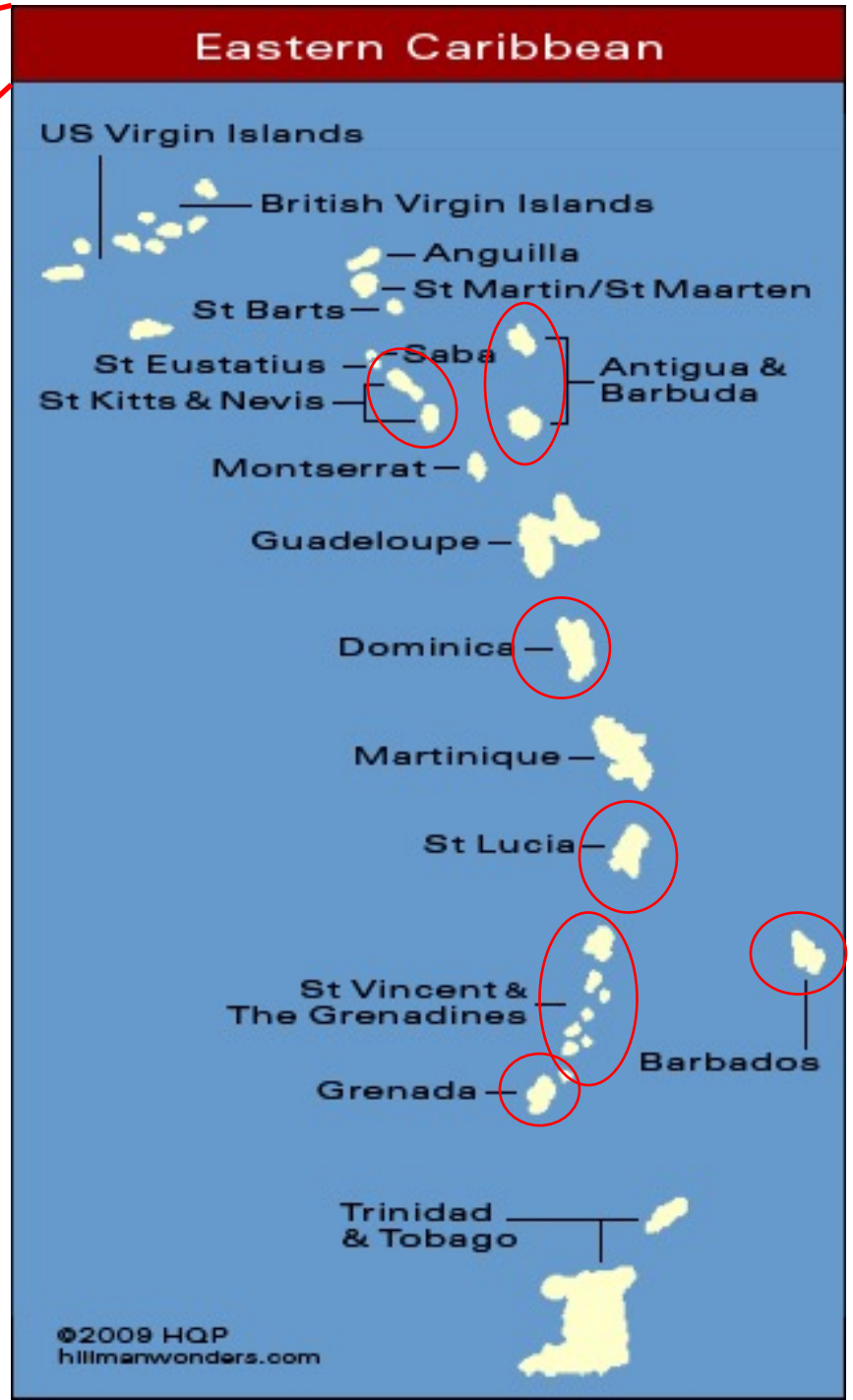
- Aquarium trade
- Ballast water
- Biofouling
- Canals
- Fisheries
- Oil & gas rigs

Overview of methods



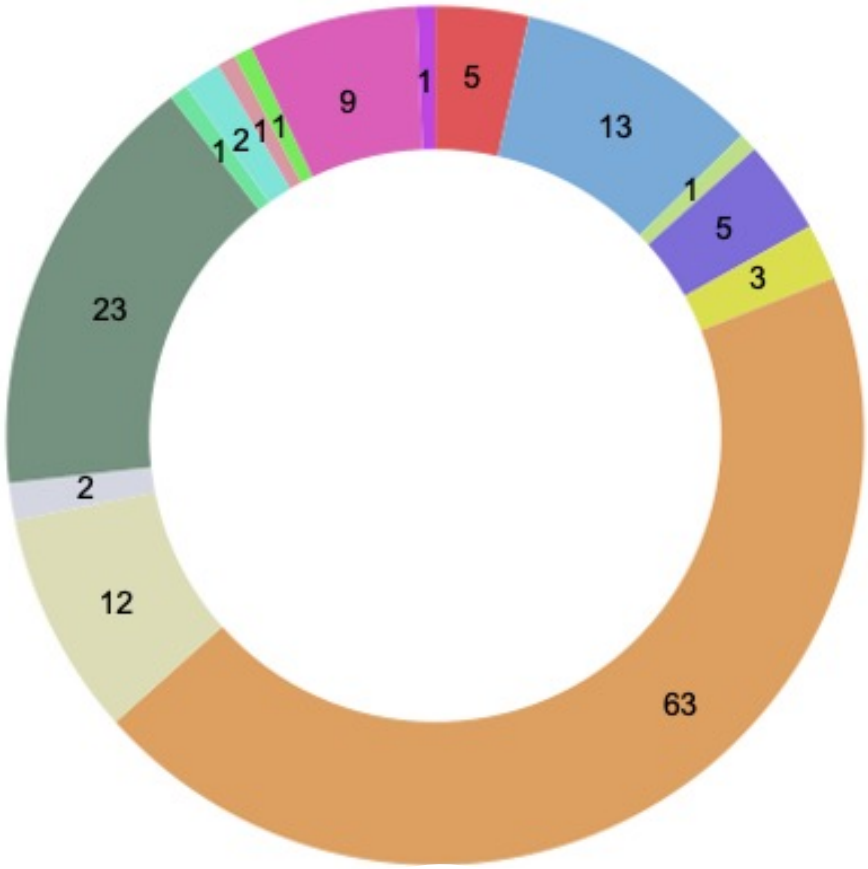
Regional scale included Florida, the Caribbean, Central America, Colombia & Venezuela

Subregional scale



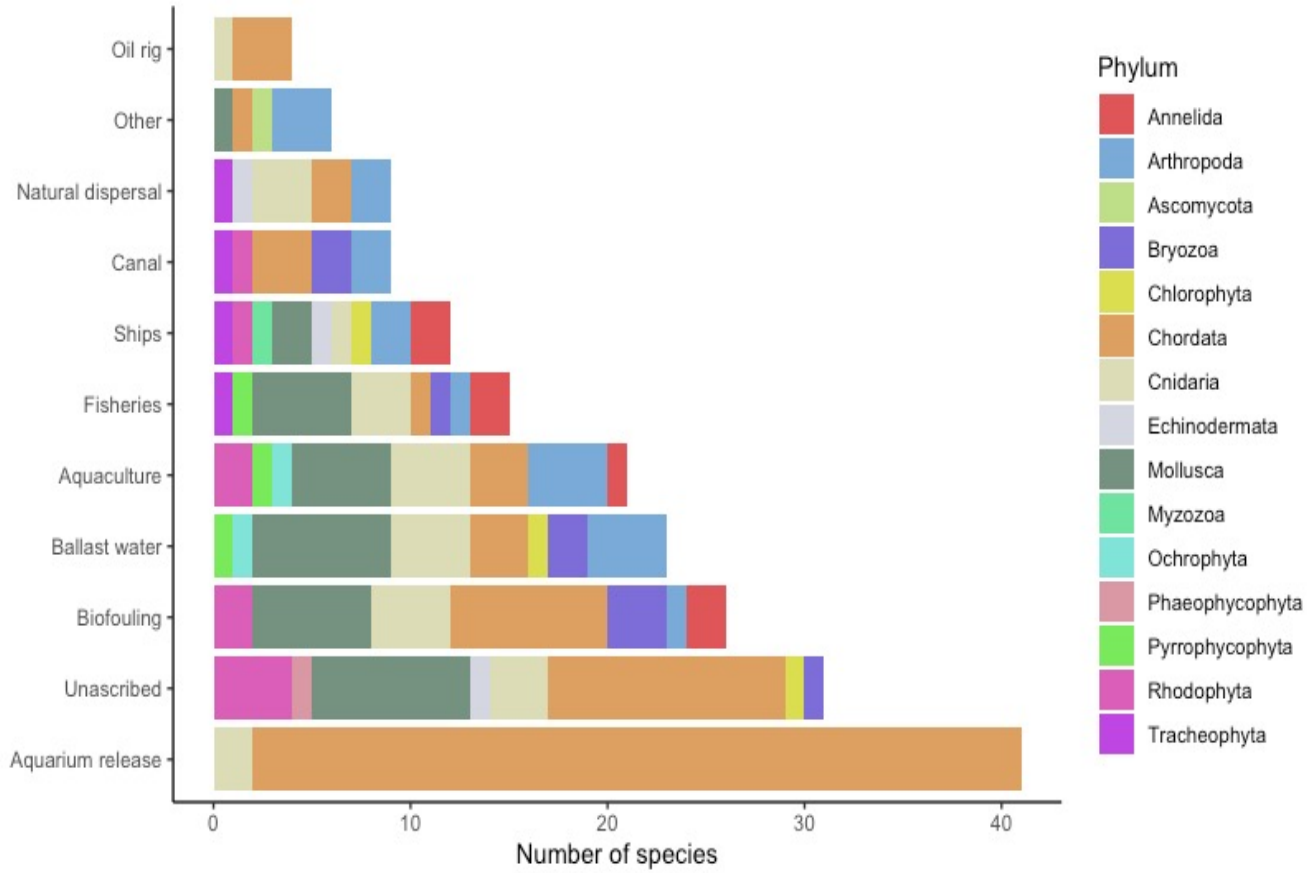
Regional scale data sources

- WRiMS – World register of introduced marine species
- IUCN Global invasive species database
- USGS Non-indigenous aquatic species database
- Technical reports



Results: Regional pool of introduced species

Results: Retrospective vector relative risk analysis for the region



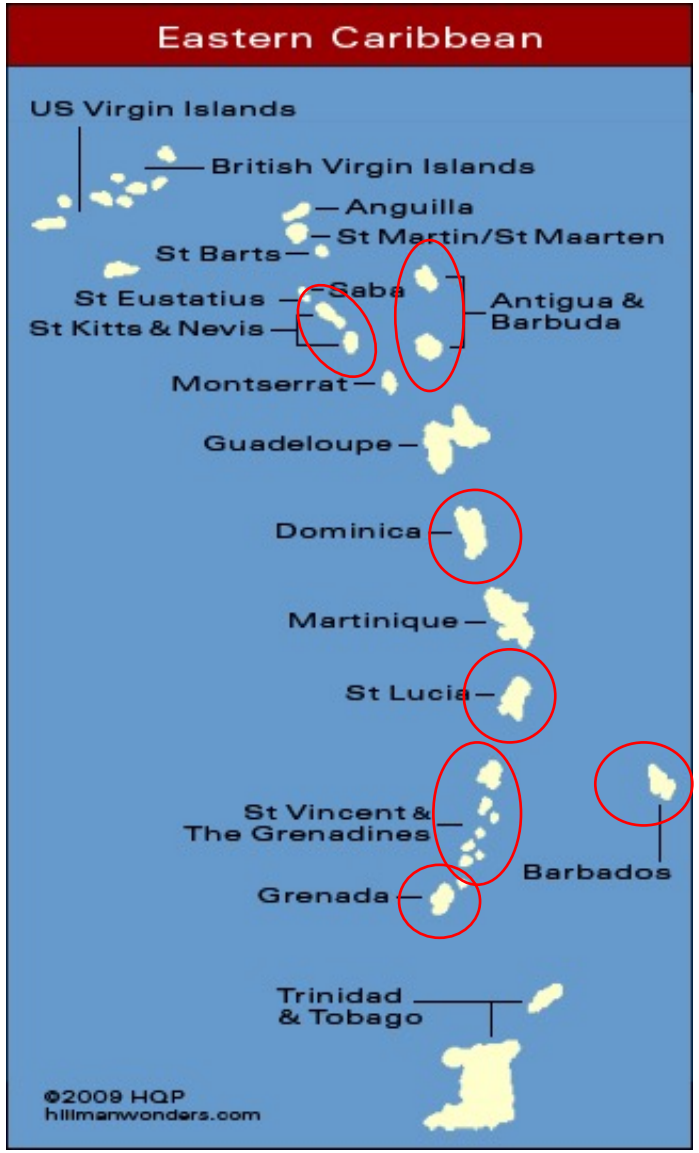
Limitations of forecasting results for the subregion

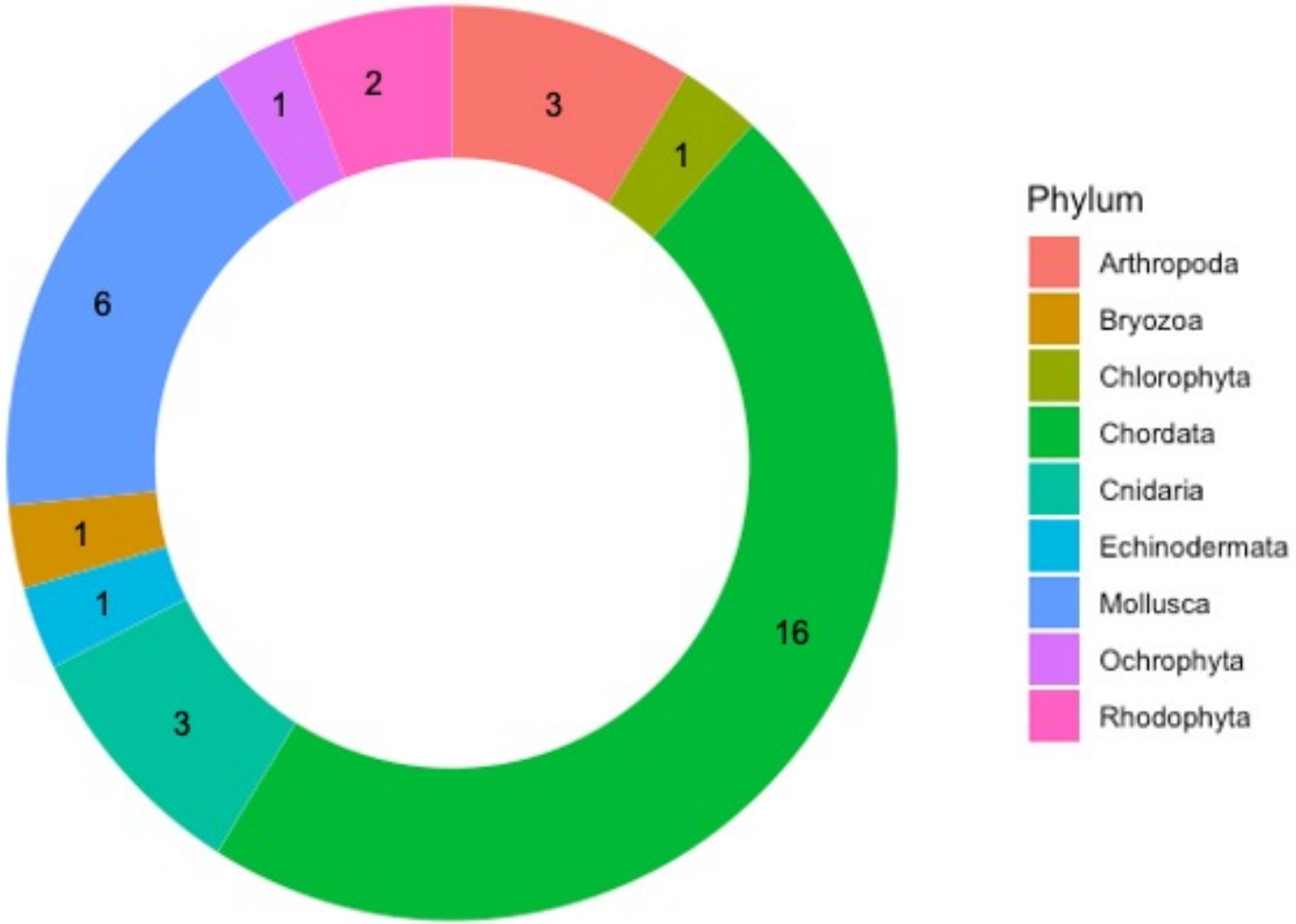
- Cannot predict new vectors or previous vectors that are increasing or decreasing in regional importance.
- Does not account for the effects of recent regulations to prevent species introductions (e.g., the Ballast Water Management Convention)
- Considers the number of introduced species per vector but does not account for the level of threat posed by different species
- Results are sensitive to biases in data availability for certain vectors (e.g., bias toward large, easily detected, charismatic fauna associated with the aquarium trade but bias against microfauna and flora associated with ballast water)

Subregional scale:
Stratified random sampling of regional species pool

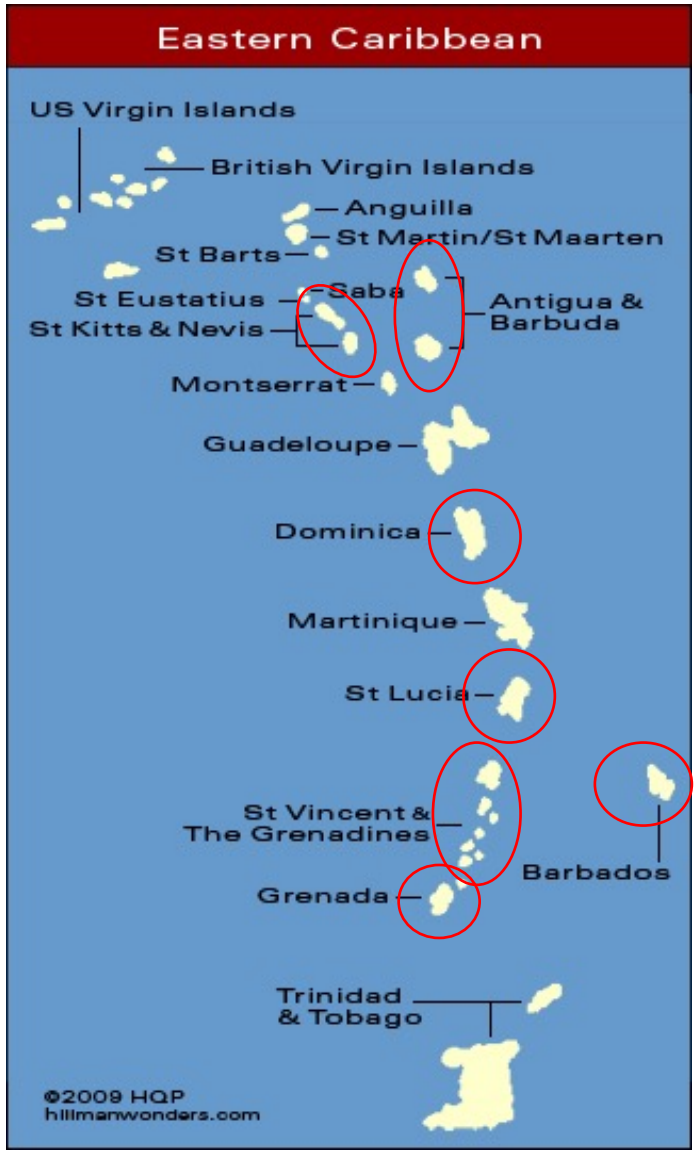
- Sampled 25% of regional species pool of introduced species
- Species selected were proportional to their representation in regional pool by phylum
- Only species present in the region but absent from the subregion were eligible for selection

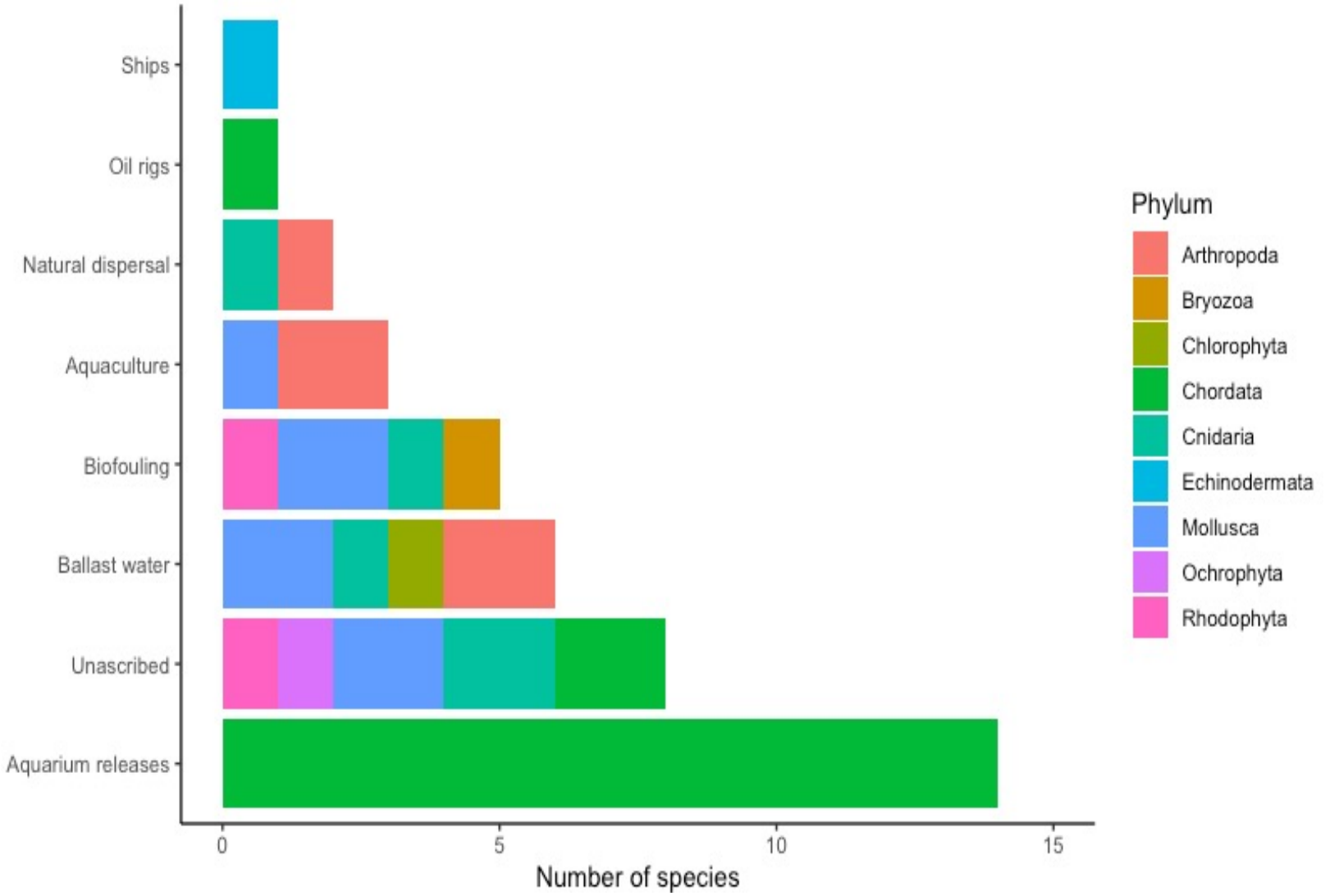
Results: Subregional pool of potential invaders





Results: Forecasting vector relative risks for the subregion





Semi-quantitative risk assessments

- Involve answering yes or no to a series of questions related to species traits, characteristics and impacts
- Responses are then given a numerical value
- Values to each question are subsequently summed and the total is used to determine a species rank based on predetermined thresholds
- Semi-quantitative tools are calibrated using already-known invaders

Pheloung et al. (1999)

	Qualitative	Semi-quantitative	Quantitative
Cost	$	$$	$$$
Data needs	Low-Medium	Medium-High	High
Technical expertise	Low	Medium-High	High
Data type	Expert opinion; Literature review	Expert opinion; Experimental and/or observational	Experimental and/or observational
Accuracy	Low-Medium	Medium	High
Reproducibility	Low-Medium	Low-Medium	High
Strengths	Rapid; effective when data and technical expertise are low	Complex modeling capabilities when quantitative data are scarce	Accurate and highly reproducible models
[1]Example tools or protocols	ERAF (Level I) ERAEF (Level I) IEA (Level I) CARE GABLIS	AS-ISK; ERAF (Level II); ERAEF (Level II); IEA (Level II); BBN; QNM; FCM	EwE; Atlantis; Marxan; PVA; GARP

Smith & Hollarsmith (2020)

Aquatic Species Invasiveness Screening Kit (AS-ISK)

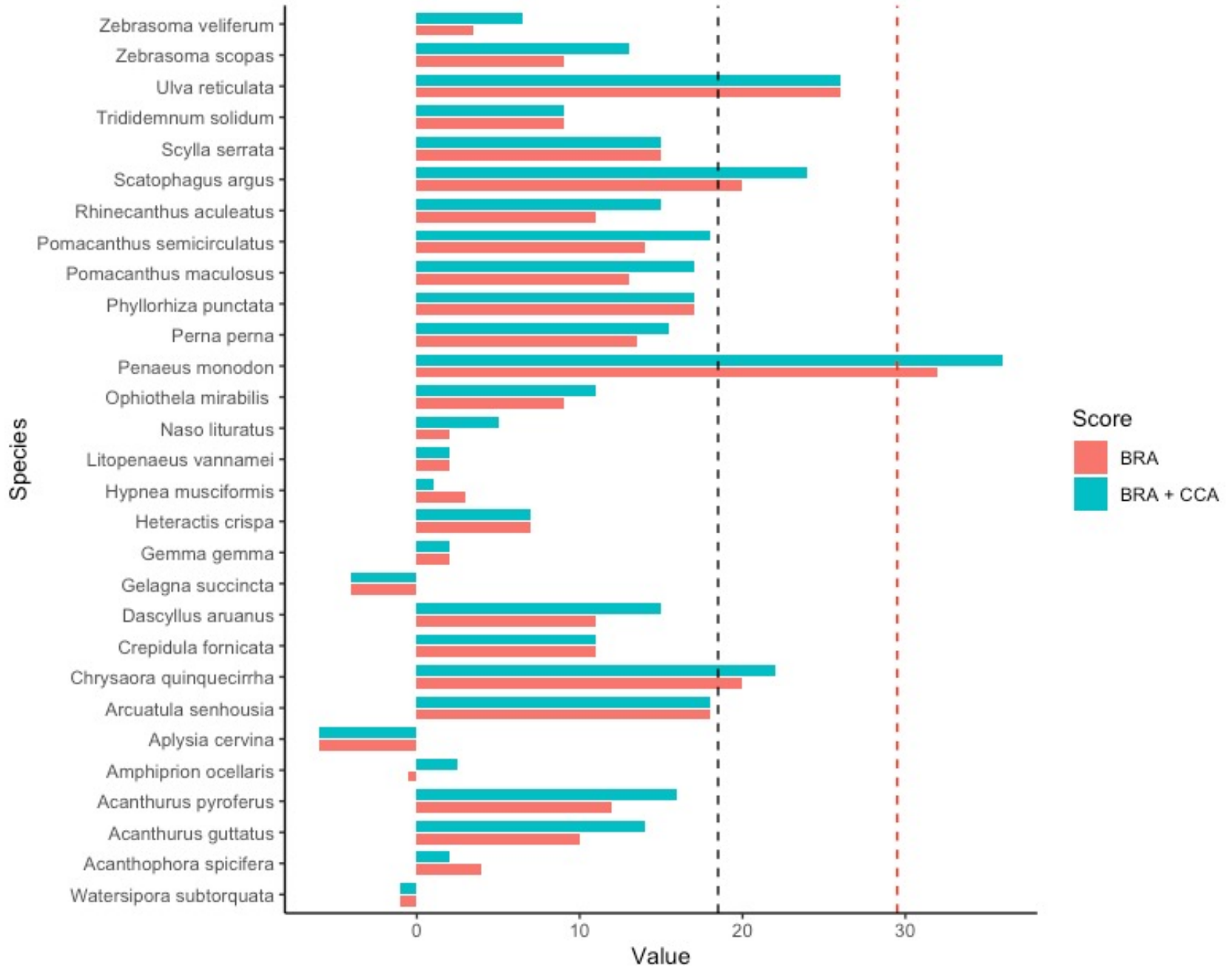
a multi-lingual decision-support tool

AS-ISK Threshold values

	Low risk	Medium risk	High risk
BRA	[-20, 1]	[1, 18.5]	[18.5, 68]
BRA + CCA	[-32, 1]	[1, 29.5]	[29.5, 80]

Bilge et al. 2019

Tentative Results: Species risk assessment



High-risk introduced species fact sheets

GIANT TIGER PRAWN

Penaeus monodon

Photo credit: CSIRO

Invasive Species Profile

The giant tiger prawn is a marine crustacean native to the Indo-Pacific, including East Africa, South and Southeast Asia, and Australia. As larvae, they grow up in estuaries, lagoons, and mangroves before moving out to open waters as adults. They thrive in tropical climates with temperatures between 28-33°C, and feed on small invertebrates such as molluscs, gastropods, and crabs. When spawning, females can produce as many as 500,000 to 750,000 eggs.

Introduced Range

The giant tiger prawn has been introduced to the Atlantic Ocean along the southeastern coast of the United States and the west coast of Africa. Increased sightings and trawling catches of this species in these regions suggest that populations have become established.

Methods of Invasion

Accidental aquaculture releases and ballast water releases have allowed the giant tiger prawn to enter non-native regions.

Description

Giant tiger prawns are distinguished by their rust-coloured body with black and white banding along their back and tail. They can reach up to approximately 30cm in length and weigh 320g, with females being larger than males.

Photo credit: Ranjith Chemmad

Commercial Significance

The giant tiger prawn plays a major role in the aquaculture industry, and research on breeding and raising these prawns for human consumption began in Taiwan in the early 1970's. In 1972, the first extensive farms were established for this species, and in 1974 semi-intensive farms were created. Since then, farming of the giant tiger prawn has spread through Southeast Asia, with some of the largest producers of this species being Taiwan, Thailand, Vietnam, Indonesia, and the Philippines.

Potential Impacts

The impacts that the giant tiger prawn may have in their introduced ranges is not yet fully understood. This species is known for being an aggressive predator in its native range and can reach a larger size than native crustaceans on the Atlantic coast of the United States, which suggests that it may outcompete native species for food resources. The giant tiger prawn is also known for carrying several harmful pathogens including White Spot Syndrome Virus, which can be transmitted to wild crustacean populations. In addition, this prawn can contract Acute Hepatopancreatic Necrosis Syndrome, which has had a large impact on farmed giant tiger prawn populations in southeast Asia.

How Can I Help?

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Draft by Amanda Gray

SPOTTED SCAT

Scatophagus argus

Photo Credit: Jack Randall

Invasive Species Profile

The spotted scat is native to the coastal waters of the Indo-Pacific, including the southern tip of India, Indonesia, the Philippines, southern Japan, Tahiti, as well as the north coast of Australia. They inhabit estuaries and mangroves, and feed on a wide range of organisms such as insects, algae, worms, crustaceans, and organic matter. Female spotted scats reach a larger size than males at sexual maturity, and in the Philippines, spawning coincides with the heavy rains associated with the monsoon season.

Introduced Range

This fish species has established itself in the Maltese part of the Mediterranean Sea, and has also been reported in Cedar Key, Levy County as well as the St. Lucie inlet in Florida.

Methods of Invasion

The spotted scat has been introduced by aquarium releases, both accidental and deliberate.

Description

The spotted scat is a green and silver fish with brown spots, and has a rectangular body shape and a steep head profile. They can reach about 30cm in length from snout to tail, with some growing even larger. Juveniles are greenish-brown with large spots or stripes. This fish is also known for its venomous spines which can inflict painful wounds.

Photo Credit: Guérin Nicolas

Commerical Uses and Role in the Aquarium Trade

While the spotted scat is only of small commercial importance, it is a very popular aquarium fish and juveniles are taken from the wild for use in captivity. The spotted scat is valued in the aquarium trade for its attractive patterning, slow growth rate, hardiness, and good disposition. In addition, the spotted scat is sold in fish markets for human consumption in southeast Asia, and is known for being a nutrient-dense fish with good flavour.

Potential Impacts

The impacts of the spotted scat in its introduced ranges are yet to be determined.

How Can I Help?

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ATLANTIC SEA NETTLE

Chrysaora quinquecirrha

Photo credit: Antoine Taveneaux

Invasive Species Profile

The Atlantic sea nettle is a species of jellyfish native to the Pacific, Atlantic, and Indian oceans, where it inhabits estuaries and coastal waters. This species is capable of tolerating a range of water salinities, and feeds on marine worms, plankton, and other species of jellyfish.

Introduced Range

The Atlantic sea nettle has been introduced to The Bahamas.

Photo credit: Jarek Tuszyński, https://creativecommons.org/licenses/by-sa/3.0/deed.en

Description and Life Cycle

On average, the Atlantic sea nettle measures 25cm wide and 50cm long, with adults being white in colour with red spots or stripes. The jellyfish's tentacles originate from 8 lobes located on its body and are lined with stinging structures called nematocysts.

The life cycle of the Atlantic sea nettle consists of several phases, and it starts with an immobile polyp stage that settles on hard substrate and reproduces asexually. The polyp then matures into a free-swimming larva called an ephyra, which eventually becomes a sexually-reproducing adult called a medusa. Spawning generally peaks in July and August, and fertilization of eggs can occur externally or internally in the gastrovascular cavity of the adult. Free-swimming larvae hatch from the eggs and grow into polyps, thus starting the cycle all over again.

Potential Impacts

The impacts of the Atlantic sea nettle in its introduced ranges are yet to be determined.

How Can I Help?

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Stay in touch!

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