

Contemporary & Emerging Fisheries in The Bahamas – Conservation & Management Challenges, Achievements & Future Directions

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Introduction

Marine resources are culturally and economically vital to The Bahamas and other small island developing states (SIDS). Contemporary Bahamian fisheries comprise commercial, sport, recreational and subsistence fishing, with most of the reported revenue (2% of GDP) generated from commercial fishing (Sherman et al. 2018). Commercial fishing typically occurs on Great Bahama, Little Bahama and Cay Sal banks and is legally restricted to vessels owned by Bahamians (Fig. 1). Species including Caribbean spiny lobster (*Panulirus argus*), queen conch (*Lobatus gigas*), Nassau grouper (*Epinephelus striatus*) along with other fish and invertebrate species are sold both locally and to international markets. **Illegal, unreported and unregulated fishing coupled with inadequate regulations and enforcement are the main factors contributing to the decline of Bahamian fisheries along with other anthropogenic impacts.** Case studies of economically and ecologically valuable fishery species, are used to highlight conservation successes, knowledge gaps and deficiencies in existing management approaches.

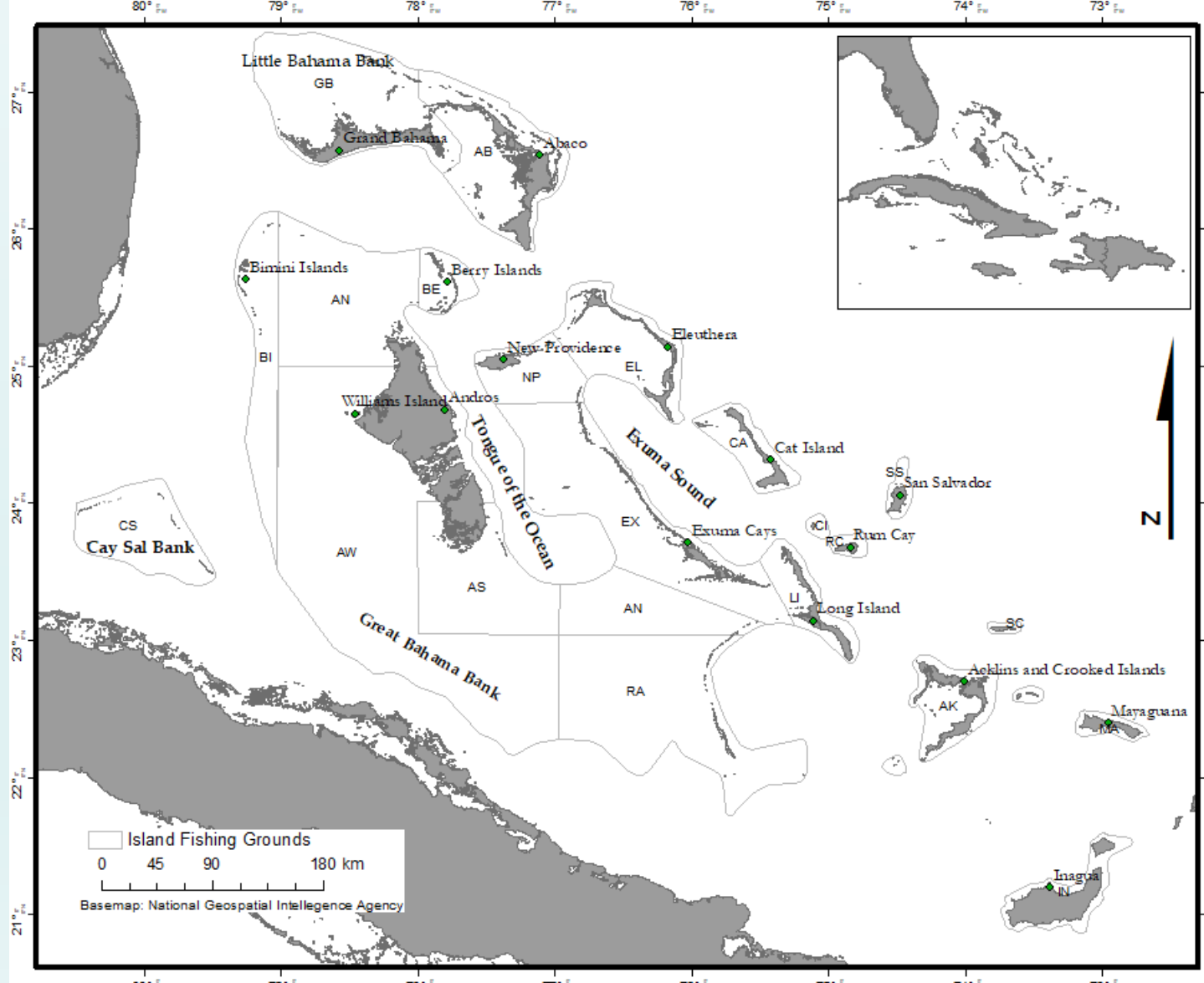


Figure 1. Map of The Bahamas showing major fishing islands and fishing banks.

Contemporary Fisheries

Commercial and subsistence fisheries mainly target Caribbean spiny lobster, queen conch, and medium- to large-bodied reef fish, including Nassau grouper, other groupers (Epinephelidae), snappers (Lutjanidae), grunts (Haemulidae) and jacks (Carangidae) as well as stone crab (*Menippe mercenaria*). **Of these commercial and subsistence species, snappers, grunts, jacks and black grouper are currently unmanaged through specific fishery regulations such as size limits or closed seasons.**

Critical needs for managing and monitoring the most economically valuable species (Caribbean spiny lobster, queen conch and Nassau grouper) are outlined below:

- Address IUU fishing both domestic and foreign
- Complete comprehensive stock assessments
- Adopt recommended science-based changes to fisheries regulations to promote population recovery and sustainability
- Improve outreach for key stakeholders about fishery regulations (e.g. size limits and closed seasons) and the importance of fish spawning aggregations
- Examine ecosystem impacts of overfishing and use of fishing gears on benthic community structure
- Investigate source-sink dynamics to inform the placement of marine protected areas (MPAs) that also include high-quality habitats
- Complete national economic valuation studies that incorporate subsistence, recreational and commercial fisheries data

~36% OF BAHAMIAN SPINY LOBSTER LANDINGS ARE ILLEGAL, UNREPORTED & UNREGULATED

Address illegal, unreported and unregulated (IUU) fishing

MATURE QUEEN CONCH HAVE A SHELL LIP THICKNESS OF ≥15 mm

Prevent harvesting of immature individuals

MATURE NASSAU GROUPEL MIGRATE TO SPAWNN AT ≥54 cm

Implement science-based changes to fisheries regulations

Emerging Fisheries

Emerging fisheries (e.g. parrotfish, sea cucumbers, and gorgonians) have become established due to declines in traditional fishery species and other social, economic, and technological factors, including biomedical research, which utilizes bioactive compounds derived from marine organisms in drug development. **Emerging fisheries have the potential to expand the fishing sector, improve food security and provide income to a greater number of fishers.** However, they present new challenges for management due to lack of data on landings, population dynamics and the ecological function of these species.

Parrotfish

Currently, The Bahamas has greater densities of large parrotfishes than other parts of the Caribbean (Fig. 2), but the development of this emerging fishery poses a danger to parrotfish populations and the ecological function that they serve on reefs. Research is currently underway to assess the harvest of parrotfish, including how it varies across The Bahamas, which species are being targeted and how the development of the fishery is affecting populations. Integrating social science and ecological data will be used to help inform recommendations for sustainably managing parrotfish in The Bahamas. **Management decisions must examine its value as a commercial fishery weighed against its ecological value in maintaining the health of coral reefs.**

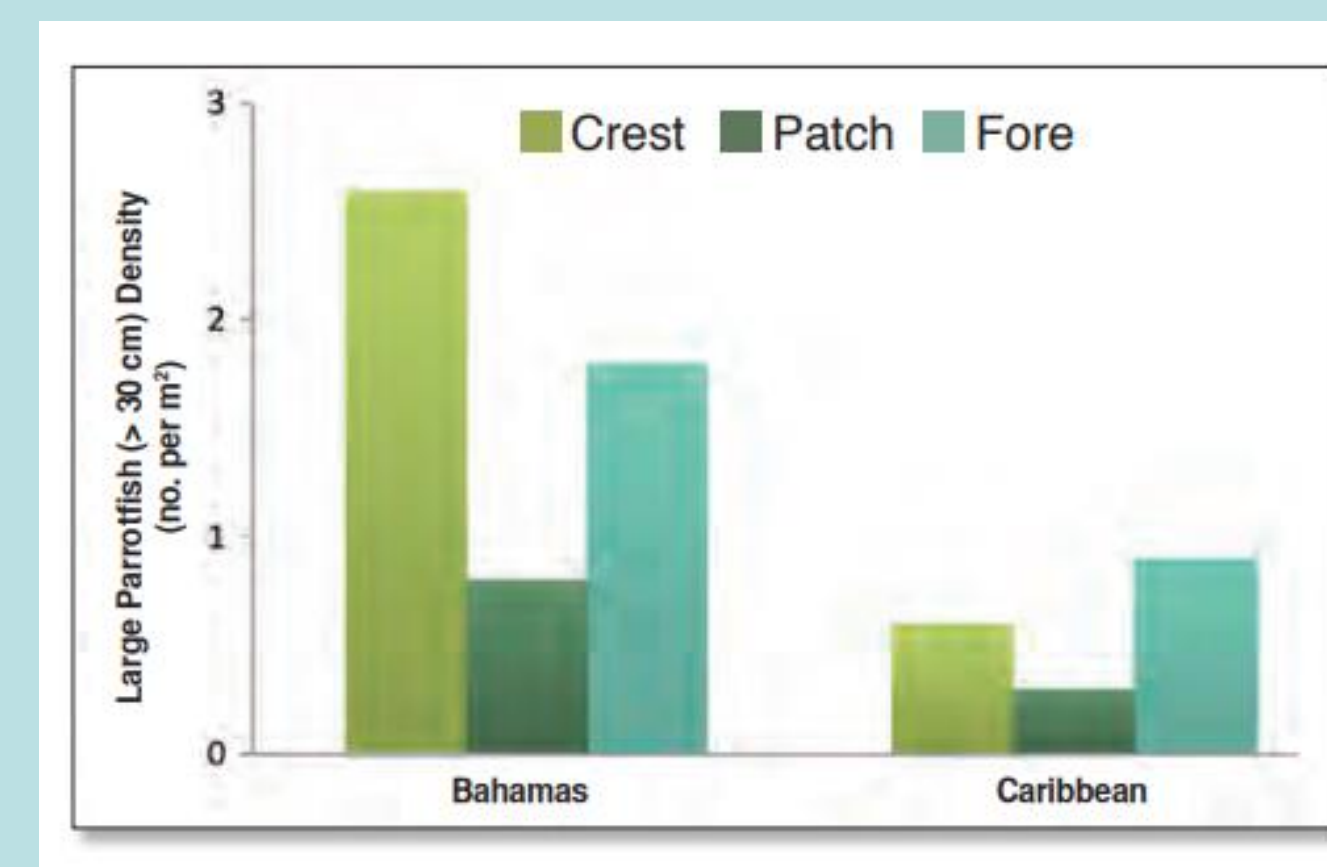


Figure 2. Comparison of densities of large parrotfish in The Bahamas versus the Caribbean using (Dahlgren et al. 2016).

Sea Cucumbers

Due to density-dependent reproduction, many sea cucumbers stocks are easily overfished and have very slow rates of recovery. In 2010, a small-scale export fishery for sea cucumbers opened in north Andros targeting two commercially valuable shallow water species, the donkey dung or “brown” sea cucumber (*Holothuria mexicana*) and the furry or “green” sea cucumber (*Astichopus multifidus*). After only 11 months, the fishery collapsed due to local stock depletion, high fuel costs and falling sea cucumber prices (Sherman et al. 2018). Since 2016, there have been reports of sea cucumbers being harvested in several parts of The Bahamas, but no landings data have been collected. **Because sea cucumber fisheries around the world have proven difficult to manage sustainably, it may not be suitable for further development in The Bahamas unless better stock assessments and strict limits are placed on the fishery.**



Donkey dung or “brown” sea cucumber



Sea cucumber fisheries are difficult to manage sustainably

Conservation Successes

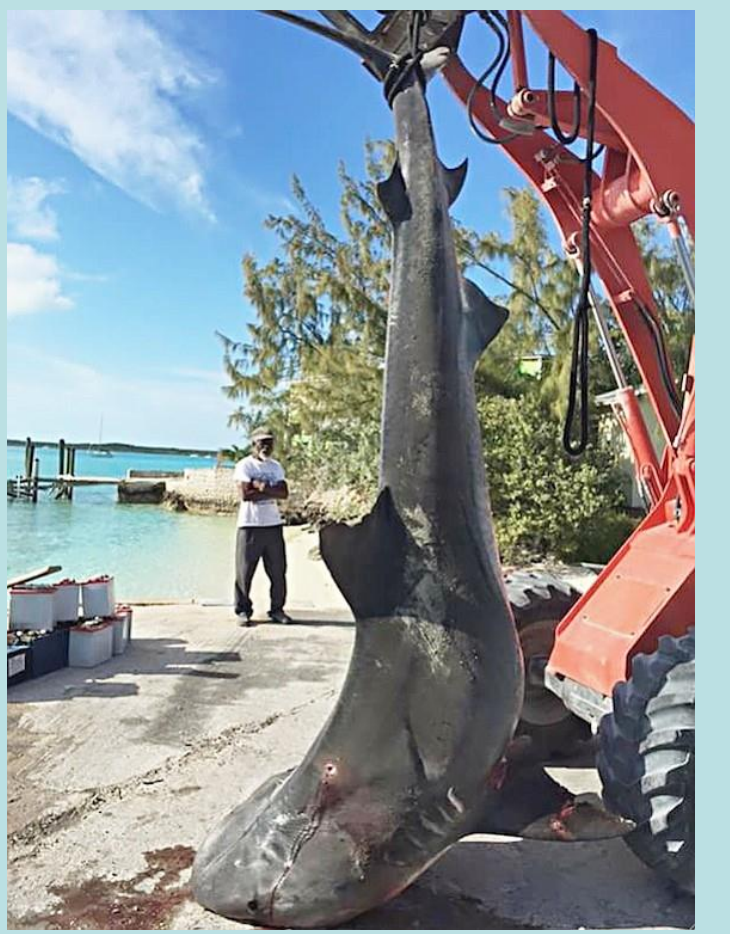
Reducing anthropogenic threats through proactive management approaches have been instrumental for conserving sharks, sea turtles and bonefish. Examples of successful conservation measures include:

- Bans or restrictions on specific gear types and fishing practices (e.g. 1993 longline ban for sharks and 1986 ban on use of nets to capture bonefish)
- Harvest bans on sea turtles and turtle products in 2009 and sharks (2011)
- Shift from extractive to catch-and-release recreational fishery for bonefish
- Establishment of regulations prohibiting commercial sale of bonefish
- Development and adoption of best handling practices by guides and anglers to increase post-release survivorship of bonefish.

These decisions have resulted in positive ecological and economic benefits for The Bahamas.

Conservation & Management Challenges

- Overexploitation
- Unsustainable fishing practices and IUU fishing
- Inadequate fishery regulations and governance frameworks
- Strong sociocultural and economic drivers associated with harvesting marine resources for both local consumption and export
- Balancing how social and ecological factors influence MPA design to achieve effective fisheries management and biological conservation objectives
- Limited resources and capacity for enforcement, research and monitoring
- Broad spatial scale of the Bahamian archipelago
- Highly complex and dynamic nature of marine ecosystems



Illegally killed tiger shark

Management Recommendations

In The Bahamas and other SIDS, exploited species provide key ecological functions that are critical to maintain healthy marine ecosystems. To better address fisheries objectives for The Bahamas and prevent further declines in species and ecosystem function, we recommend:

- ✓ Completing comprehensive stock assessments for contemporary and emerging fishery species
- ✓ Developing and implementing adaptive science based species-specific fishery regulations and management plans
- ✓ Implementing long-term integrative and inter-disciplinary monitoring programs
- ✓ Incorporating genetic and demographic connectivity (population dynamics) into strategic placement of MPAs and no-take MPAs to maintain genetic diversity and assist with population recovery
- ✓ Implementing standardized consistent, accurate and timely reporting across all fishery sectors
- ✓ Strengthening regional and international management agreements and partnerships to improve enforcement of fishery regulations, reduce IUU fishing, protect migratory species and support population dynamics
- ✓ Strategic use of targeted communication and outreach materials for various stakeholders to engender support for fisheries management and conservation
- ✓ Improving coastal and habitat protection for marine ecosystems
- ✓ Advocating for further development and diversification of sustainable livelihoods and eco-tourism-based opportunities for fishers and Family Island communities
- ✓ Adopting ecosystem-based and precautionary management approaches for data deficient species and habitats.

The future of fisheries depends on the successful use of adaptive measures to address both current and predicted anthropogenic and natural impacts to species and their habitats.

Acknowledgements

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Sherman KD, Shultz AD, Dahlgren CP, Thomas C, Brooks E, Brooks A, Brumbaugh DR, Gittens L, Murchie KJ (2018) Contemporary and emerging fisheries in The Bahamas – Conservation and management challenges, achievements and future directions. Fisheries Management and Ecology 25:319–331. <https://doi.org/10.1111/fme.12299>