

Understanding fishery trends

Altered freshwater flows influence fish species

The installation of weirs and stormwater drainage systems to prevent flooding in southwest Florida has resulted in higher mean salinities and extreme salinity fluctuations downstream in the Rookery Bay estuary. A research project, conducted by the Rookery Bay National Estuarine Research Reserve and the Conservancy of Southwest Florida, reviewed historic studies to determine the possible effects from altered freshwater inflows and salinity on fish community composition and abundance over a 40-year timeframe. The findings can be used to make stormwater drainage and weir management recommendations to improve fish habitat, abundance, and diversity.

Changes in fish communities

A series of otter trawl surveys were conducted in Rookery Bay between 1970 and 2012 with the goal of understanding long-term patterns of fish composition by comparing three historic data sets.

In each study, a 3-meter otter trawl was used to collect fish from Rookery Bay. Night sampling was performed for greater catch efficiencies. Four fixed stations were sampled using seven replicate trawls at each station once a month for two years. Captured fish were identified and counted in each of the studies. Statistical software was used to identify and characterize possible changes to the fish community structure during the 40-year period.

The results indicate there have been significant changes in the fish communities in the Rookery Bay estuary since the 1970s and these changes may be attributable to water management practices and possible habitat loss.

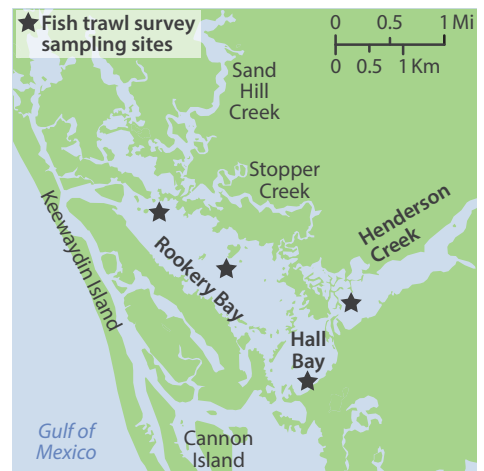
- Most changes occurred between the 1970s and 1990s which corresponds to the installation of weirs in the headwaters of Henderson Creek in the 1980s.
- The composition of fish communities among four different sampling stations have become more similar to one another over time, possibly resulting from the loss of seagrass habitat that was observed in some locations.
- Wet and dry season differences in fish assemblages have increased, which could also be the result of hydrologic alterations in the watershed.
- The species, or type of fish present in Rookery Bay has changed over time which may be due to changes in salinity patterns, bottom types, food availability, or a combination of environmental factors resulting from alterations to the freshwater inflow to the estuary.



Florida Sea Grant



Rookery Bay Reserve



Top: Estuaries like Rookery Bay provide important habitat for many recreationally and commercially important species of fish. Bottom: A series of otter trawl surveys were conducted between 1970 and 2012 to sample fish populations in Rookery Bay.

| Fish composition by study year | | | | |
|--------------------------------|--|-------|-------|-------|
| Fish Species | | 1970s | 1990s | 2010s |
| Bay anchovy | | 1% | 6% | 18% |
| Mojarra | | 30% | 65% | 58% |
| Pinfish | | 46% | 5% | 11% |

The percent composition of total catch of three fish species which were all present during the three studies.

Management recommendations

Based on research findings about fish communities, abundance, and diversity in the Rookery Bay estuary, the following future research is recommended:

Conduct comprehensive mapping of submerged habitats in the Rookery Bay estuary, including species identification and on-going monitoring, to determine if management recommendations are effective in restoring lost fisheries habitat.

Expand strategic water quality monitoring and data analysis to better identify salinity patterns.

Information on juvenile sport fish, such as snook, tarpon, and redfish/red drum that were not represented in the reviewed studies, is needed to conserve the remaining habitat of these economically-important species and to guide restoration efforts in impacted areas. Research needs to be conducted about their tidal creek and salt marsh habitats to assess their ecological relationships within the Rookery Bay complex.

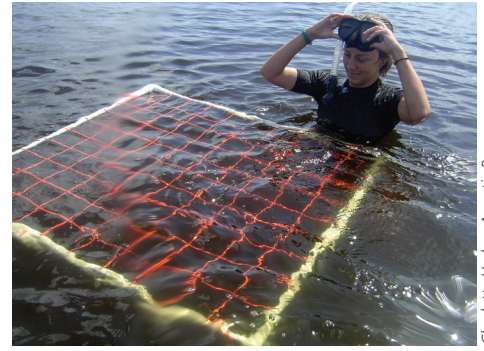
Address altered flow distributions by correcting inflow overages and deficits by sub-basin. The general trend was excessive flows to the west of Collier Boulevard and deficits to the east.

Increase dry season flows to the Henderson Creek sub-basin to as close to historic levels as possible (3-5 cubic feet per second).

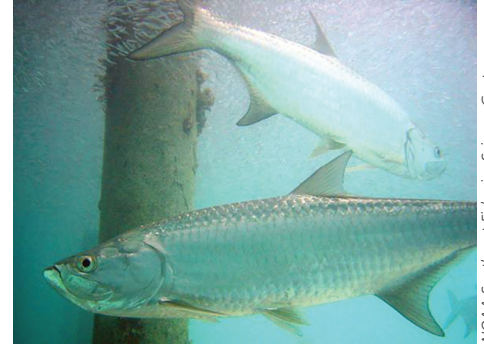
Increase comprehensive and inclusive watershed planning and prioritization in the region to better accomplish cost-effective management goals, including the implementation of these recommendations.

11.2

1.2 million average total seafood landings in Collier County annually.



Charlottesville Harbor Aquatic Preserve



NOAA Southeast Fisheries Science Center



Rookery Bay Reserve

500,000

500,000 pounds of stone crab claws are harvested on average annually in Collier County, which includes Rookery Bay Reserve.



Top to bottom: Mapping of submerged aquatic habitats; Atlantic tarpon are an economically important species in the Rookery Bay estuary; addressing altered flow distributions to Rookery Bay to maintain fish communities, abundance, and diversity in the Rookery Bay estuary.

Restoring the Rookery Bay Estuary Project

The Restoring the Rookery Bay Estuary Project focused on collaborative watershed management through hydrologic, ecologic, and social science research, education, and partnerships. Guided by a diverse stakeholder group, the effort was coordinated by the Rookery Bay National Estuarine Research Reserve in Naples, Florida, and resulted in a wide range of management recommendations.

Funding for this project was provided to the Rookery Bay National Estuarine Research Reserve in 2011–2015 by the National Estuarine Research Reserve System's (NERRS) Science Collaborative which is a cooperative agreement between the National Oceanic and Atmospheric Administration (NOAA) and the University of New Hampshire under NOAA grant NA09NOS4190153.

**For more information, visit www.rookerybay.org/restoreRB
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Cover photo courtesy of Florida Sea Grant



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