Lane Snapper
Filling in Critical Gaps for Life History Parameters

Virginia Shervette and Jesús Rivera Hernández, University of South Carolina
Noemí Peña Alvarado and Wilson Santiago Soler, Puerto Rico DNER

Summary of life history sample collections for SEDAR species

*****we are the only group that does age/growth/reproductive histology for U.S. Caribbean fisheries species**

SEDAR Caribbean Species	Tentative Assessment	PR	STT/STJ	STX	Total samples for life history
Queen Triggerfish	2021	693	719	735	2147
Redtail parrotfish	2023	545	432	667	1644
Queen Snapper	2023	488	114 (otoliths only)	25 (otoliths only)	488 (+139 with just otoliths)
Yellowtail Snapper	2024	675	316	63	1054
Lane Snapper	2024	117	151		268
Caribbean Hogfish	2025	717	144	1	862

Consistently listed as a priority species in NOAA calls for proposals

Currently in review for 2021 NOAA MARFIN: Data-Poor Caribbean Deepwater Snappers - Addressing Critical Gaps in Life History Research for Queen, Silk, Vermilion, Wenchman, Cardinal, and Black Snappers

Lane and Mutton Snapper Regulations

USVI Regulations

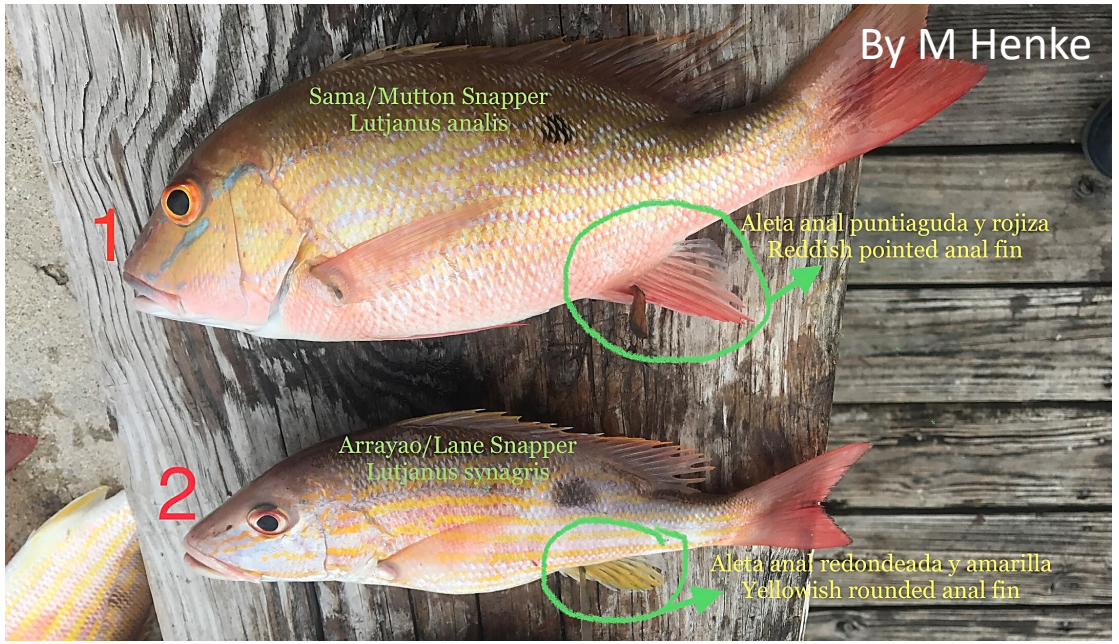
https://www.caribbeanfmc.com/regulations/usvi-area-of-jurisdiction

- **FEDERAL**: 50 CFR 622.33(a)(7) – April 1 through June 30, no harvest and/or possession of lane or mutton snapper
- **TERRITORIAL**: V.I.R.R., Title 12, Chapter 9A, §316. Lane and Mutton: No possession from April 1 through June 30 for the territory.

PR Regulations

https://www.caribbeanfmc.com/regulations/usvi-area-of-jurisdiction

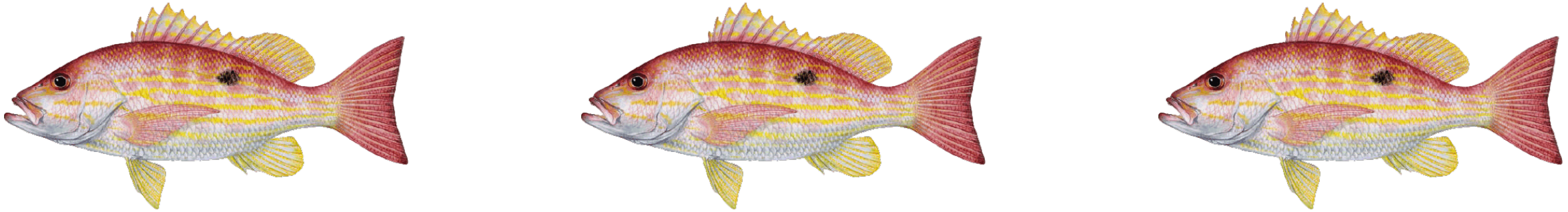
- **FEDERAL**: 50 CFR 622.33(a)(7) – April 1 through June 30, no harvest and/or possession of lane or mutton snapper
- **TERRITORIAL**: Mutton: No possession from April 1 through May 31



Propose for CFMC to support investigation of Lane Snapper life history

REASONS/JUSTIFICATION

- SEDAR 2024 – cannot complete a stock assessment without life history data for U.S. Caribbean waters
- Federal and Territorial Seasonal Closures for Lane Snapper – regulated species need periodic evaluations of population life history parameters
- No age and growth information for the U.S. Caribbean populations of Lane Snapper
- Lack of reproductive biology information on Lane Snapper in USVI waters



With CFMC support – these critical data gaps can be filled in for Lane Snapper

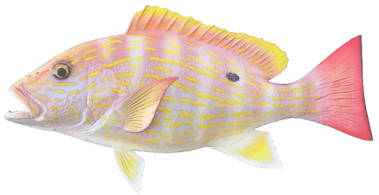
Filling critical life history information gaps of data-poor fisheries in U.S. Caribbean waters: Age, growth, and reproduction of lane snapper

Objective 1: Determine and compare growth rates, population age structure, and sex ratios in and among multiple areas in U.S. Caribbean waters

Objective 2: Determine and compare reproductive seasonality, size, and age at maturity/ transition in and among multiple areas in U.S. Caribbean waters

Summary of Preliminary Collections

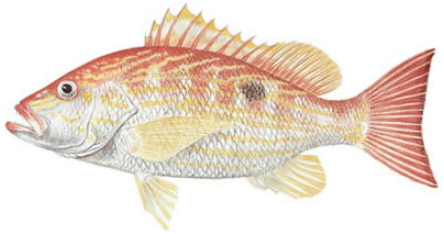
- To obtain preliminary data for lane snapper, we started collecting samples in 2014 from PR opportunistically for age, growth, and reproductive biology
- To obtain preliminary data for lane snapper, we started collecting samples in 2016 from St. Thomas opportunistically for age, growth, and reproductive biology



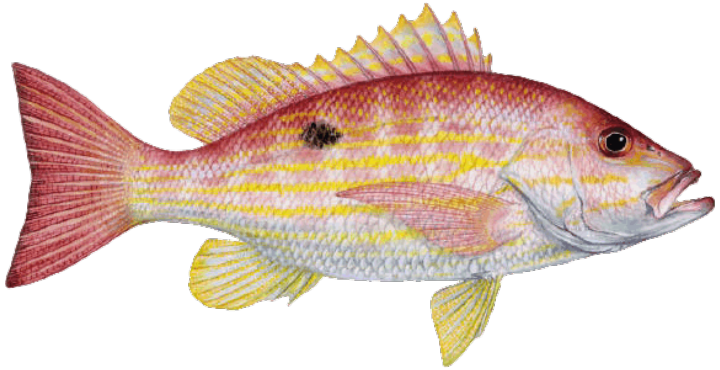
	USVI			PR			All 2014-2020
Month	Fishery Dep	Fishery Ind	USVI TOTAL	Fishery Dep	Fishery Ind + SEAMAP	PR TOTAL	Total Samples w otoliths and gonads
January	73		73		12	12	**85**
February	15		15		3	3	**18**
March							
April							
May					37	37	**37**
June							
July	2		2		32	32	**34**
August	22	1	23				**23**
September	16		16		1	1	**17**
October	1		1	10	11	21	**22**
November	1		1		10	9	**10**
December	20		20		2	2	**22**
Total	150	1	151	10	107	117	**268**

Budget Explanation

Travel: two trips to STT and two trips to STX each lasting a minimum of 8 days for two personnel
STT airfare and baggage fees (includes cost to transport samples) for two people for two trips: $4,800
STX airfare and baggage fees (includes cost to transport samples) for two people for two trips: $4,800
STT rental vehicle for two trips: $1400; Fuel for vehicle for two trips: $400
STX rental vehicle for two trips: $1400; Fuel for vehicle for two trips: $400



STT Housing for two people for two trips: $2,800
STX Housing for two people for two trips: $2,800
STT Per diem $55/day x 8 days x 2 trips x 2 people: $1,760
STX Per diem $55/day x 8 days x 2 trips x 2 people: $1,760
PR Mileage reimbursement for internal travel across island to pick up samples 2x per month x 12 months: $1,200
Total Travel: $23,520



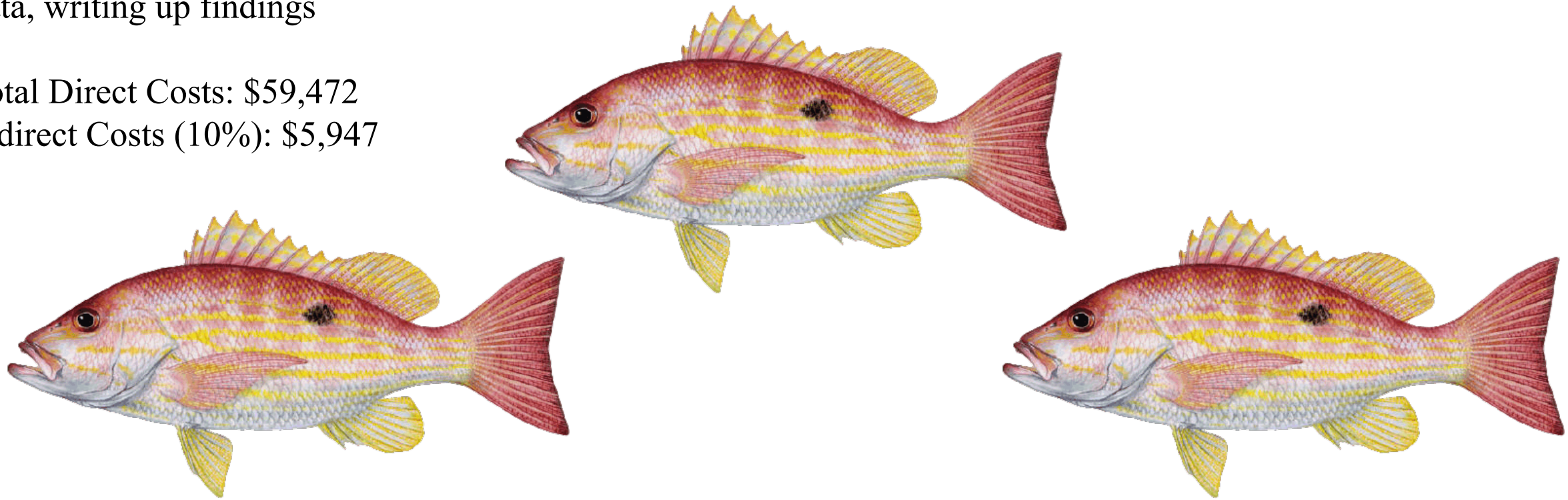
Fishery-Dependent Samples to fill in monthly sample gaps
STT/J: $2,500 STX: $2,500 PR: $3,600
Total: $8,600

Fishery-Independent Sampling to fill in sample gaps
STT: $2,400 STX: $2,400 PR: Fishery-independent sampling included in another project
Total: $4,800

Research field and lab supplies: $3,500 total
Includes funds for : saw blades for otolith sectioning, resin/hardener for embedding otoliths, slides and slides boxes for otoliths and gonads, sealant and lubricant for saw processing of otoliths, coolers for STT and STX sampling, ice during USVI sampling trips, fishing supplies for fishery-independent sample collections, preservative and containers for gonad collections, chemicals for processing gonads for histological examination

Personnel and Required Fringe: $14,000 + $5,052
This includes salary support for approximately 500 hours of time working for investigators while sampling, processing samples in the field, processing sample parts in the lab, analyzing samples, reading slides, analyzing data, writing up findings

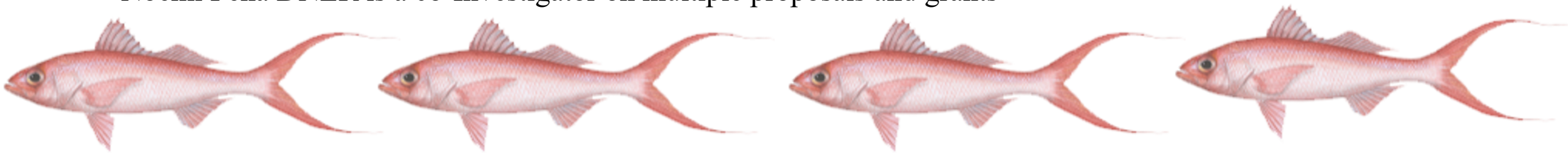
Total Direct Costs: $59,472
Indirect Costs (10%): $5,947



Capacity Building in U.S. Caribbean

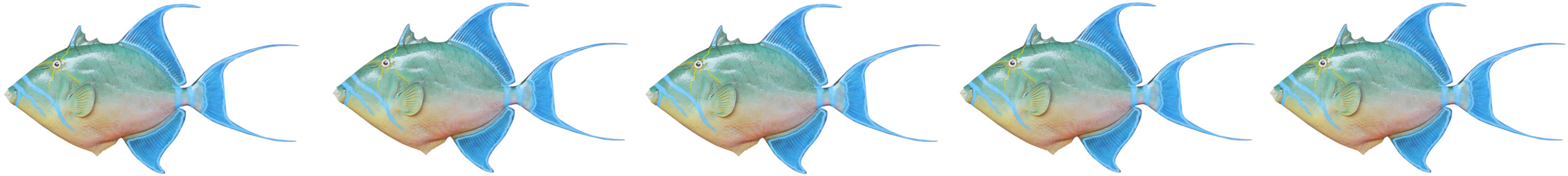
Puerto Rico

- JMRH is a Puerto Rican fisheries biologist completing doctoral degree; continues to work towards fisheries management goals in U.S. Caribbean
- Workshops in PR to train biologist and students on fisheries-related life history research
- Working with local fishers, student researchers
- Wilson Santiago Soler DNER is a co-Investigator on multiple proposals and grants
- Noemi Peña DNER is a co-Investigator on multiple proposals and grants

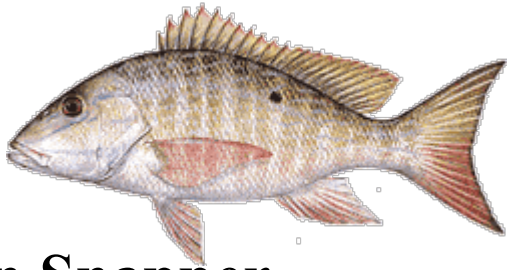


USVI

- VRS served as research advisor to an MS student at UVI (2015-2018); currently working with another UVI student on ageing mutton snapper aggregation samples
- We have conducted multiple workshops in St. Thomas and St. Croix on fisheries-related life history research for VIDPNR DWF and UVI students – will continue when requested
- Working closely with STT/J and STX fishers, student researchers
- Fishers collaborate with us directly on research investigations

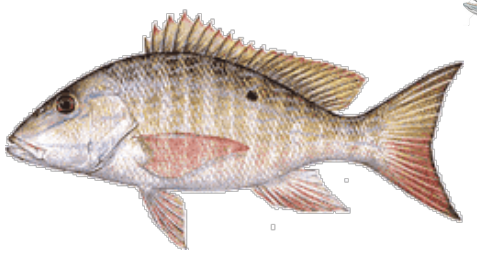


Proposed target species for future life history research



Mutton Snapper Life History Sample Collections

Month	Puerto Rico			St. Thomas			St. Croix			Total Samples Otoliths (% SEAMAP)	Total Samples gonads/otoliths (%SEAMAP)
	F-D/F-I JR/WS/NP	SEAMAP	PR Total	F-D VS/JR	SEAMAP	STT Total	F-D VS/JR	UVI Agg	STX Total		
January	30	4	34	1	1	2				36 (14%)	35 (11%)
February	9	4	13	13		13	6		6	32 (13%)	32 (13%)
March	6	8	14		1	1		27	27	42 (21%)	14 (57%)
April	6		6					15	15	21 (0%)	6 (0%)
May	14		14					68	68	87 (0%)	19 (0%)
June	20		20					48	48	68 (0%)	20 (0%)
July	17		17	18		18		10	10	45 (0%)	35 (0%)
August	11		11	2		2				13 (0%)	13 (0%)
September	16	4	20	1		1	1		1	22 (18%)	22 (18%)
October	19	1	20	6	1	7	1		1	28 (7%)	27 (4%)
November	23		23	15		15	13		13	51 (0%)	51 (0%)
December	1	2	3	19		19	1		1	23 (9%)	23 (9%)
Totals	160	17	183	80	3	83	22	168	190	456 (6%)	285 (8%)



Questions?

Our Research Team has a Strong Record of Obtaining Funding for U.S. Caribbean research; however, lane snapper has not been listed as a funding priority for NOAA MARFIN/CRP/S-K

- 2015 MARFIN: Filling critical life history information gaps of data-poor fisheries in U.S. Caribbean waters (queen triggerfish and FOUR parrotfishes); EXPANDED investigation to include queen triggerfish and seven parrotfish species
- 2015 MARFIN/VIMS: Assessment of maturity in commercially and recreationally important reef fishes from the U.S. Virgin Islands
- 2017 CRP: Caribbean hogfish: documenting critical life history information for a data-poor species in collaboration with Puerto Rican fishers; EXPANDED investigation to include samples from STT
- 2018 Saltonstall-Kennedy: Novel Approaches to Age Validation in four Data-Poor U.S. Caribbean Reef Fishes; EXPANDED investigation to include 23 species
- 2018 MARFIN: Conservation Genomics and Caribbean Fisheries Management: Stock Structure and Connectivity of Four Parrotfish Species and the Role of MPAs as Recruitment Sources
- In Review 2021 MARFIN: Data-Poor Caribbean Deepwater Snappers - Addressing Critical Gaps in Life History Research for Queen, Silk, Vermilion, Wenchman, Cardinal, and Black Snappers
- In Review 2021 CRP: Data-Poor Caribbean Deepwater Snappers: Addressing Critical Gaps in Blackfin Snapper Age, Growth, Reproduction, Population Genomics, and Contributions of MPAs
- In Review 2021 Saltonstall-Kennedy: Fishery-independent estimates of queen triggerfish population dynamics to support fisheries assessment and management in the US Virgin Islands

Recent Life History Publications/Reports (triggerfish and Parrotfishes)

Shervette VR, Rivera Hernández JM, Overly KE. *In Press*. Radiocarbon in otoliths of tropical marine fishes: reference $D^{14}C$ chronology for north Caribbean waters. PloS ONE.

Jones DD, Rivera Hernandez JM, Shervette VR. *In Press*. Age and growth of princess parrotfish Scarus taeniopterus. Environmental Biology of Fishes.

Rivera Hernandez JM, Pena Alvarado N, Correa Velez K, Nemeth R, Appeldoorn R, Shervette V. 2019. Queen Triggerfish *Balistes vetula* reproductive biology in U.S. Caribbean waters. Transactions of the American Fisheries Society 148: 134-147.

Rivera Hernandez JM. 2018. Queen Triggerfish *Balistes vetula* Reproductive Biology in US Caribbean Waters. MS Thesis in Marine Sciences, University of Puerto Rico.

Thomas S. 2018. Age, Growth, and Reproduction of the Queen Triggerfish, *Balistes vetula,* from the U.S. Virgin Islands. MS Thesis in Marine and Environmental Sciences, University of the Virgin Islands.

Shervette VR, Rivera Hernández JM, Nunoo FKE. 2021. Age and growth of Gray Triggerfish *Balistes capriscus* from trans-Atlantic populations. Journal of Fish Biology 2021: 1-17.

Kelly-Stormer A, Shervette V, Kolmos K, Wyanski D, Smart T, McDonough C, Reichert M. 2017. Gray triggerfish *Balistes capriscus* reproductive biology, age, and growth off the Atlantic coast of the southeastern U.S. Transactions of the American Fisheries Society 143(3): 523-538.

Shervette VR, Dean JM. 2014. Gray Triggerfish Age, Growth, and Reproduction in the South Atlantic Bight. Final Report NOAA MARFIN.

Jones DD, Rivera Hernandez JM, Shervette VR. *In Review*. Perplexing parrotfish in the Caribbean: discovery of a novel reproductive pattern for princess parrotfish *Scarus taeniopterus*. Environmental Biology of Fishes

Rivera Hernandez JM, Shervette VR. *In Prep*. Puzzling parrotfishes: novel application of bomb radiocarbon for ageing validation of six Caribbean Parrotfish species.

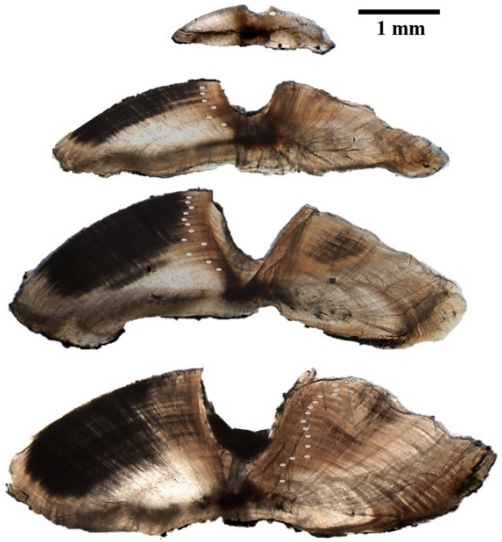
Rivera Hernandez JM, Shervette VR. *In Prep*. Caribbean parrotfish population demographics: Age, growth, and longevity of redband parrotfish

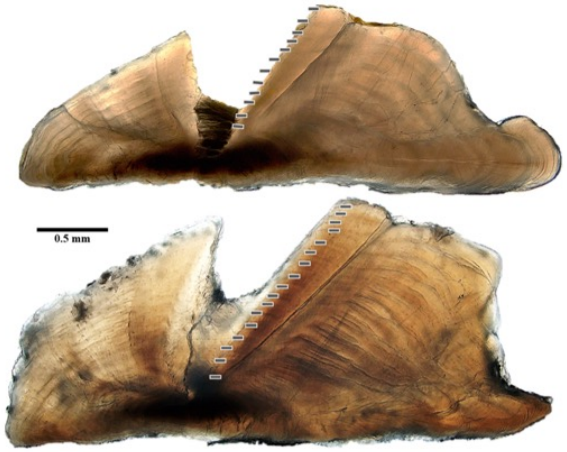
Wagner GA, Rivera Hernandez JM, Shervette VR. *In prep.* Stoplight parrotfish *Sparisoma viride* age, growth, and reproductive biology.

Jones DD. 2020. Age, Growth, and Reproductive Biology of Princess Parrotfish in the US Caribbean, MS Thesis. College of Charleston.

Wagner GA. 2019. Age, Growth, and Reproductive Biology of a Data-Deficient Parrotfish Species (*Sparisoma viride*) in the US Caribbean, MS Thesis. College of Charleston.

Yellowtail Snapper and Hogfish Life History Publications/Reports





Drake D. 2021. Caribbean hogfish age, growth, reproduction, and ageing validation via novel application of bomb radiocarbon chronometer. MS Thesis. College of Charleston.

Zajovits S. 2021. Yellowtail snapper population demographics in the U.S. Caribbean. MS Thesis. University of South Carolina

Shervette VR, Rivera Hernandez JM, Drake D, Pena Alvarado N, Santiago Soler W, Magras J. 2021. Caribbean Hogfish: documenting critical life history information for a data-poor species in collaboration with U.S. Caribbean fishers. NOAA COOPERATIVE RESEARCH PROGRAM FINAL REPORT NA17NMF4540137.

Drake D, Rivera Hernandez JM, Pena Alvarado N, Santiago Soler W. Shervette VR. *In Prep*. Caribbean hogfish age, growth, reproduction, and ageing validation via novel application of bomb radiocarbon chronometer. Transactions of the American Fisheries Society

Zajovits S, Rivera Hernandez JM, Pena Alvarado N, Shervette VR. *In Prep*. Caribbean yellowtail snapper: ageing validation via $\Delta^{14}C$ and population demographics across the waters of Puerto Rico and USVI. PLOSONE.

Landings Information for Lane Snapper

Previous Research on U.S. Caribbean Lane Snapper

REPRODUCTION

- Two studies conducted, both in Puerto Rico, included fishery-dependent and -independent samples
- No information exists for USVI waters
- No age-at-maturity information exists for U.S. Caribbean

AGE/GROWTH

- No age-related data exists for U.S. Caribbean
- No growth data exists for U.S. Caribbean

	Study Time Period	
	1996-1997	**2008-2011**
Island **Investigators**	Puerto Rico M. Figuerola Fishery Dependent	Puerto Rico M. Figuerola, W. Torres, N. Peña Fishery Dep + Ind
Sample size **Size range (mean size)** **Sex ratio M:F**	279 total samples 85-375 (208) mm FL 1:1.58	544 total samples 94-344 (204) mm FL 1:1.54
Males number of samples **L_{50} (size at median maturity)** **L_{100} (size at 100% mature)** **Smallest mature male**	108 total males 147 mm FL 210 mm FL 139 mm FL	202 total males 156 mm FL 200 mm FL 135 mm FL
Females number of samples **L_{50} (size at median maturity)** **L_{100} (size at 100% mature)** **Smallest mature female**	171 total females 185 mm FL 280 mm FL 148 mm FL	312 total females 181 mm FL 220 mm FL 155 mm FL
Spawning Season (Peak)	Mar-Sep (Jun/Jul)	Jan-Jun (Mar)
Comments	3.7% of the males 18.7% females were below the median size at sexual maturity