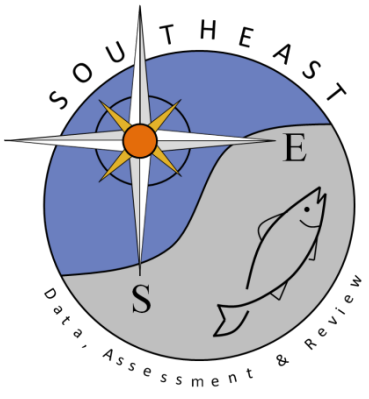

SEDAR

Southeast Data, Assessment, and Review

SEDAR 91

US Caribbean Spiny Lobster St. Thomas and St. John

SECTION II: Data Workshop Report

<January 2025>

SEDAR
4055 Faber Place Drive, Suite 201
North Charleston, SC 29405

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1. INTRODUCTION

1.1 WORKSHOP TIME AND PLACE

The SEDAR 91 Data Workshop was held November 13-15, 2024, in St Thomas, USVI. In addition to the in-person workshop, a series for webinars were held before (June and October 2024) the meeting.

1.2 TERMS OF REFERNCE

Data Workshop Terms of Reference:

1. Review available data inputs and provide tables and figures including, but not limited to:
    a. Commercial and recreational catches and/or discards.
    b. Length/age composition data
    c. Life history and ecological information
    d. Indices of abundance
    e. Include data through at least 2022.
2. Provide recommendations for future research in areas such as sampling, fishery monitoring, and stock assessment. Include specific guidance on research goals, data to be collected, and how the research will inform stock assessment.
3. Prepare the Data Workshop report providing complete documentation of workshop actions and decisions in accordance with project schedule deadlines (Section II of the SEDAR assessment report).

1.3 LIST OF PARTICIPANTS

Data Workshop Participants

Matt Damiano (Lead Analyst)	NMFS/SEFSC
Adyan Rios	NMFS/SEFSC
Sarah Beggerly	NMFS/SEFSC
J.J. Cruz-Motta	CFMC SSC, UPRM
Jorge R. Garciá	CFMC SSC
Katherine Godwin	UM-CIMAS
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Daniel Matos-Caraballo	PR DNER
Kevin McCarthy	NMFS/SEFSC
Maggie Rios	USVI DPNR
M. Refik Orhun	NMFS/SEFSC
Wilson Santiago Soler	PR Fisheries Liaison
Michelle Scharer	CFMC SSC
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Jesus Leon.....
Martha Prada..... DRNA
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Aida Rosario.....PR DNER

1.4 LIST OF DATA WORKSHOP WORKING PAPERS & REFERNCE DOCUMENTS

Document #	Title	Authors	Date Submitted
Documents Prepared for the Data Workshop			
SEDAR91-DW-01	Summary of participatory modeling workshops to understand ecological, social and economic dimensions of the U.S. Virgin Islands lobster fishery	Juan Agar, Mandy Karnauskas, Kelsi Furman, Matt McPherson, Manoj Shivlani	11/1/2024
SEDAR91-DW-02	Summary of participatory modeling workshops to understand ecological, social and economic dimensions of the Puerto Rican lobster fishery	Mandy Karnauskas, Juan Agar, Matt McPherson, Kelsi Furman, Manoj Shivlani	11/1/2024
SEDAR91-DW-03	PR/DNER/Commercial Fisheries Statistics Program Report Signs of the Abundance of Spiny Lobster Panulirus argus Observed by Commercial Landings Reported during 2014-2023	Daniel Matos-Caraballo, Jesús León-Fernández, Luis A. Rivera-Padilla, and Wilson Santiago-Soler	11/15/2024
SEDAR91-DW-04	SEDAR 91 Trip Interview Program (TIP) Size Composition Analysis of Caribbean Spiny Lobster (Panulirus argus) in Puerto Rico, U.S. Caribbean, 1981-2023	Katherine Godwin, Adyan Rios	11/20/2024
SEDAR91-DW-05	SEDAR 91 Trip Interview Program (TIP) Size Composition Analysis of Caribbean Spiny Lobster (Panulirus argus) in St. Thomas/St. John, U.S. Caribbean, 1981-2023	Katherine Godwin, Adyan Rios	11/20/2024
SEDAR91-DW-06	SEDAR 91 Trip Interview Program (TIP) Size Composition Analysis of Caribbean Spiny Lobster (Panulirus argus) in St. Croix, U.S. Caribbean, 1981-2023	Katherine Godwin, Adyan Rios	11/20/2024
SEDAR91-DW-07	SEDAR 91 Commercial Landings of Caribbean Spiny Lobster (Panulirus argus, Panulirus guttatus) in Puerto Rico, US Caribbean, 1983-2023	M. Refik Orhun, Katherine Godwin, Kim Johnson, and Stephanie Martínez Rivera	11/24/2024

SEDAR91-DW-08	SEDAR 91 Commercial Landings of Caribbean Spiny Lobster (Panulirus argus) in St. Thomas and St. John, US Caribbean, 1975-2023	M. Refik Orhun, Katherine Godwin, Kim Johnson, and Stephanie Martínez Rivera	11/24/2024
SEDAR91-DW-09	SEDAR 91 Commercial Landings of Caribbean Spiny Lobster (Panulirus argus) in St. Croix, US Caribbean, 1975-2023	M. Refik Orhun, Katherine Godwin, Kim Johnson, and Stephanie Martínez Rivera	11/24/2024
Reference Documents			
SEDAR91-RD01	On the productivity and technical efficiency of the Puerto Rican queen conch Aliger gigas fishery	Juan Agar and Daniel Solis	10/9/2024
SEDAR91-RD02	Socio-economic Profile of the Small-scale Dive Fishery in the Commonwealth of Puerto Rico	Juan J. Agar and Manoj Shivlani	10/9/2024
SEDAR91-RD03	Determining the age-size relationship of Panulirus argus in the southwest area of Puerto Rico	Ana G. Medina Martinez	10/9/2024
SEDAR91-RD04	Annual Juvenile Recruitment of Spiny Lobsters, Panulirus Argus (Decapoda, Palinuridae), in a Shallow Seagrass Bed and a Deeper Hard Bottom off Western Puerto Rico	Nilda M. Jiménez, Ernest H. Williams, Jr. and Aida Rosario	10/10/2024
SEDAR91-RD05	Patterns of Spiny Lobster (Panulirus argus) Postlarval Recruitment in the Carribbean: A CRTR Project	Mark J. Butler IV, Angela M. Mojica, Eloy Sosa-Cordero, Marines Millet and Paul Sanchez-Navarro	10/10/2024
SEDAR91-RD06	Developing a population assessment for Caribbean spiny lobster *Panulirus argus* in the United States Virgin Islands: lessons learned	Lee Richter[1] and Michael W Feeley[2]	11/7/2024
SEDAR91-RD07	Estimate of In-water Size Structure of Spiny Lobsters in St. Thomas	Tyler B. Smith, Sarah L. Heidmann, Rosmin S. Ennis, Viktor W. Brandtneris, Adeline Shelby,	11/7/2024

		Jeremiah Blondeau	
SEDAR91-RD08	Displaced juvenile and subadult Caribbean spiny lobsters show strong orientation toward home dens	Michael J. Childress a,*, Coral Holt a, Rodney D. Bertelsen b	11/14/2024
SEDAR91-RD09	Ocean acidification disrupts the orientation of postlarval Caribbean spiny lobsters	Philip M. Gravinese, Heather N. Pag, Casey B. Butler, Angelo Jason Spadaro, Clay Hewett, Megan Considine, David Lankes & Samantha Fisher	11/14/2024
SEDAR91-RD10	Relationships between postlarval settlement and commercial landings of Caribbean spiny lobster (Panulirus argus) in Florida (USA)	Emily Hutchinson, Thomas R. Matthews , Gabrielle F. Renchen	11/14/2024
SEDAR91-RD11	Gastric mill ossicles record chronological age in the Caribbean spiny lobster (*Panulirus argus*)	Emily Hutchinson, Thomas. R Matthews, Erica Ross, Samantha Hagedorn , Mark J. Butler IV,	11/14/2024
SEDAR91-12	Spiny Lobster SEAMAP Program Survey 2021-23	Department of Natural and Environmental Resources	11/14/2024
SEDAR91-13	Progress Report: Independent fishery data collection for lobster (Panulirus argus) and conch (Lobatus gigas) under the SEAMAP-C program	Juan J. Cruz Motta	11/14/2024

2. Life History

2.1 Overview

No new life history information was available for the SEDAR Panel to discuss during the data workshop. Therefore, sections 2.2-2.6 were carried over from SEDAR 57.

2.2 Stock Definition and Description

The Caribbean spiny lobster (hereafter referred to as spiny lobster), occurs in the Caribbean Sea, the Gulf of Mexico and the Western Central and South Atlantic Ocean. North Carolina marks its northernmost limit whereas Brazil marks its southernmost limit (Bliss 1982). The spiny lobster occurs from the extreme shallows of the littoral fringe to depths exceeding 100 meters (Kanciruk 1980; Munro 1974). CFMC (1981) reports that its distribution off Puerto Rico extends to the edge of the shelf, which is described as the 100−fathom contour (183 meters). Shallow areas with mangroves and seagrass (*Thalassia testudinum*) beds serve as nursery areas where available (Munro 1974). Generally, spiny lobsters move offshore when they reach reproductive size (Phillips et al. 1980). These animals are primarily carnivores, and serve as the major benthic carnivores in some ecosystems (Kanciruk 1980), feeding upon smaller crustaceans, mollusks and annelids (Cobb and Wang 1985).

2.3 Meristic & Conversion factors

Length-weight conversions were estimated using the Trip Interview Program (TIP) database. TIP records were filtered according to island platform (Puerto Rico, St. Thomas/St. John, and St. Croix). Records were further filtered such that retained records consisted only of those with paired length-weight measurements that had reported units of measure (e.g., mm or kg) and corresponding measurement type (e.g., carapace length or whole weight). A subsequent evaluation of data entry and/or measurement errors led to the removal of 55 records for St. Thomas/St. John (Table 2.1).

Length-weight relationships were fit as log-linear functions in the R statistical computing software (Quinn and Deriso 1999, R Development Core Team 2012). The relationship for length (mm CL) to weight (kg whole weight) is:

$$W = aL^b$$

Model fitting was carried out using linear regression on the log transformed equation:

$$log(W) = log(a) + b * \ log(L)$$

Analyses were carried out separately for males, females, and for both sexes combined. Resulting L-W relationships are found in Table 2.2. For St. Thomas/St. John, a total of *n*=11,723 L-W observations were available from TIP (*n* male=6,692; *n* female=5,031) from 1980 to 2017 (Fig. 2.1). The largest individual by length was 203.2 mm CL (3.175 kg), while the largest individual by weight was 4.7 kg (200 mm CL). Carapace length to weight conversion for St. Thomas/St. John spiny lobsters are shown in Table 2.2.

2.4 Natural Mortality

During SEDAR 8, various sources are referenced with respect to natural mortality, including Olsen and Koblic 1975, Medley and Ninnes 1996, and FAO 2001. Natural mortality was specified at 0.36 for adult lobsters and used for all ages during SEDAR 8. During SEDAR 46 (Spiny lobster St. Thomas/St. John and St. Croix), consideration was given to natural mortality estimates from tagging studies, with estimates typically occurring between 0.26 and 0.44 $year^{-1}$ for adult spiny lobster, with the most reliable estimates suggested to be in the range of 0.30 to 0.40 (FAO 2001). A point estimate of 0.34, calculated from a variant of Pauly's equation, is also widely reported (Cruz et al. 1981). Point estimates based on longevity were also considered, but require evidence of maximum age, which is difficult to obtain for lobsters (Kanciruk 1980). This issue is reinforced by additional statements made by Olsen and Koblic (1975). Further discussion about spiny lobster longevity can be found on pg 27, SEDAR 46, Data and Assessment Workshop report (SEDAR 2016). Several spiny lobster stock assessments in the Caribbean have used 0.34 to 0.36 $year^{-1}$ in base model runs (Cruz 2001; Gongora 2010; SEDAR 2005; Babcock et al. 2014). During the SEDAR 57 data workshop, participants identified a mark- recapture dataset from a study undertaken by the St. Thomas Fishermen's Association (Olsen et al. 2017). Analysts determined obtaining an estimate of natural mortality from this study for use in the assessment was not feasible; this was potentially due to an underestimate of reporting practices stated by Olsen et al. (2017), which resulted in an unreasonably high (M > 2.0 per year) estimate of natural mortality (see SEDAR 57 Final Assessment Report).

2.5 Reproduction

Die (2005) estimated a logistic maturity curve from TIP prior to 1990, when landing of egg bearing females was permitted. Data from Puerto Rico and St. Thomas/St. John were aggregated for the purpose of model fitting. Two model parameterizations were considered, in both cases, length at 50% maturity were similar being either 91 mm or 92 mm CL.

For SEDAR 8 (2005), fecundity-at-length was obtained for Cuba spiny lobster (FAO 2001):

$$E = 0.5911L^{4.5677}$$

where E is number of eggs and L is carapace length in mm.

2.6 Age and Growth

During SEDAR 8, von Bertalanffy growth curves for males and females were obtained from Leon et al. (1994) for Cuba (SEDAR 2005). Since SEDAR 8, several additional publications have become available for von Bertalanffy growth curves from regions such as Cuba, Puerto Rico, and Mexico (Table 2.3). Also, during SEDAR 46 (Spiny lobster St. Thomas/St. John & St. Croix), von Bertalanffy growth parameters from Leon et al. (1995) were reviewed, noting similar values used in other stock assessment (i.e., Gongora 2010; Babcock et al. 2014). These point estimates were also compared to a more recent study by Leon et al. (2005) and analyses in SEDAR 46 were based on a single growth curve for both sexes. During the SEDAR 57 data workshop, participants identified a mark-recapture dataset from a study undertaken by the St. Thomas Fishermen's Association (Olsen et al. 2017). During SEDAR 57, analysts determined that obtaining a growth curve from this study for use in the assessment was not feasible. This

was due to an absence of the largest size classes in the data set, though results verified that growth in Puerto Rico (Table 2.3) was generally consistent with growth in St. Thomas/St. John (see SEDAR 57 Final Assessment Report).

Table 2.1. Records manually removed from St. Thomas/St. John TIP prior to L-W model fitting.

L	W	Sex
114.3	0.003	F
101.6	0.002	F
107.95	0.003	F
107.95	0.003	F
88.9	0.002	F
107.95	0.003	F
82.55	0.002	F
114.3	0.003	F
107.95	0.003	F
101.6	0.002	F
101.6	0.002	F
114.3	0.003	F
127	0.004	F
152.4	0.007	F
133.35	0.004	F
120.65	0.003	F
133.35	0.004	F
95.25	0.002	F
88.9	0.002	F
95.25	0.002	F
120.65	0.003	F
114.3	0.003	F
82.55	0.002	F
120.65	0.003	F
107.95	0.002	F
88.9	0.002	F
101.6	0.002	F
101.6	0.002	F

L	W	Sex
63.5	0.003	M
88.9	0.002	M
88.9	0.002	M
120.65	0.003	M
120.65	0.004	M
127	0.004	M
114.3	0.003	M
114.3	0.002	M
95.25	0.002	M
101.6	0.002	M
107.95	0.002	M
95.25	0.002	M
107.95	0.002	M
101.6	0.002	M
101.6	0.002	M
95.25	0.002	M
95.25	0.002	M
158.75	0.006	M
146.05	0.006	M
114.3	0.003	M
133.35	0.004	M
107.95	0.002	M
101.6	0.002	M
114.3	0.003	M
120.65	0.003	M
101.6	0.002	M
107.95	0.003	M

Table 2.2 Fitted conversion functions from length (mm CL) to weight (kg whole weight) for St. Thomas/St. John.

Island platform	Year	n	a	b
St. Thomas/St. John				
Males	1980-2017	6692	3.548E-05	2.204
Females	1980-2017	5031	4.889E-05	2.138
Males + Females	1980-2017	11723	4.166E-05	2.171

Table 2.3 von Bertalanffy growth parameters, noting values used in SEDARs 8 and 46 (i.e., Leon et al. (1995)) and with emphasis on studies that have been subsequently produced.

Study	Region/Country	Source	Sex	L∞ (mm)	K
Leon et al. (1995)	Cuba	Length frequency	M	184	0.24
			F	155	0.22
Leon et al. (2005)	Cuba	Length frequency	Both	184	0.24
Mateo (2004)	Puerto Rico	Length frequency	M (1999)	197	0.24
			M (2000)	195	0.24
			F (1999)	191	0.25
			F (2000)	185	0.23
Velazquez-Abunader et al. (2015)	Mexico, Yucatan	Length frequency	M	203	0.28
			F	189	0.34

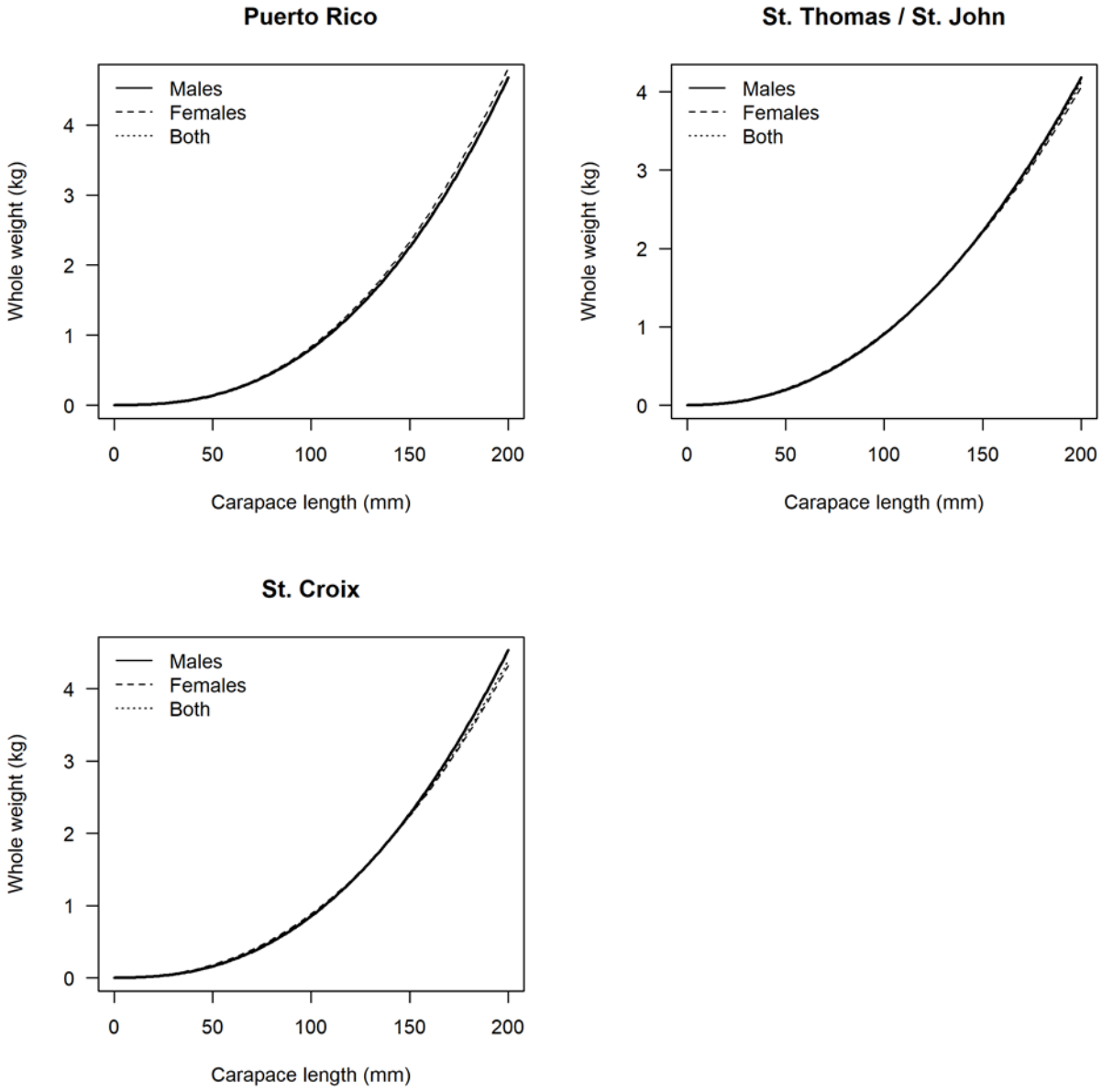

Figure 2.1 Length-weight curves for spiny lobster of Puerto Rico, St. Thomas/St. John, and St. Croix.

3. Commercial Fishery Statistics

3.1 Biological Sampling

3.1.1 Overview

The NOAA Fisheries, Southeast Fisheries Science Center Trip Interview Program (TIP) collects length and weight data from fish landed by commercial fishing vessels, along with information about fishing area and gear. Data collection began in the 1980s with frequent updates in best practices; the latest being in 2017. Data are collected by trained shore-based samplers (Beggerly et al., 2022).

3.1.2 Length Composition Sampling Intensity

The TIP data pertaining to Caribbean Spiny Lobster in St. Thomas/St. John consists of 15,921 length observations across 699 unique port sampling interviews (Figure 3.1.1). Of the Caribbean spiny lobster measured, 15,904 were carapace length observations (99.9%). Plots and summary statistics of the currently available length frequency data of Caribbean spiny lobster sampled from the predominant gears in St. Thomas/St. John are included in the working paper Godwin et al. 2024.

3.1.3 Length Distributions

A variety of fishing gears were used by St. Thomas/St. John commercial fishers to catch Caribbean spiny lobster. A generalized linear mixed model (GLMM) was fit to TIP data to compare mean size composition among gear types. The purpose of the analysis was to identify gear groups among the commercial fishing gears with groups based upon Caribbean spiny lobster size composition. Gears with size compositions that were not significantly different were assigned to the same gear group. The analysis identified no difference among gear specific size compositions and the gears with nonconfidential data are provided in Table 3.1.1. Summary statistics produced by the GLMM analysis of the available length frequency data from 1981 to 2023 are also included in Table 3.1.1. Gear groups were identified based on GLMM analysis using a gamma-distributed dependent variable and a covariate to account for changes in mean size over time. Random effects for interview ID and categorical year were included to account for non-independence of observations.

The aggregated density plot for all gears combined of Caribbean spiny lobster carapace lengths collected across the time series 1981-2023 are summarized in Figure 3.1.2. Aggregated density plots of Caribbean spiny lobster landed by nonconfidential gears are summarized in Figure 3.1.3.

3.1.4 Adequacy of Size Composition Data for Characterizing Catch

The available TIP size composition data can be used to inform selectivity; however, it is not certain that sample sizes are sufficient to identify annual population trends in the SEDAR 91 assessment models.

A weight-length analysis was not conducted to identify outliers in the TIP data. A cutoff of 2.5cm minimum and 25cm maximum length was implemented to remove notable outliers in the TIP dataset (Godwin et al 2024).

Decisions:
- Consider TIP data to inform selectivity in the assessment models and allow the assessment analyst to explore the data for any evidence of annual population trends.
- Supply complete TIP time series for use in SEDAR 91 investigations.
- Compare aggregated length density of SEAMAP-C data with that of TIP data.

3.2 Commercial Landings

3.2.1 Overview

Commercial fishery landings in St. Thomas/St. John, referred to as "STTJ", were obtained from self-reported fisher logbook data (Caribbean Commercial Logbook, CCL). Classification of Caribbean Spiny Lobster by species began in 1974, which was a partial year (Valle-Esquivel and Díaz 2004). Commercial fishery landings data for Caribbean Spiny Lobster in STTJ were available for the years 1975-2023.

3.2.2 Outlier Analysis

An outlier analysis was conducted by using a mean and standard deviation method. If the landings of Caribbean Spiny Lobster reported on a trip were greater than three standard deviations from the mean (i.e., 99.73% quantile), they were marked for removal from the dataset. Outliers were identified for each gear group across all years. Total landings with and without outliers are shown in Figure 3.2.1 and the percent change in landings with outliers removed is shown in Table **3.2.1**.

Decisions:
- SEDAR 91 Panel decided to use the St. Thomas and St. John commercial landings without removing the outliers.
- Panel recommended using the landings time series starting in 1975.

3.2.3 St. Thomas/St. John Caribbean Spiny Lobster Fishery

Logbook data are recorded by fishing year, which runs from July 1 through June 30 of the following year. However, data in this report are provided by calendar year. STTJ's Caribbean Spiny lobster fishery is dominated by traps as the major gear and accordingly, gears are grouped into diving and traps and all other gears are merged with the trap data in a "traps all" gear group following the protocol of the prior Caribbean Spiny Lobster assessment and its update (SEDAR 57, 2019; SEDAR 57 Update, 2022) shown in Orhun et al. (2024). The commercial landings were presented in pounds by year and fishing gear group are shown in Table 3.2.2.

3.3 Commercial Discards

Species-specific commercial discard reporting began in July 2003 and the first full year of reporting was 2004 in the USVI for Caribbean Spiny Lobster. Commercial discards were infrequently reported by fishers. Plenary group discussion resulted in the recommendation that discard mortality be considered minimal.

Decision:

- Discard mortality of spiny lobster was considered minimal and therefore represent a very minor source of mortality due to fishing (as per SEDAR 57)

3.4 Commercial Effort

Commercial trips with reported Caribbean Spiny Lobster landings per year and gear group were compiled from 1975 to 2023 (Table 3.4.1).

Table 3.1.1 GLMM analysis summary results for St. Thomas/St. John TIP Caribbean Spiny Lobster lengths(cm) from 1981 to 2023. The column titled "group" indicates the group(s) where mean lengths are not statistically different from other gears with matching group number(s). The "n" column indicates the number of unique lengths recorded for each gear. The "Percentage" column indicates the percent of the total recorded lengths for each gear. Only nonconfidential data shown.

Gear	Mean	Estimated Marginal Mean	LCL	UCL	Group	Lobster (n)	Interview (n)	Percentage
POTS AND TRAPS; SPINY LOBSTER	10.90	2.42	2.40	2.45	1	9,285	197	60.03
POTS AND TRAPS; FISH	11.44	2.42	2.40	2.45	1	3,969	330	25.66
POTS AND TRAPS; CMB	10.96	2.42	2.38	2.46	1	1,129	49	7.30
BY HAND; DIVING GEAR	11.39	2.43	2.39	2.47	1	644	55	4.16

Table 3.2.1 Comparison of all reported landings and landings after outlier removal of commercial landings of Caribbean Spiny Lobster in pounds for St. Thomas/St. John.

Year	Landings (lbs.)	Landings outlier removed (lbs.)	Difference (%)
1975	6,795	6,795	0.0
1976	6,741	6,741	0.0
1977	19,461	19,461	0.0
1978	58,311	50,501	13.4
1979	29,385	27,815	5.3
1980	36,089	30,429	15.7
1981	38,068	38,068	0.0
1982	36,662	35,094	4.3
1983	36,140	36,140	0.0
1984	35,976	34,156	5.1
1985	29,357	29,357	0.0
1986	23,637	23,637	0.0
1987	40,666	37,406	8.0
1988	54,679	54,136	1.0
1989	58,856	57,768	1.8
1990	77,836	68,581	11.9
1991	54,798	53,758	1.9
1992	86,413	84,073	2.7
1993	83,260	82,007	1.5
1994	61,774	61,774	0.0
1995	67,392	67,392	0.0
1996	87,932	87,932	0.0
1997	95,094	95,094	0.0
1998	73,715	72,727	1.3
1999	75,828	73,675	2.8
2000	76,151	76,030	0.2
2001	89,707	88,242	1.6
2002	115,973	114,048	1.7
2003	135,290	133,014	1.7
2004	133,982	132,852	0.8
2005	124,641	124,641	0.0
2006	136,028	133,232	2.1
2007	119,640	117,904	1.5
2008	110,465	110,465	0.0
2009	115,761	113,663	1.8
2010	114,572	108,700	5.1
2011	84,301	82,896	1.7
2012	83,156	82,641	0.6
2013	84,514	83,976	0.6
2014	92,260	92,173	0.1
2015	109,454	109,454	0.0
2016	121,695	120,755	0.8
2017	91,913	90,711	1.3
2018	86,708	84,078	3.0
2019	98,609	97,694	0.9

2020	94,333	94,008	0.3
2021	101,108	100,501	0.6
2022	104,905	101,273	3.5
2023	123,027	120,001	2.5
Total	3,823,058	3,747,469	2.0

Table 3.2.2 Commercial landings of Caribbean Spiny Lobster in pounds by gear group that reported Caribbean Spiny Lobster landings in St. Thomas/St. John.

YEAR	TOTALTRAPS LBS	TOTAL DIVING ALL LBS	GRAND TOTAL LBS
1975	4,908	*	*
1976	5,404	1,337	6,741
1977	14,964	*	*
1978	50,524	*	*
1979	25,868	3,517	29,385
1980	30,989	5,100	36,089
1981	34,919	3,149	38,068
1982	33,612	3,050	36,662
1983	32,614	3,526	36,140
1984	30,889	5,087	35,976
1985	25,557	3,800	29,357
1986	19,020	4,617	23,637
1987	35,319	5,347	40,666
1988	48,681	5,998	54,679
1989	55,554	3,302	58,856
1990	58,707	19,129	77,836
1991	46,060	8,738	54,798
1992	82,558	3,855	86,413
1993	77,816	5,444	83,260
1994	58,116	3,658	61,774
1995	63,646	3,746	67,392
1996	82,722	5,210	87,932
1997	90,299	4,795	95,094
1998	70,484	3,231	73,715
1999	70,619	5,209	75,828
2000	71,605	4,546	76,151
2001	82,136	7,571	89,707
2002	104,071	11,902	115,973
2003	125,641	9,649	135,290
2004	130,759	3,223	133,982
2005	121,759	2,882	124,641
2006	132,513	3,515	136,028
2007	116,855	2,785	119,640
2008	108,042	2,423	110,465
2009	111,599	4,162	115,761
2010	112,833	1,739	114,572
2011	81,994	2,307	84,301
2012	81,766	1,390	83,156
2013	83,349	1,165	84,514
2014	91,337	923	92,260
2015	108,170	1,284	109,454
2016	119,817	1,878	121,695

2017	86,728	5,185	91,913
2018	81,004	5,704	86,708
2019	97,247	1,362	98,609
2020	92,683	1,650	94,333
2021	99,403	1,705	101,108
2022	102,582	2,323	104,905
2023	120,545	2,482	123,027

* Confidential data by year and gear were removed. Total landings (lbs.) of confidential data is 14,171.

Table 3.4.1 Number of commercial trips by gear group that reported Caribbean Spiny Lobster landings in St. Thomas/St. John.

YEAR	TRIPS TRAPS	TRIPS DIVING ALL	TOTAL TRIPS
1975	212	*	*
1976	176	24	200
1977	407	*	*
1978	612	*	*
1979	547	97	644
1980	462	72	534
1981	543	95	638
1982	510	85	595
1983	474	154	628
1984	394	227	621
1985	527	162	689
1986	439	169	608
1987	518	194	712
1988	670	182	852
1990	640	139	779
1991	813	147	960
1992	805	164	969
1993	1,244	146	1,390
1994	1,079	206	1,285
1995	945	184	1,129
1996	904	146	1,050
1997	1,025	162	1,187
1998	1,136	202	1,338
1999	1,033	101	1,134
2000	1,068	153	1,221
2001	1,053	165	1,218
2002	1,180	232	1,412
2003	1,288	295	1,583
2004	1,451	253	1,704
2005	1,615	102	1,717
2006	1,524	81	1,605
2007	1,395	100	1,495
2008	1,352	76	1,428
2009	1,353	100	1,453
2010	1,277	120	1,397
2011	1,180	76	1,256
2012	985	77	1,087
2013	958	54	1,062
2014	902	39	1,012
2015	961	68	941
2016	1,048	96	1,144
2017	838	144	982
2018	694	112	806
2019	821	46	867

2020	948	66	1,014
2021	986	81	1,067
2022	912	89	1,001
2023	862	81	943

* Confidential data by year and gear were removed. Total number of trips of confidential data is 258.

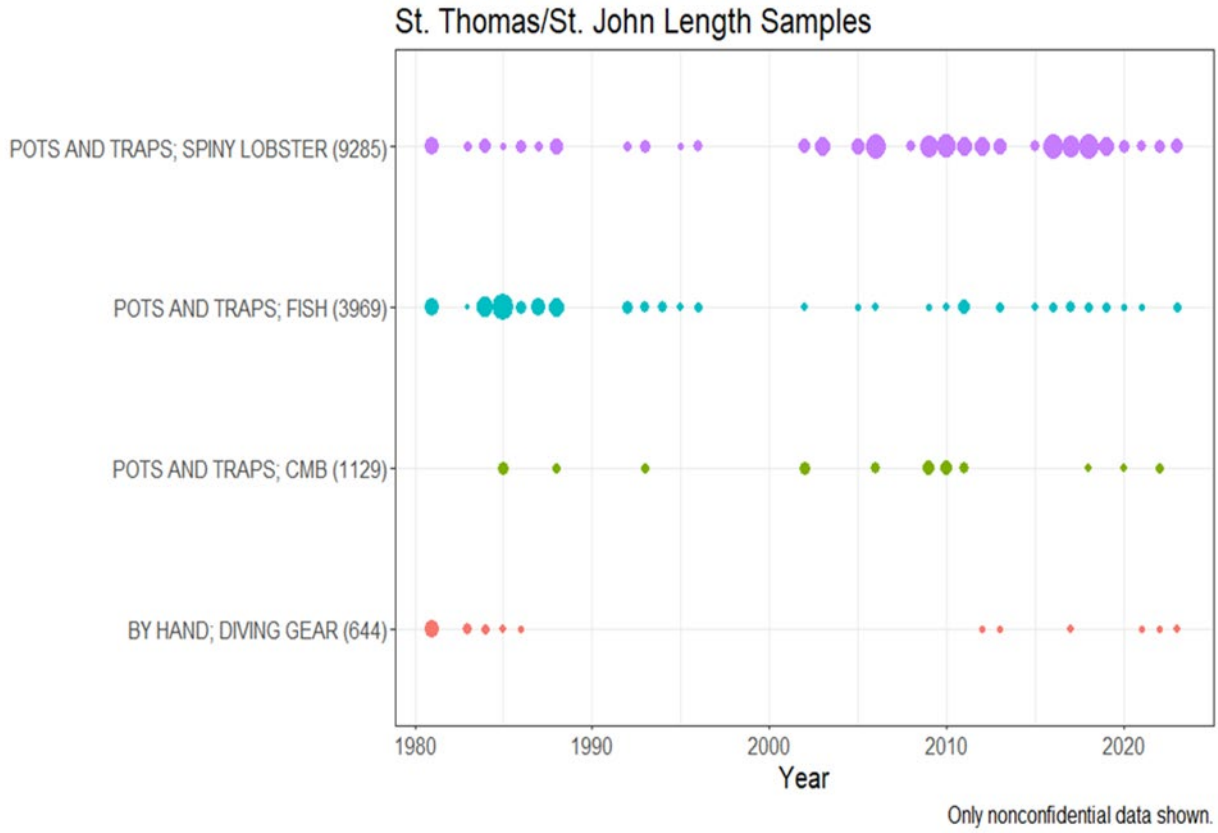

Figure 3.1.1 Plot showing relative number of Caribbean Spiny Lobster lengths in St. Thomas/St. John across time collected. Each point is color specific to the gear it represents. Gears are arranged from most to least abundant.

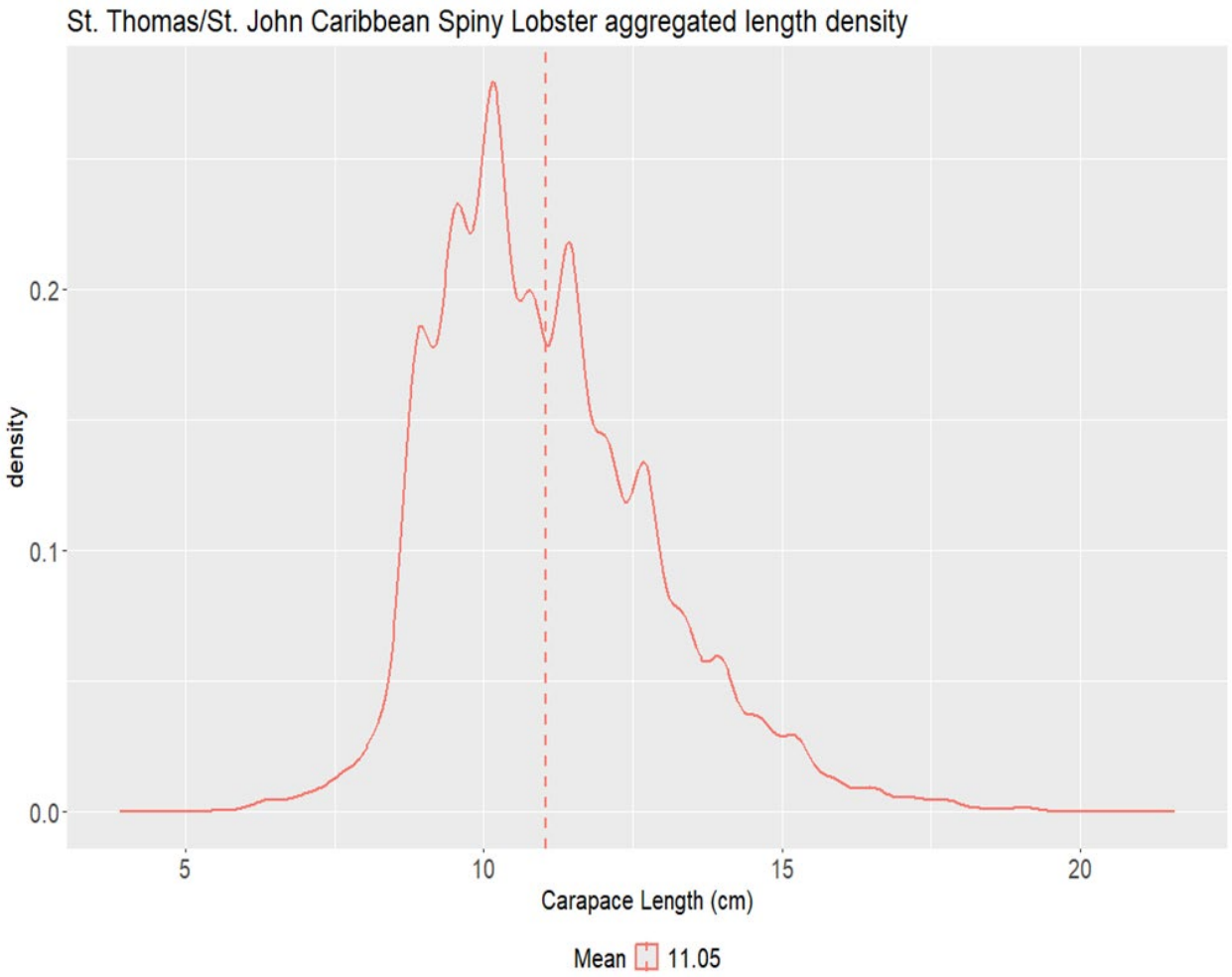

Figure 3.1.2 Aggregated density plot of lengths(cm) of Caribbean Spiny Lobster in St. Thomas/St. John, all gears combined. Dotted line represents mean length.

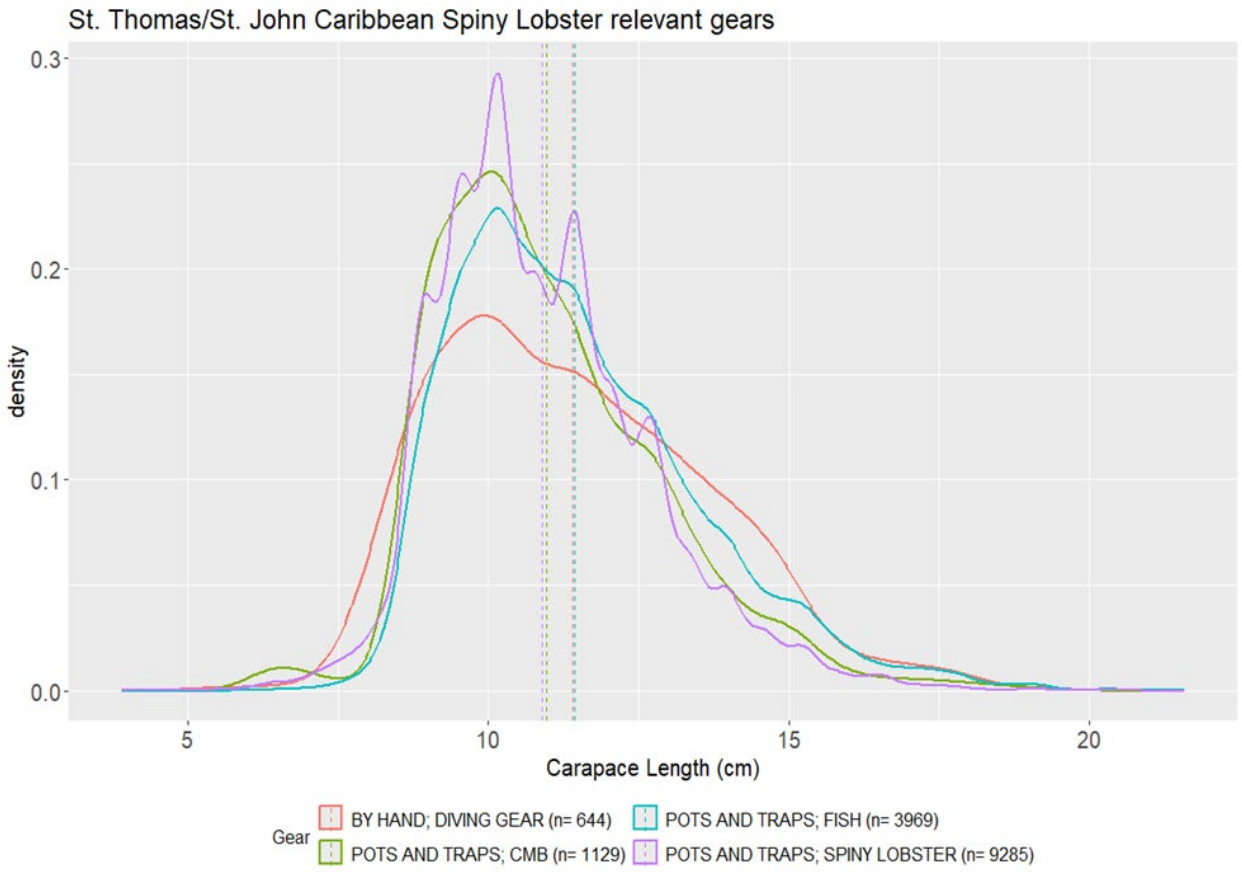

Figure 3.1.3 Aggregated density plot of lengths(cm) of nonconfidential gears recorded for Caribbean Spiny Lobster in St. Thomas/St. John from 1981 to 2023. Dotted line represents mean length. Mean lengths can be found in **Table 3.1.1**.

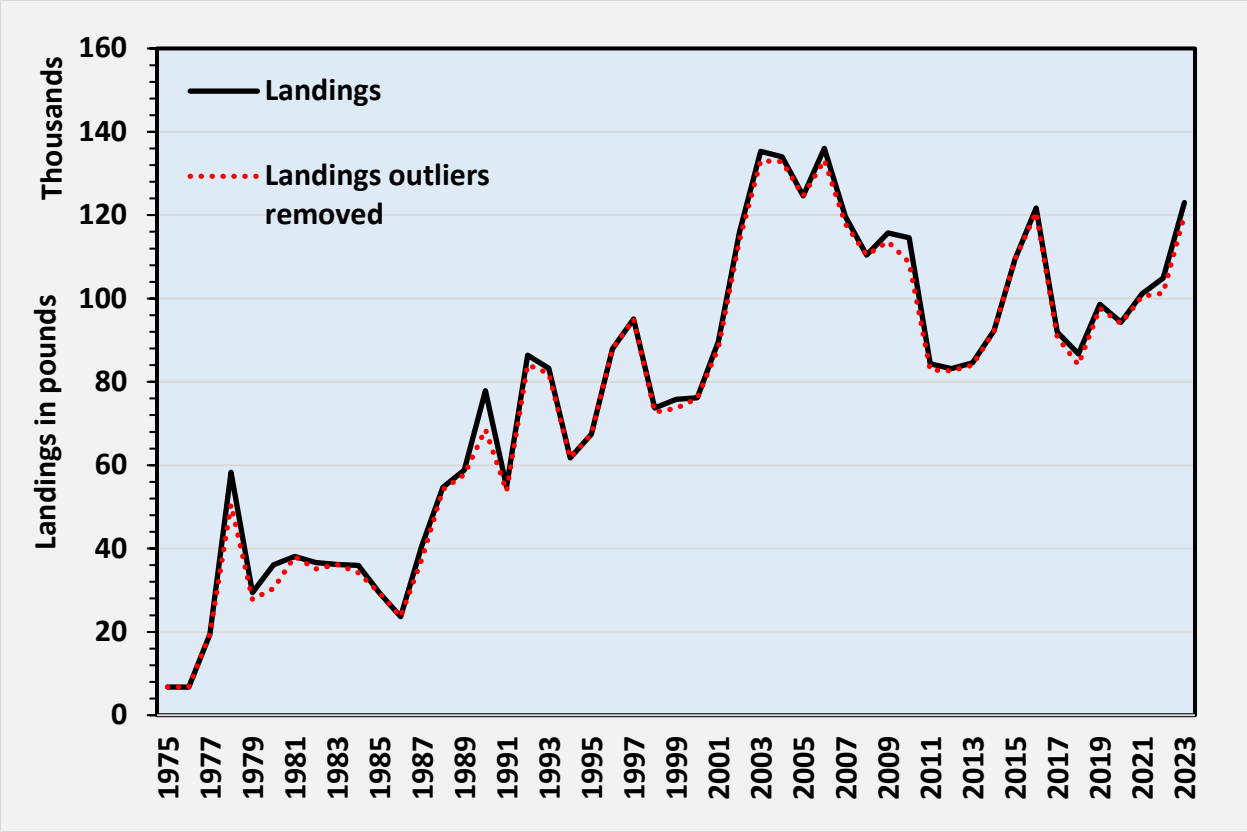

Figure 3.2.1 Commercial landings of Caribbean Spiny Lobster landings of St. Thomas/St. John with and without the outliers removed.

4. Recreational Fishery Statistics

There are currently no data available on recreational landings in St. Thomas/St. John.

5. Measures of Population Abundance

5.1 Overview

The panel was presented with summaries of the fishery-independent research conducted by The University of the Virgin Islands in cooperation with the Southeast Fisheries Science Center (RD-05), and by the National Park Service in Buck Island Reef National Monument and Salt River National Historical Park in St. Croix, US Virgin Islands and St. John, US Virgin Islands (RD-06). The panel discussed concerns about using data collected from the two studies for indices of relative abundance, principally due to short time series, small spatial extent of the studies, and small sample sizes, and recommended they not be considered for use in either the STX or STTJ assessment models.

6. Research Recommendations

-When developing new research projects, consider how those projects can be designed to include data collection and/or analyses that would inform ecosystem models and analyses. The original objectives of the project should not be compromised, however.

6.1 Life History Research Recommendation

- Life history studies focused on the US Caribbean – generate region-specific parameters for growth, fecundity, natural mortality.
- Look for ongoing growth/aging work via SEAMAP-C
- Merge selectivity studies, life history data collection, and fishery-independent survey frameworks to determine how to get best data for stock assessment

6.2 Commercial Fishery Statistics

6.2.1 Length Composition Research Recommendations

- Compare SEAMAP-C to TIP size composition to better inform gear selectivity.

6.2.2 Commercial Landings Research Recommendations

- Track number of fishers per year in relation to annual landings.
- Support connectivity studies consider spiny lobster as one stock vs. by island (metapopulation).

-Investigate weak/lack of correlation between TIP and landings data.

- Conduct a supplemental exploratory analysis to look at the STTJ trap CPUE in lbs./trap/hour.
- Investigate species associations with spiny lobster.

- Demand analysis: look at price per pound (survey), market preferences, trends and correlation with landings, and for all islands.

- Market survey to determine whether the size of the lobster being landed is a response to the market preference/availability.

- Increase funding for port samplers to improve TIP data collection in PR and USVI.

- Propose new gear type of "diving on traps" in TIP reports (larger conversation to be had among those collecting and collating data).

a) Recommended this be a conversation including all jurisdictions,
b) Periodically review gears on forms to ensure they are accurate

6.2.3 Discards and Discard Mortality Research Recommendations

- Discard information in the catch reports doesn't allow data on length or sex in current reporting schema

6.3 Indices Research Recommendations

- The panel recommended moving forward with planned lobster trap surveys in the US Virgin Islands.

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