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THE FEASIBILITY OF A LIONFISH MEAT MARKET IN THE U.S. VIRGIN ISLANDS: CONSUMER WILLINGNESS TO PAY

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THE PROJECT: ASSESS THE VIABILITY OF CREATING A MARKET FOR LIONFISH IN THE US VIRGIN ISLANDS

- Are consumers willing to consume and pay for lionfish?
- Are fishermen willing to harvest and sell lionfish?
- Economic, cultural, and regulatory barriers

Photo Credit: Holden Harris

INFORMATION GATHERING STRATEGIES

- Consumers – Structured intercept surveys
- Fishermen – Structured intercept surveys, semi-structured interviews, participant observation
- Restaurant/Distributors – Structured surveys, participant observations

TOPICS OF FOCUS

Consumers/Restaurants

- Knowledge of fish issues /lionfish
- Interest in new food/lionfish
- Willingness to pay
- Demographics
- Spatial Variables

Fishermen

- Fishing behavior
- Knowledge/observation lionfish
- Willingness to harvest lionfish
- Demographics
- Spatial Variables

INFORMATION GATHERING RESULTS

Fisher men

152 intercept surveys & In-depth interviews

61 Interviews

Restaurants

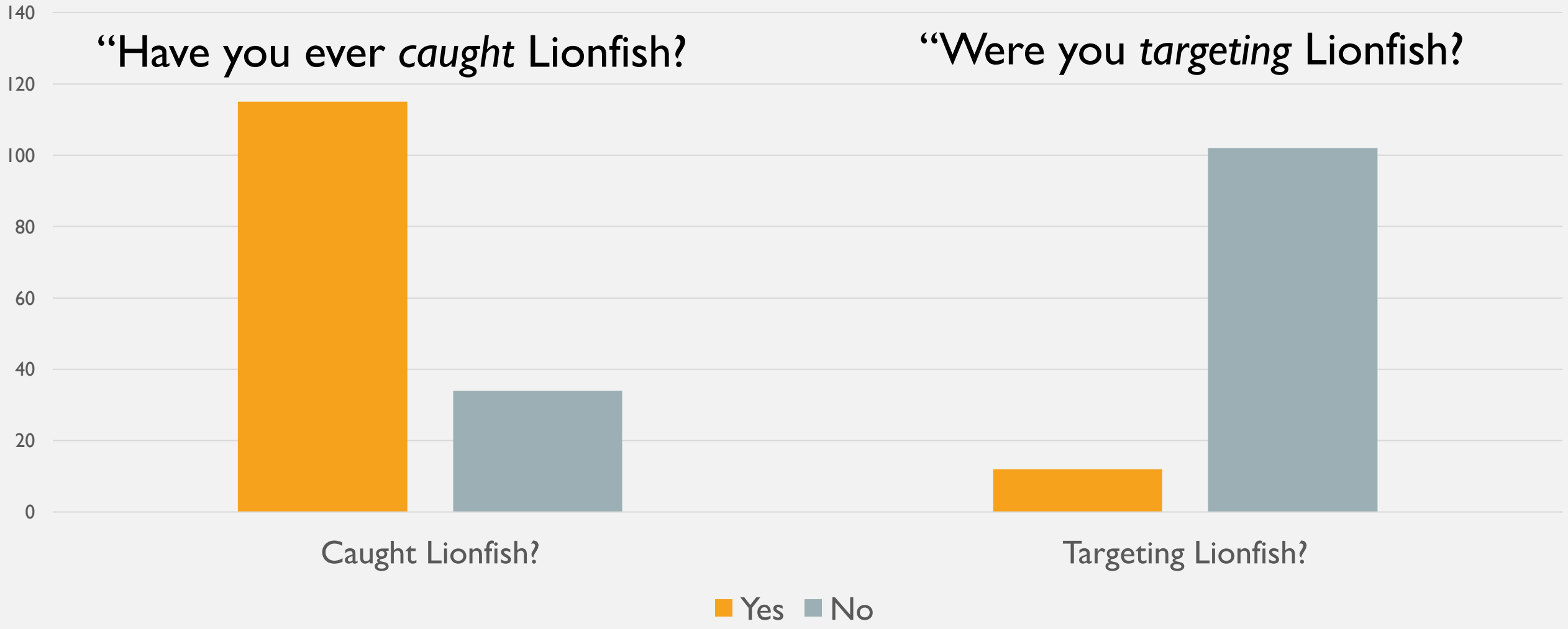
Tourist Consumers

193 intercept surveys

346 intercept surveys

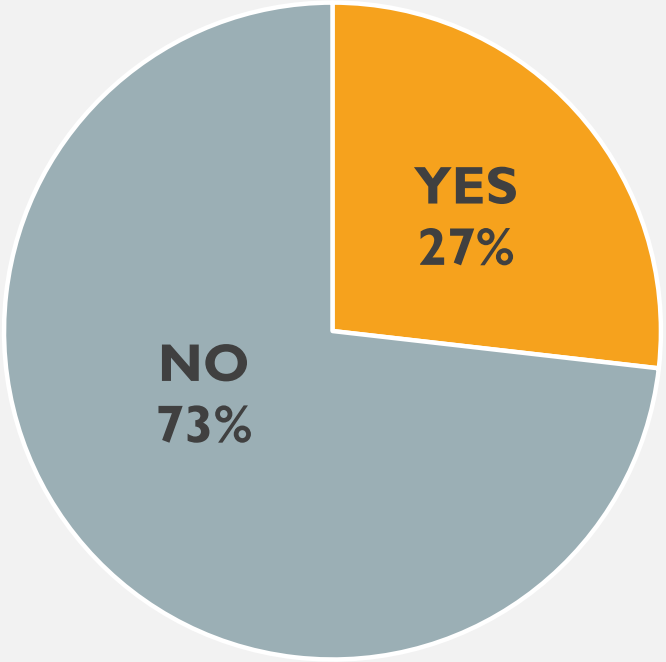
Local Cons-umers

FISHERMEN'S INTEREST IN CATCHING LIONFISH

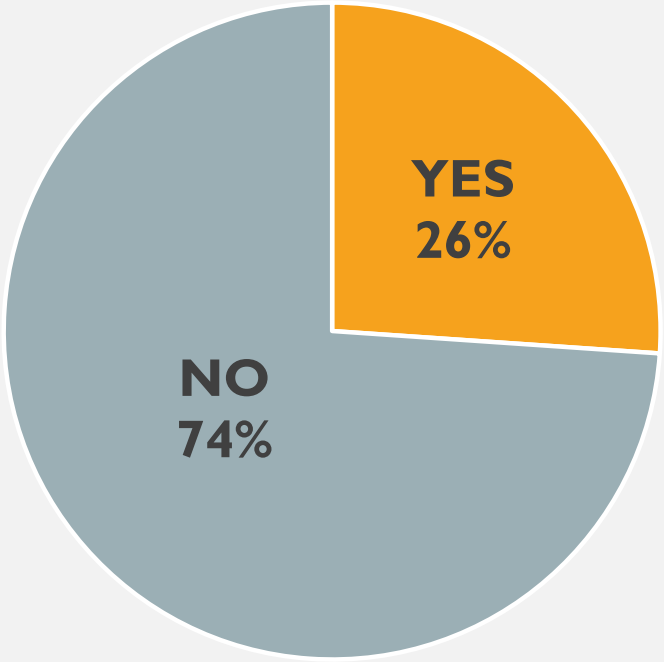


FISHERMEN'S WILLINGNESS TO HARVEST LIONFISH

"Is the price of Lionfish high enough to cover your costs?"

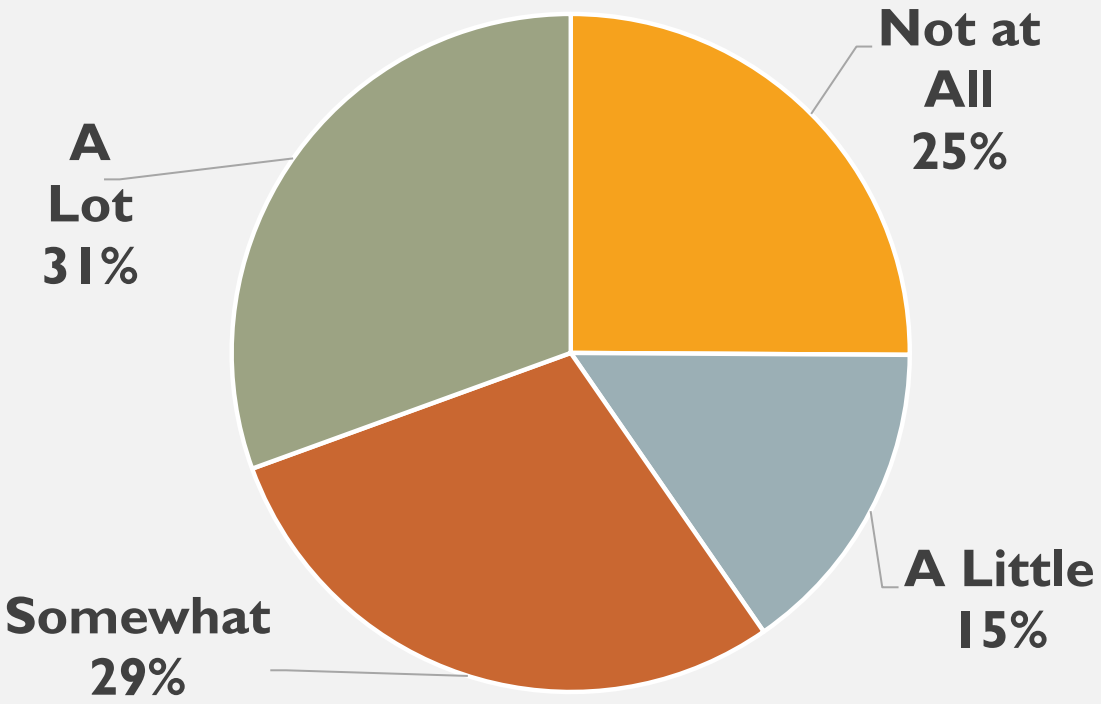


"Do you have buyers for Lionfish right now?"

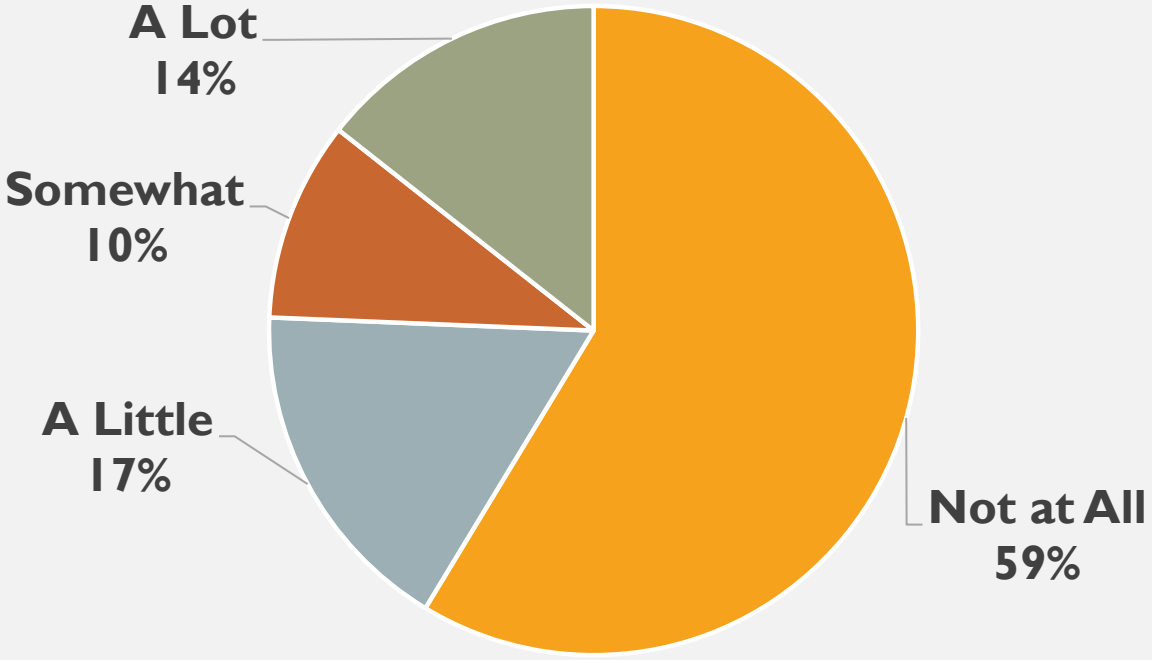


RESIDENT CONSUMERS INTEREST IN NEW SEAFOOD

"I am interested in trying new kinds of seafood"

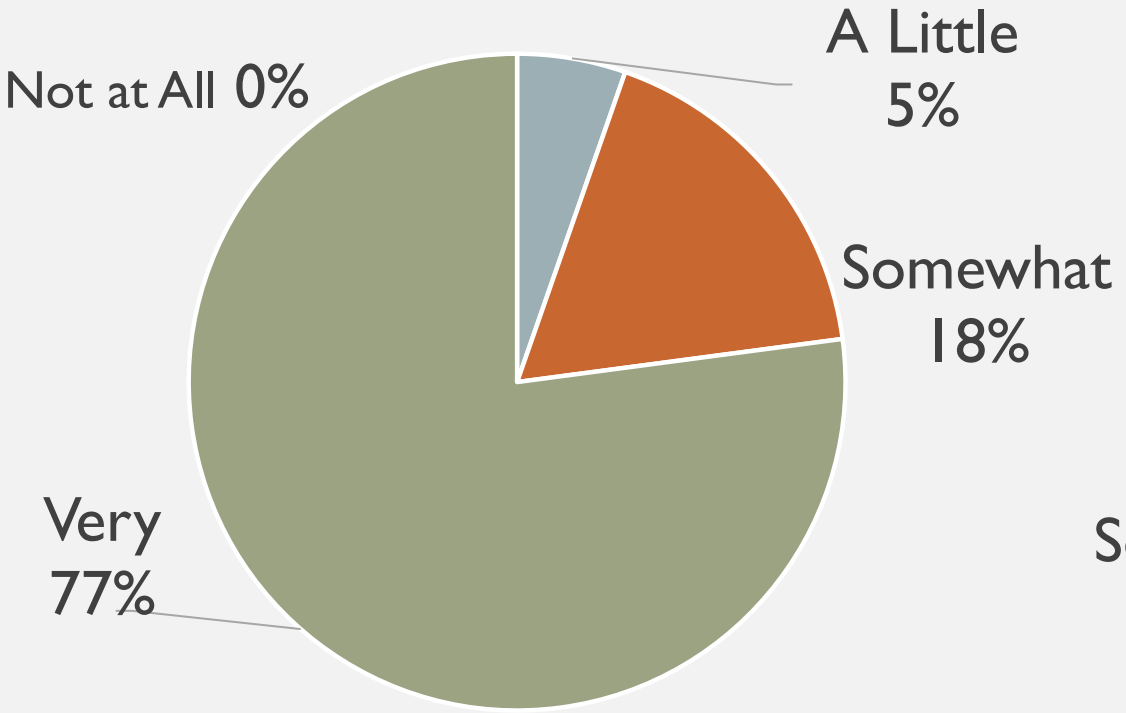


"How interested are you in eating lionfish?"

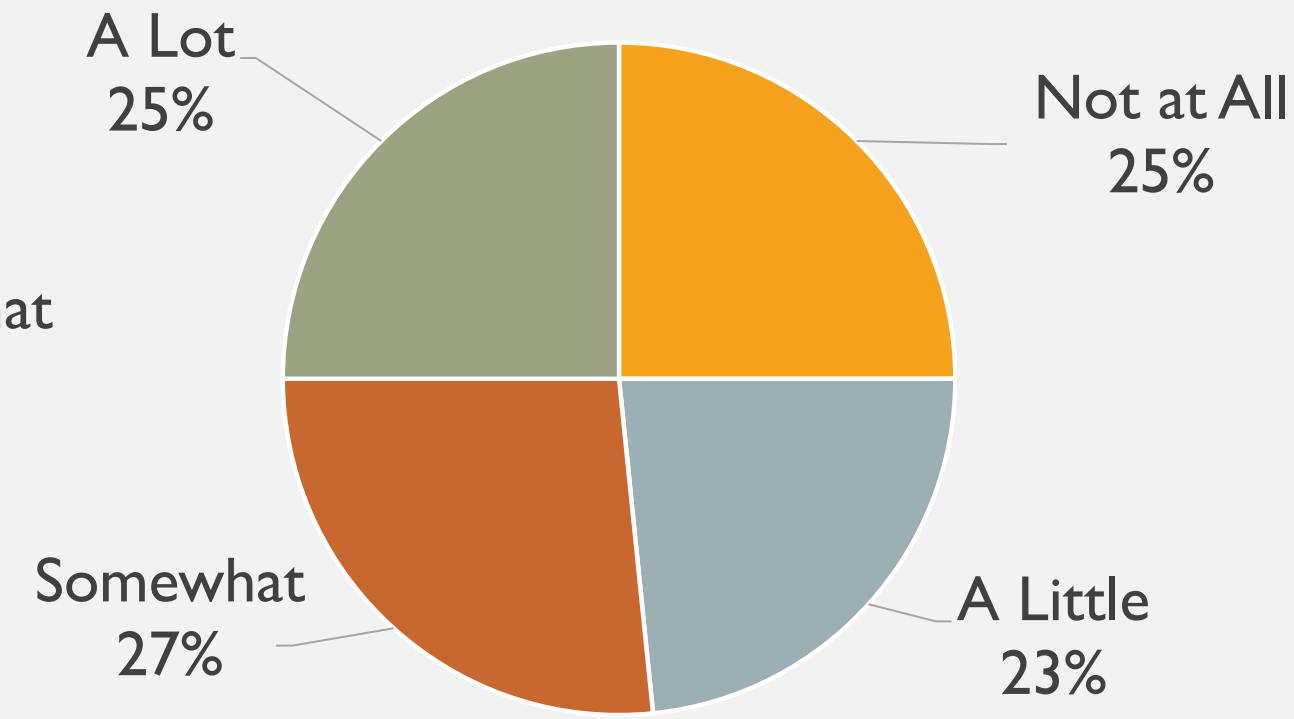


TOURISTS INTEREST IN SEAFOOD

How interested are you in eating locally-caught seafood during your stay in the USVI?

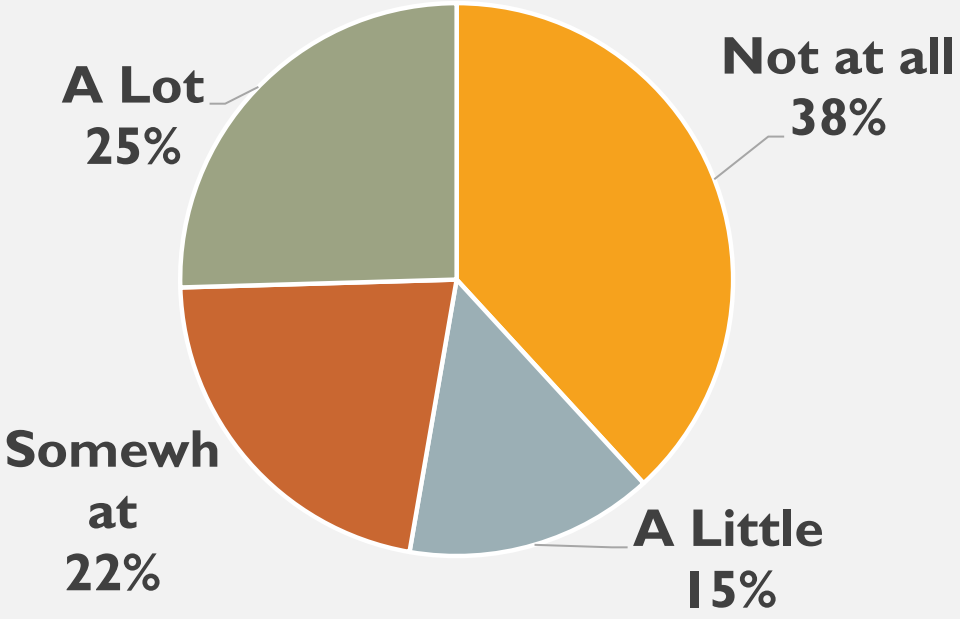


How interested are you in eating lionfish?

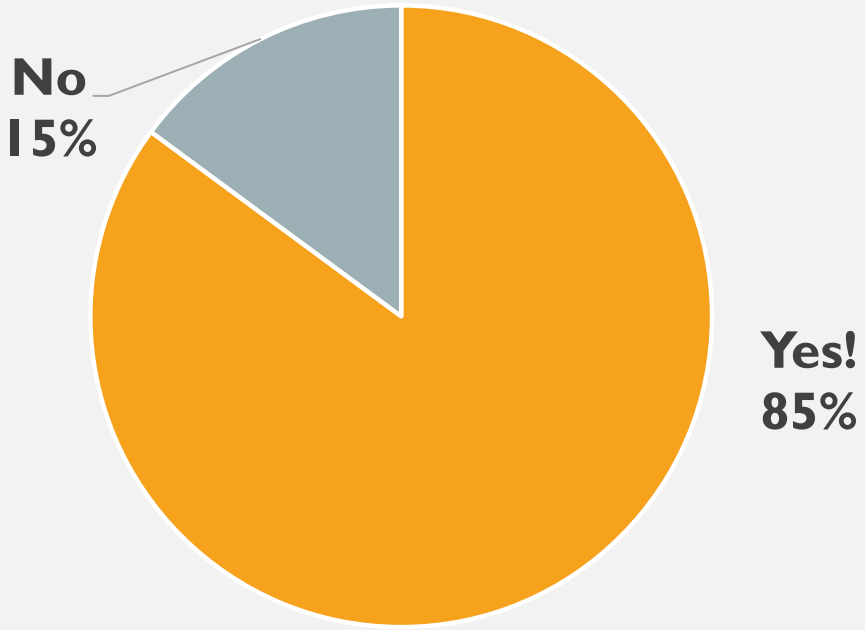


RESTAURANTS

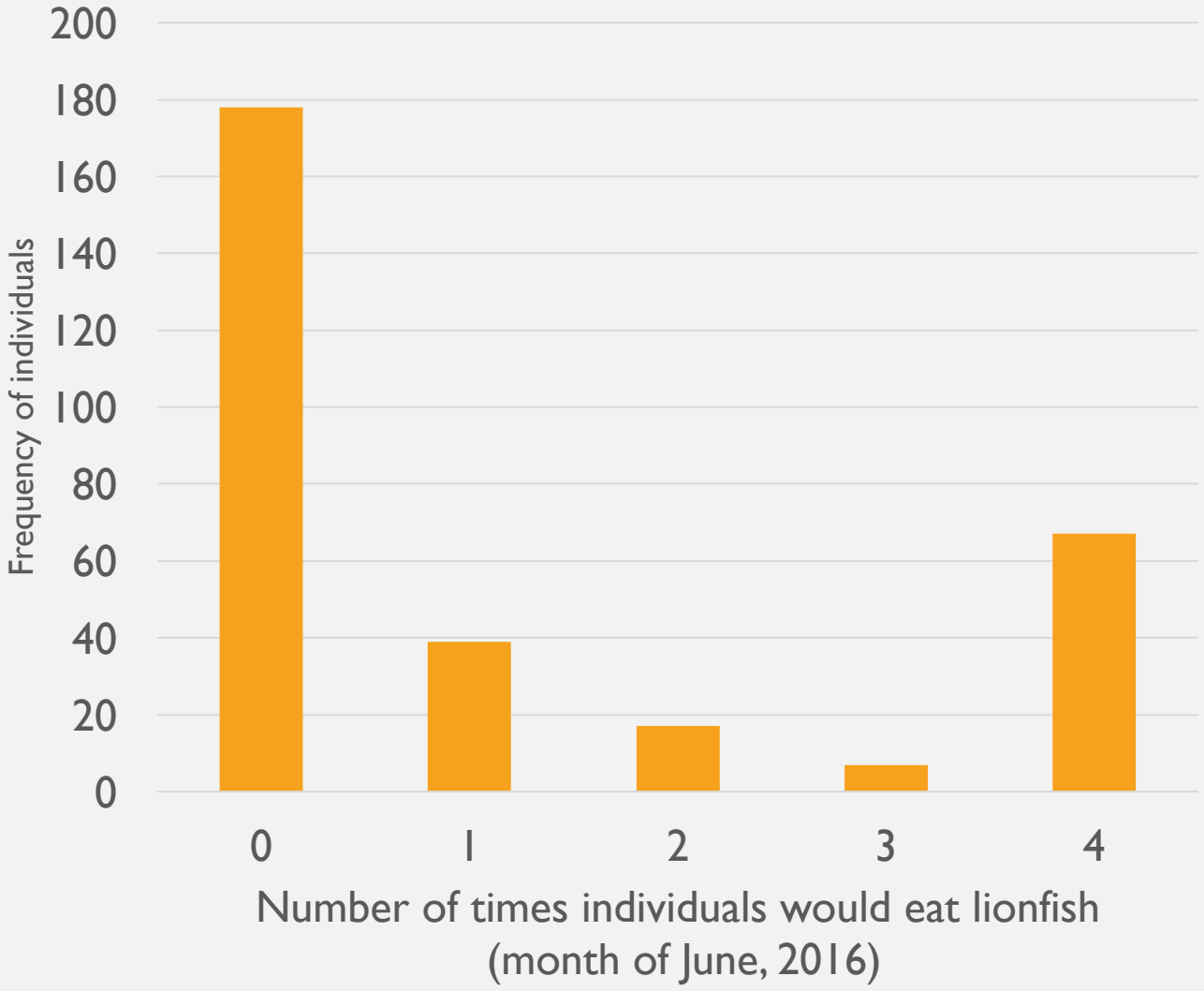
"How interested are you in selling lionfish in the future?""



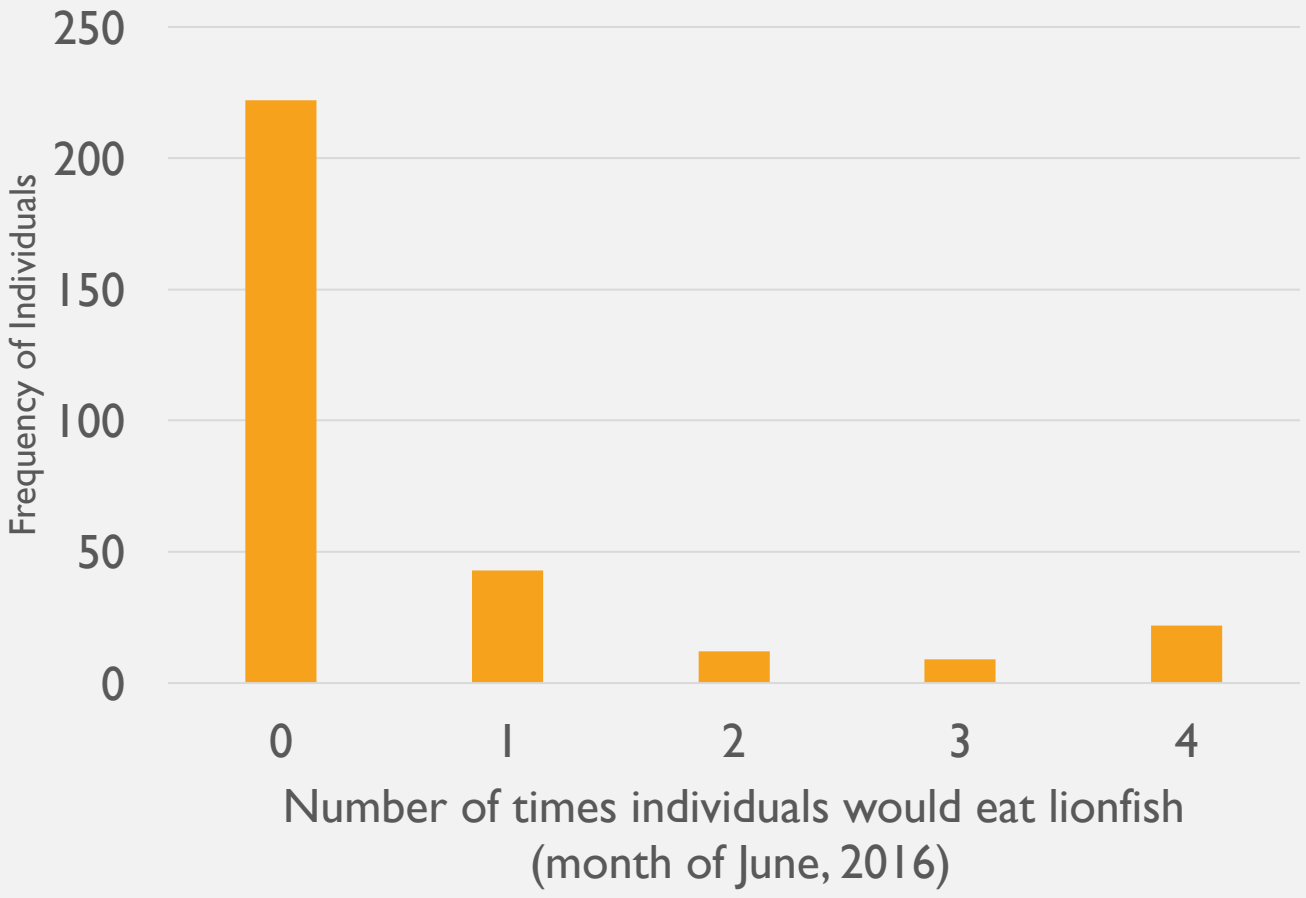
"If the price were reasonable would you buy lionfish to sell in your business?"



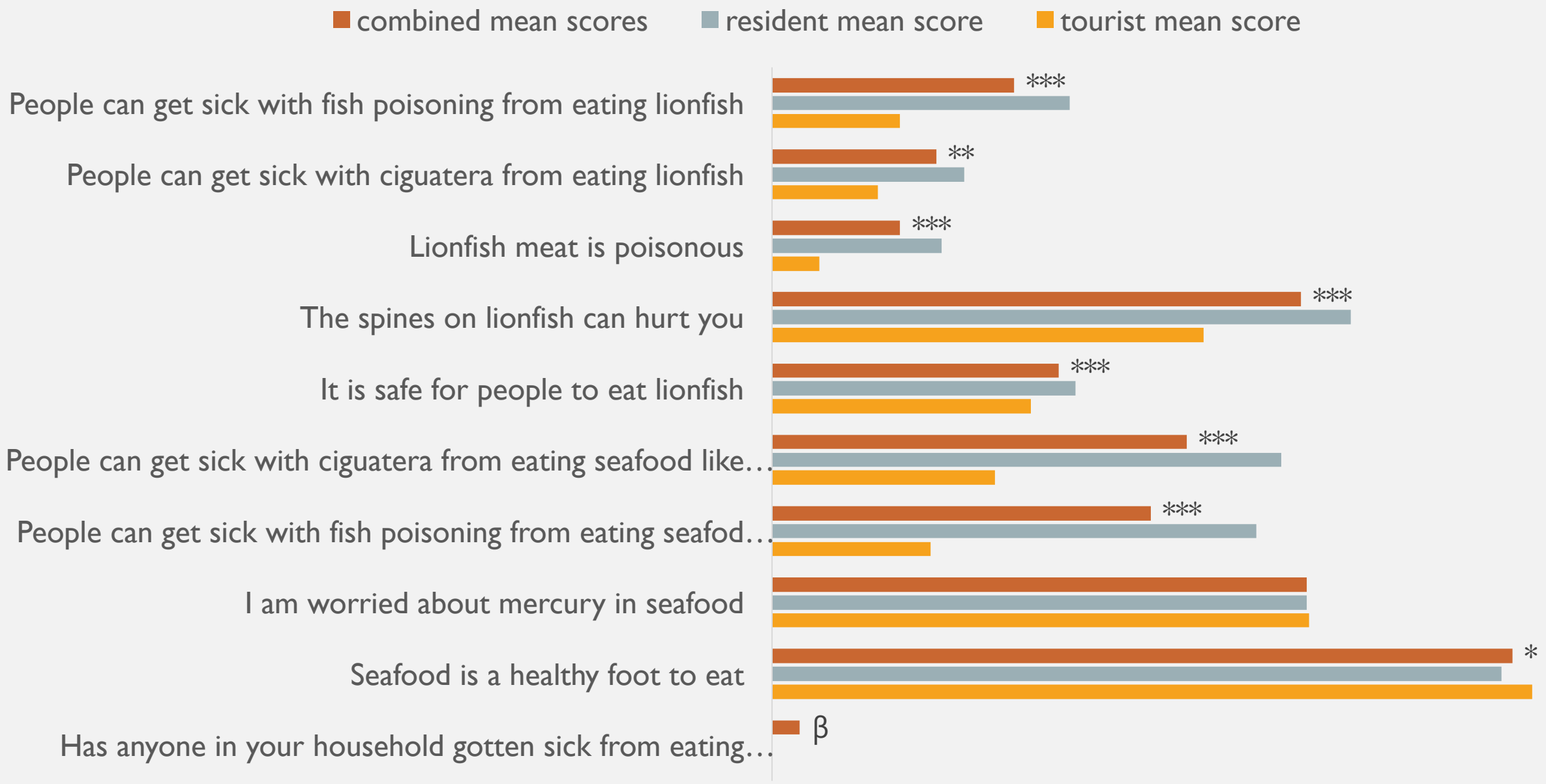
RESTAURANT CONSUMPTION



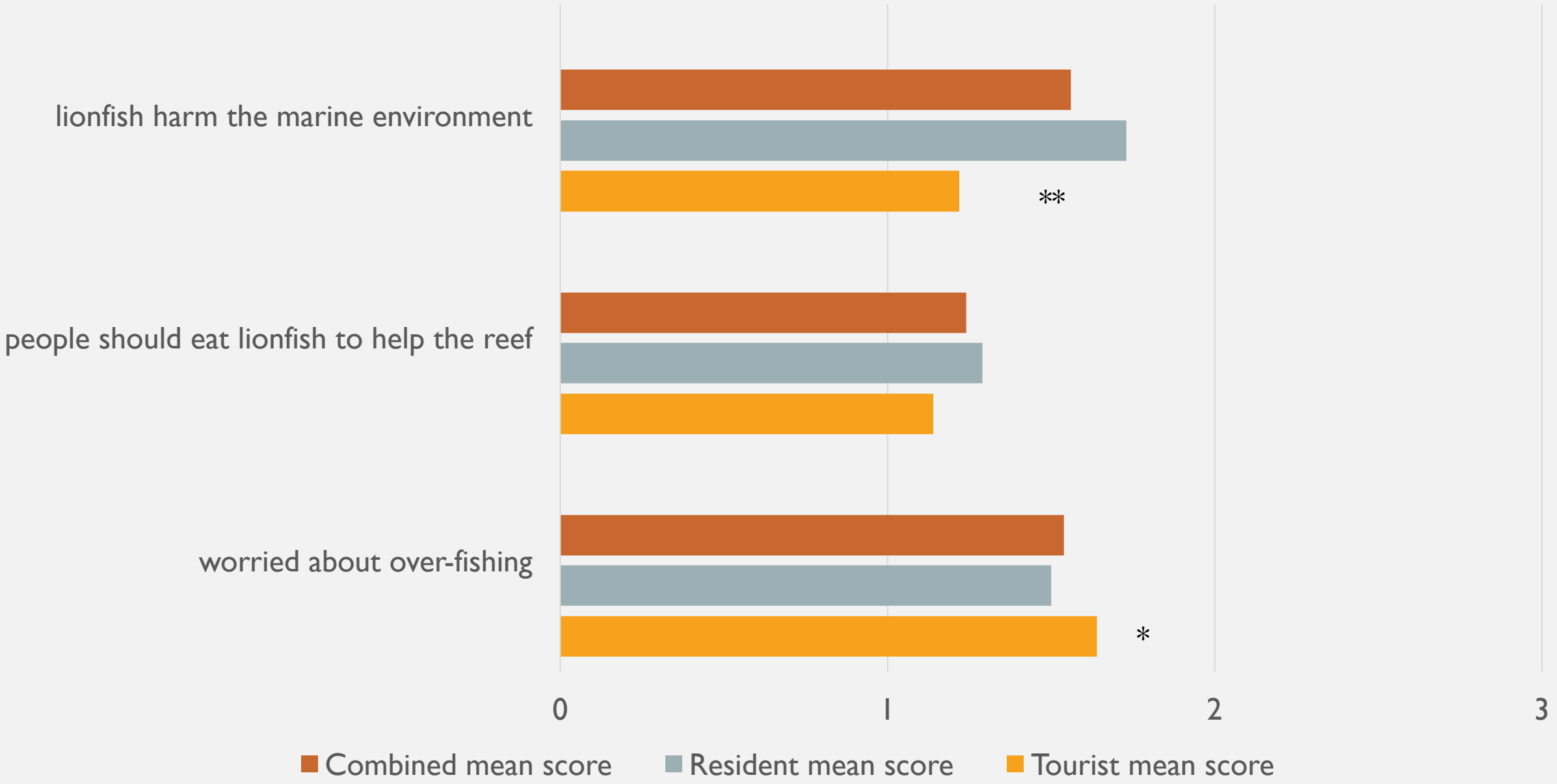
FRESH MARKET OR HOME CONSUMPTION



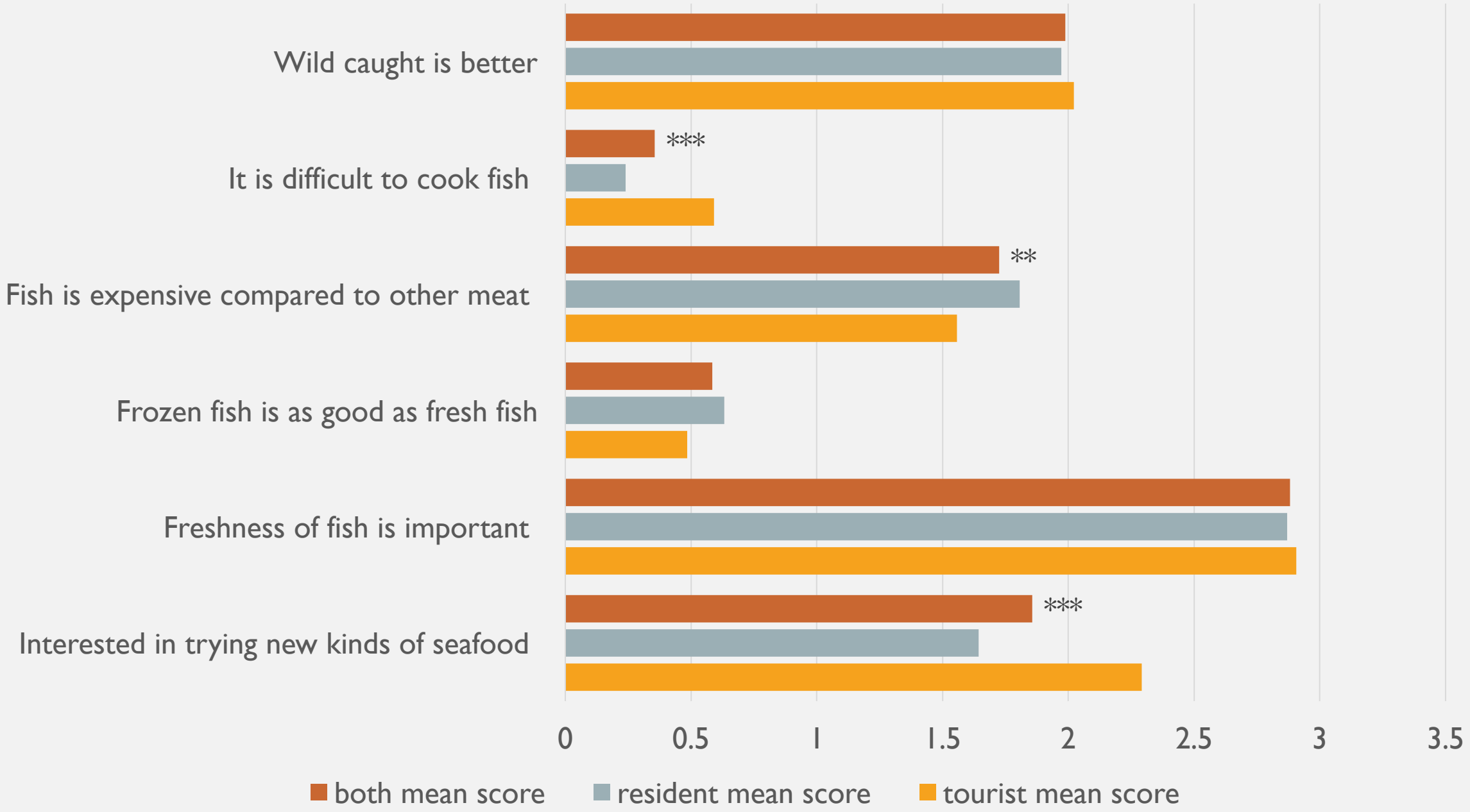
Likert Score, Concerns about Seafood Safety



Likert Scale, Environmental Concern Questions



Likert Score, Interest in Seafood



WTP OR WTA FOR LIONFISH ESTIMATION METHODOLOGY

- Data collection, CVM double bound
- An initial price is proposed, then a higher or lower second price
- Turnbull lower bound on Mean WTP (1976)
- Responses are combined and probabilities computed for price interval
- The E(LB) or E(UB) bound is computed by summing up the multiple of each interval lower bound and its corresponding probability
- Provides a conservative estimate

LOG-LIKELIHOOD FUNCTION OF DOUBLE BOUNDED CVM LOGIT MODEL

1. no, no $(\mathrm{I}_i^{\mathrm{nn}})$
2. no, yes $(\mathrm{I}_i^{\mathrm{ny}})$
3. yes, no $(\mathrm{I}_i^{\mathrm{yn}})$
4. yes, yes $(\mathrm{I}_i^{\mathrm{yy}})$

- Φ – CDF of the standard normal
- X_{i}' – vector of explanatory variables
- B – vector of coefficient estimates
- A_{L} – lower of two bids offered
- A_{H} – higher of two bids offered
- A – true maximum WTP

LOG-LIKELIHOOD FUNCTION OF DOUBLE BOUNDED CVM LOGIT MODEL

$$\mathrm{LogL} = \Sigma\left[\mathrm{I}_i^{\mathrm{nn}}\left(1-\Phi\left(\mathrm{X}_\mathrm{i}'\cdot\frac{\beta}{\sigma}-\frac{\mathrm{A_L}}{\sigma}\right)\right)+\mathrm{I}_\mathrm{i}^{\mathrm{ny}}\ln\left(\Phi\left(\mathrm{Xi}'\cdot\frac{\beta}{\sigma}-\frac{\mathrm{A_L}}{\sigma}\right)-\Phi\left(\mathrm{X_i}'\cdot\frac{\beta}{\sigma}-\frac{A}{\sigma}\right)\right)+\mathrm{I}_\mathrm{i}^{\mathrm{yn}}ln\left(\Phi\left(\mathrm{X_i}'\cdot\frac{\beta}{\sigma}-\frac{A}{\sigma}\right)-\Phi\left(\mathrm{X_i}'\cdot\frac{\beta}{\sigma}-\frac{A_H}{\sigma}\right)\right)+I_i^{yy}ln\left(\Phi\left(\mathrm{X}_\mathrm{i}'\cdot\frac{\beta}{\sigma}-\frac{A_H}{\sigma}\right)\right)\right]$$

Turnbull WTP lower bound estimation

Price $	Yes	No	Fj	Fj Pooled	PDF	std. Error
0-2	1	0	0	0.000	0.000	0.000
2-4	3	3	0.5	0.194	0.194	0.066
4-6	26	4	0.13			
6-7	7	8	0.53	0.500	0.306	0.103
7-8	13	12	0.48			
8-9	12	15	0.56			
9-10	3	9	0.75	0.569	0.069	0.105
10-11	7	5	0.42			
11-12	10	11	0.52			
12-13	2	8	0.8			
13-14	4	6	0.6			
14-15	6	9	0.6	0.571	0.003	0.093
15-17	3	2	0.4			
17-19	1	0	0			
19-21	1	0	0			
21+				1.000	0.429	0.062
				E(LB)=	$11.80	

TURBULL WTP / WTA LOWER / UPPER BOUND ESTIMATES

consumer	venue	E(LB)	V(LB)
resident	home	$11.80/lb	8.117
resident	restaurant	$19.51*	6.297
tourist	lodging	$10.09/lb	1.658
tourist	restaurant	$22.83*	0.692
restaurant	N/A	$5.75/lb	1.032
fisherman	**--**	**$4.36 /lb**	**0.143**

* Restaurant entrée

FACTORS INFLUENCING CONSUMER WTP HOME CONSUMPTION (CVM.DB)

Independent Variable	Estimate	Std. Error	M/E	
(Intercept)	6.390	1.657	$13.97	***
age	0.013	0.015		
sex (male)	-1.096	0.493	-$2.40	**
environmental concerns	0.191	0.122		
safety concerns	-0.145	0.071	-$0.32	*
interest in seafood	-0.020	0.121		
Knowledge about lionfish	-0.148	0.244		
log(bid)	-0.457	0.060		***
Log-likelihood:	-107.107			

To conserve space did not report income, race, educational attainment, and residency (which are all significant)

FACTORS INFLUENCING CONSUMER WTP AT RESTAURANTS (CVM.DB)

Independent Variable	Estimate	Std. Error	M/E	
(Intercept)	5.242	1.416	$17.97	***
age	-0.006	0.013		
sex (male)	0.090	0.391		
environmental concerns	0.015	0.098		
safety concerns	-0.074	0.051		
interest in seafood	0.137	0.118		
knowledge about lionfish	0.075	0.269		
log(bid)	-0.292	0.037		***
Log-likelihood:	-156.601			

To conserve space did not report income, race, educational attainment, and residency (which are all significant)

ESTIMATING AGGREGATE DEMAND AND SUPPLY

Consumer Variables	Mean # of times	Std Dev.	Max # times	N. Survey	Population St. Croix (2016)
Tourist	1.12	(1.072)	6	138	8,504
Local	1.97	(1.356)	15	283	36,479

Fisher Variables	Mean	Std Dev.	Max # times	N. Survey	Population St. Croix
Full-time	57%	--	--	151	181de jure
lbs/ month	103.7	227.61	1400	142	1,124 arguendo
Think program will succeed	73%	--	--	145	

ESTIMATED TOTAL VALUES

- Total demand approximately 45,000 lbs per month
- Total supply approximate 18,824 – 116,300 lbs per month

THANK YOU

- Research Participants in St. Croix and St. Thomas
- Undergraduate Students: Duncan Watson, Han Yang, Megan Withers, Jakob Perryman, Molly O'Neil, Kaetlyn Lee, Jeff Kraprayoon, Paige Crowl, Jason Boss, Madison Hilley
- USVI Department of Planning and Natural Resources (Division of Fish and Wildlife and Division of Environmental Enforcement), Caribbean Fisheries Management Council, CFMC District Advisory Panel of St.Criox
- NOAA Saltonstall-Kennedy Grant # NA15SNMF4270347

Photo Credit: Paulita Bennett-Martin

SOURCES

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