Improving Market Access of Small-Scale Seafood Producers by Demonstrating the Feasibility of Supplying Fresh Seafood Profitably in Kentucky and Ohio
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Aquaculture producers have the potential to sell their products locally, although very little research has been done to determine restaurant preferences for locally grown seafood. Seafood is usually of high value and successful sales to restaurants depend on the knowledge of species, product form, size, and delivery schedule preferred by chefs. This study focused on the feasibility of marketing seafood to restaurants in Kentucky and Ohio at a small scale. Researchers also investigated the supply and shipment of aquaculture products from small-scale growers and processors in order to determine whether they could meet the restaurant demand for locally grown seafood.

FINAL REPORT

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Final Report

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Research into "food mileage" has indicated that many consumers do not realize how far the distance between the producer and the consumer has grown over the past few decades (Futamura 2007). Although this has helped increase the availability of food, it has also had negative impacts such as increased reliance on transportation networks and increased competition for local growers.

The small-scale aquaculture industry in Kentucky and Ohio relies on direct and niche marketing in order to compete with imported seafood. Marketing to restaurants that feature local foods is a potential area where small-scale producers could become competitive in the low-margin seafood market. As evident through the huge increase in farmers' market sales in the United States over the past years, some consumers are interested in narrowing the separation between them and the agricultural producers (Curtis 2009). Also, a growing "buy local" movement has been taking place in U. S. restaurants where strong competition makes it necessary for them to catering to niche markets. Most restaurants have indicated that product

price is of little importance when compared to product quality (Starr 2003). The number of restaurants sourcing food locally has increased significantly: in Kentucky, nearly 200 restaurants are registered buyers of locally-grown food (Kentucky Department of Agriculture, Restaurant Rewards Program 2014).

Food safety is a major concern by Americans, and many are interested about food origins before making purchasing decisions (Curtis 2009). With increasing consumer interest in specific agricultural production methods such as organic farming, there are even greater local marketing opportunities (Bukenya 2007). All of these factors have led to increases in locally-grown food being served in restaurants in Kentucky and Ohio.

Aquaculture producers have the potential to sell their products locally, although very little research has been done to determine restaurant preferences for locally grown seafood. Seafood is usually of high value and successful sales to restaurants depend on the knowledge of species, product form, size and delivery schedule preferred by chefs (Dasgupta 2009). Our study focused on the feasibility of marketing seafood to restaurants in Kentucky and Ohio at a small scale. We also investigated the supply and shipment of aquaculture products from small-scale growers and processors in order to determine whether they could meet the restaurant demand for locally grown seafood.

Materials and Methods

One objective of this study was to document the demand for fresh aquaculture products exhibited by independent restaurants in Kentucky and Ohio. This was accomplished by a survey of 208 locally-owned restaurants in Kentucky and Ohio using Survey Monkey, an electronic survey resource. Also, 50 survey questionnaires were hand delivered to locally-owned

restaurants in the Cincinnati area along with self-addressed stamped envelopes. The link to our electronic survey on Survey Monkey was also included in the Ohio Restaurant Association's "News Bites" e-publication.

The questions in the survey focused on restaurants' willingness to purchase seafood currently being cultured in Kentucky and Ohio, including catfish, largemouth bass, bluegill, hybrid striped bass, paddlefish, yellow perch, and rainbow trout. Restaurants were asked about the types of freshwater fish that they currently were serving and their preferred delivery schedule for locally-grown fish. Restaurants were also asked to indicate the fish attributes that were important to them, such as freshness, taste, product form (whole on ice, live, fillets, etc.), size of fish, and product origin. Finally, restaurants were asked to rank preferred fish species by eliciting their top three choices for fish.

Transshipment model description

The survey provided information about both the species of fish and the volume of whole fish and fillets demanded by restaurants (Table 3). While most restaurants indicated a year-round delivery schedule, some restaurants indicated only a seasonal demand for fish. This was ambiguous because the fish types used in the model were available year round. Hence, restaurants reporting season demand were excluded from the following analysis.

Secondary data were available about the production capacity of fish farms in Kentucky and Ohio that are capable of addressing the restaurants' demand. Secondary data were also available for certified commercial fish processors in Kentucky and Ohio that are able to process and ship fish fillets to restaurants. Using these data and a series of distances among fish farms, processors, and restaurants using ARC-GIS software, a linear programming transshipment model

was developed to deduce the optimal routing of whole and processed fish. The following is an exposition of this model:

Assume ‘f’, ‘p’, and ‘r’ indexes fish farms, certified commercial fish processors, and restaurants responding to the survey, in Kentucky and Ohio, respectively. Assume that ‘t’ indexes the types of fish in both demand and supply (e.g., t ε. Using these indexes, we define Supply(f, t) to be the amount of fish of type ‘t’ available from farm ‘f’ during any given timeframe, i.e., a week, month, or year. Similarly, we define DemWhole(r, t) and DemFillet(r, t) to be the volume of whole fish and fillets of type ‘t’ demanded by restaurant ‘r’ during any given timeframe, respectively. We define Dist1(f, p), Dist2(f, r), and Dist3(r, p) as distances (in miles) from farms to processing plants, restaurants to farms, and restaurants to processing plants, respectively.

The transshipment model has three types of decision variables: 1) the volume of whole fish transported from farms to processors, denoted by WholeP(f, p, t), 2) the volume of whole fish transported from farms to restaurants, denoted by WholeR(f, r, t), and 3) the volume of fillets transported from processors to restaurants, denoted by Fillets(p, r, t). The objective function is the total cost of transportation (TCost), which is defined by equation 1.

(1) $$\text{TCost} = \text{Unit cost} \times \{ \sum_{f}\sum_{p}\sum_{t} \text{Dist1}(f,p) \times \text{WholeP}(f,p,t) + \sum_{f}\sum_{r}\sum_{t} \text{Dist2}(f,r) \times \text{WholeR}(f,r,t) + \sum_{p}\sum_{r}\sum_{t} \text{Dist3}(r,p) \times \text{Fillets}(p,r,t) \},$$ where Unit cost is the transportation cost in dollars per mile per pound of payload. This objective function is a variation of the transportation model discussed in McCarl and Spreen (2014), which shows that TCost is simultaneously dependent on shipment volumes and distances. The actual

transportation cost is dependent on the modes of transportation, price of fuel, cost of vehicle maintenance, labor costs, etc.; however, in the optimization model, the inclusion of shipment volume multiplied by shipment distances will cause it to arrive at correct the minimum-cost transportation solution.

The transshipment model minimizes TCost, by appropriate choice of decision variable values, subject to the following constraints on the values that the decision variables can take:

(2) $\sum_{p} \text{WholeP}(f,p,t) + \sum_{r} \text{WholeR}(f,r,t) \leq \text{Supply}(f, t)$, for all 'f' and 't'

(3) $\sum_{r} \text{Fillets}(p,r,t) - \sum_{f} \text{WholeP}(f,p,t) \times \text{Dressout}(t) \times (1 - \text{Dockage}) = 0$, for all 'p' and 't'

(4) $\sum_{f} \text{WholeR}(f,r,t) \geq \text{DemWhole}(r, t)$, for all 'r' and 't'

(5) $\sum_{p} \text{Fillets}(p,r,t) \geq \text{DemFillet}(r, t)$, for all 'r' and 't'

(6) $\text{WholeP}(f, p, t) \geq 0$, $\text{WholeR}(f, r, t) \geq 0$, $\text{Fillets}(p, r, t) \geq 0$, for all 'f', 'p', 'r', and 't'

Constraints (2) show that the total amount of fish of type 't' supplied by each farm 'f' to processors and restaurants is bounded above by the total amount of production of the farm. Constraints (3) indicate that the total volume of fillets produced for any fish type at any processing plant depends upon the amount of whole fish supplied to the processing plant, the fillet dressout of the fish type, and the proportion of fish discarded because of damage, blemishes, or other problems (i.e., dockage percentage). Constraints (4) and (5) indicate that the amount of whole fish and fillets shipped to restaurants must be adequate to meet the restaurant's demand. Constraint (6) indicates that all decision variables are non-negative. The model was

optimized using a GAMS solver, and re-run for four scenarios: 1) shipping fish at the middle of the first week of a month, which included restaurants that exhibited a bi-weekly demand for fish, 2) shipping fish at the end of the first week of a month, which included restaurants that exhibited a bi-weekly and weekly demand for fish, 3) shipping fish at the middle of a month, which included restaurants that exhibited a bi-weekly, weekly, and bi-monthly demand for fish, and 3) shipping fish at the end of a month, which included restaurants that exhibited a bi-weekly, weekly, bi-monthly, and monthly demand for fish.

Results

Restaurant survey results

We received 52 responses from restaurants (39 from Kentucky and 13 from Ohio). Over half of the respondents (52%) currently serve freshwater fish. Among these restaurants, tilapia (37%), catfish (27%), and hybrid striped bass (15%) were the most commonly-served species (Figure 1). Rainbow trout was chosen by 44 percent of the respondents as the first choice of fish they were most interested in trying at their restaurant. Correspondently, the second choice was hybrid striped bass (27%) and the third choice was channel catfish (12%). The restaurants also reported the size ranges for each species of fish, which is outlined in Table 1.

Additional demand parameters were also elicited from restaurants. For example, chefs indicated the fish attributes of importance; Figure 2 illustrates the corresponding data which show that product quality, consistent supply, and taste as the most important of fish characteristics. Restaurants are also well known for a high frequency of orders, so they can always have fresh foods to serve. Figure 3 depicts the delivery schedules reported by restaurants, of which weekly deliveries were chosen by over half (51%) of the respondents.

The survey data indicate that rainbow trout has the highest potential of achieving restaurant sales in Kentucky and Ohio. Fresh whole trout (38%) and fresh fillets (29%) were the two most preferred forms of trout, as shown in Figure 4. Small whole trout (0.68 kg or 1.5 pound) was preferred by half of the restaurants who chose whole trout as their most preferred local seafood and over half (67%) of the restaurants who chose whole trout as their second-best local seafood choice (Figure 5). Medium-sized fillets (141 to 252 g) were preferred by 76 percent of restaurants who chose trout fillets as their top local seafood choice (Figure 6). The willingness to pay for whole trout was $4 to $6/pound ($9 to $13/kg) and $8 to $10/pound ($18 to $22/kg) for fresh fillets (Figure 7 and Figure 8).

Hybrid striped bass had the second-highest potential of achieving restaurant sales in Kentucky and Ohio. Fresh whole fish and fillets were preferred by 39 percent and 32 percent of respondents respectively (Figure 9). Large whole hybrid striped bass (> 1.49 kg or > 3 pound) were preferred by 75 percent of the restaurants that chose whole hybrid striped bass as their preferred fish (Figure 10). Of those that preferred fillets, most chose medium-sized fillets between 142 g and 252 g (Figure 11). The popular willingness-to-pay for whole hybrid striped bass was $4 to $6/pound ($9 to $13/kg) (Figure 12). Correspondingly, the stated willingness to pay for hybrid striped bass fillets varied from $8 to $10/pound (29 percent of restaurants wanting the fish) to over $14/pound (36% of restaurants wanting the fish) (Figure 13).

Catfish was the third most preferred species among the responding restaurants. Fresh fish (31%) and fillets (31%) were the two most preferred forms of catfish (Figure 14). Whole, unprocessed catfish was generally unpopular among restaurants (Figure 15). The preferred size range of fillets was 142 g to 252 g. Sixty percent of restaurants expressing willingness to buy

catfish indicated that they would pay $5 to $7/pound ($11 to $15/kg) for fresh catfish fillets (Figure 16, Figure 17, and Figure 18).

The survey data indicated that, the majority of restaurants with upper middle class, middle class, and mixed class customers selected trout as their first choice of freshwater fish. Similarly, the majority of restaurants that chose hybrid striped bass as their first choice of fish catered mostly to upper middle class customers (Figure 19). A single restaurant, with primarily blue collar customers, exclusively chose paddlefish as their first choice of fish; restaurants that catered to college students exclusively chose catfish as their first choice of fish.

Transshipment model results

Table 2 outlines the names, locations, supply parameters of fish farms used in the transshipment model. While, there are several suppliers of trout and catfish, the sources of hybrid striped bass are currently limited to one farm in Kentucky and Ohio, respectively. Table 3 reported names, locations, and demand parameters for restaurants responding to the survey. As noted above, restaurants wanted a wide variety of fish; however, trout, hybrid striped bass, and catfish were the top three fish types in demand. Therefore, Table 3 included the demand parameters for trout, hybrid striped bass, and catfish, and the transshipment model included only these three fish types. Table 4 reports the names and locations of certified fish processors. It is noteworthy that a few farms have processing plants on site, which gave them a competitive advantage in the least-cost transshipment model.

The cost of transportation depends upon factors such as the weight and size of the payload, and the distance transported, in conjunction with the method of transportation, i.e., type of equipment used. In order to make the results of this study realistic, we assumed that shipping

of small volumes of fish from farms to restaurants within two neighboring states such as Kentucky and Ohio will be performed by using pickup trucks and/or vans, i. e., large freight movers such as box truck, semi-trucks, railways, or aircraft will not be used.

The first scenario of the transshipment model involved supplying restaurants with a biweekly demand for fish. This scenario corresponds to delivering fish during the middle of the first week of a month. Table 5 lists the optimal routing of fish, based on the supply and demand parameters. The model results show that the total weight of fish shipped multiplied by the total distance was approximately 7,882 pound-miles. The total distance traveled was 1,320 miles assuming no multiple delivery tours, akin to the Traveling Salesman problem.

Table 5 shows that the maximum payload transported on a per-trip basis was 625 pounds of fish, which can be easily accomplished in a pickup truck or van. The cost of shipment can be calculated using the following formula = Fuel price × Fuel use/mile × Distance shipped + Shipping time × wage rate + Vehicle maintenance cost/mile × Distance shipped. This calculation is highly dependent on the equipment used; however, an estimate of shipping cost can be derived using the mileage reimbursement rates from $0.46/mile (Kentucky state government rate for 2014) to $0.56/mile (Federal rate). Thus the estimated shipping cost with respect to the minimum-cost shipping route is approximately $607-$739.

In the next scenario fish were delivered to those restaurants that wanted fish bi-weekly and weekly; i. e., this scenario corresponds to shipping fish during the end of the first week of a month. These results are listed in Table 6. This table shows a total of 2,240 pounds of fish (1.12 tons) were shipped among farms, processors, and restaurants, which can be accomplished by a pickup truck or van.

Table 7 contains results of the third scenario where fish were delivered to restaurants that wanted fish bi-weekly, weekly, or bi-monthly; i. e., this scenario corresponds to shipping fish during the middle of a month. This table shows that a total of 2,626 pounds of fish (1.31 tons) were shipped among farms, processors, and restaurants. Finally, Table 8 contains results of the scenario where fish were shipped to restaurants with bi-weekly, weekly, bi-monthly and monthly demands, which corresponds to a shipping schedule at the end of a month. A total of 2,888 pounds (1.44 tons) were shipped among farms, processors, and restaurants.

These results (Table 5 to Table 8), in aggregate, show that 1) all of the restaurants' fish demands are easily met by farms and processors in Kentucky and Ohio and 2) a total of 8,379 pounds (4.19 tons) of fish were traded among farms, processors, and restaurants per month in Kentucky and Ohio. Not surprisingly, fish shipped from farms with on-site processing facilities were important to reduce the transportation costs. However, the results also show that it was uneconomical to source catfish from growers in western Kentucky to supply restaurants in Lexington, Louisville, Cincinnati, and Columbus. Similarly, processing plants in central and western Kentucky were too distant from restaurants to enter the least-cost routing solution.

Discussion and conclusions

Due to the growing number of restaurants that are interested in featuring locally-grown food, more marketing opportunities are available to small-scale aquaculture producers. Our survey validated earlier results that restaurants consider taste and freshness of products to be more important than price. These characteristics are popularly attributed to fresh foods that are grown near the demand sites, whether they be restaurants or farmers' markets. Knowing the species, price, form, and size of fish that restaurants prefer is valuable information for farmers

who are starting small scale aquaculture farms because it assists them in developing a marketing plan prior to beginning production.

The survey results clearly show that of the various types of fishes farmed in Kentucky and Ohio, trout, hybrid striped bass and catfish were the most popular. This data is significant because Table 2 shows a relative scarcity of hybrid striped bass producers in both states. This project definitely should encourage diversification of existing producers to growing hybrid striped bass.

The results of the transshipment model confirmed the notion that the low demand volumes and relatively high delivery frequencies associated with sales to restaurants makes it economical for farmers and processors to be located close to urban regions where most of the restaurants are concentrated. While urban aquaculture is at its infancy, small-scale pond-based aquaculture of hybrid-striped bass and catfish is feasible at a peri-urban setting. Many such farms have existing ponds that can be converted for aquaculture without much expense.

The challenge facing most small scale aquaculture farmers in Kentucky and Ohio is processing of fish. This activity is time consuming, requiring significant labor and capital investment, and farmers have to follow lengthy government fish processing regulations. The results of this project show that some enterprising farmers have already incorporated processing plants to their farms; however, the majority of farmers need help to process fish. In this situation, one important boon is that most restaurants are allowed by the government to process fish in their kitchen, provided the fish will be served to it patrons. This will definitely help in increasing sales of locally-grown, whole fish to restaurants, more than any other form of livestock.

Project impacts

The project's beneficiaries include aquaculture producers in Kentucky, Ohio and the surrounding region. Most of these producers are small-scale operators. This project directly involved 13 producers of trout, hybrid striped bass, and catfish in the two states. However, there are potential spillover effects to producers located in other states such as Indiana, which shares a border with Kentucky and Ohio along the metropolises of Louisville and Cincinnati. Other beneficiaries include small-scale fish processors in Kentucky and Ohio, of which there are 10. If the results of this project are implemented, many processors that currently have little or no business could be re-activated to contribute in the local food economy. Finally, this project benefits many independent restaurants in Kentucky and Ohio that are willing to source food locally. Demand data for fresh fish were made available from 28 restaurants in this project. The project results show the feasibility of supplying these restaurants with fresh fish grown and processed locally. Chefs and managers of these restaurants were actively seeking locally-grown food, which is relatively easy for more abundant types of food such as horticulture products or pastured poultry, local beef, etc. However, given that aquaculture is still a relatively small industry in Kentucky and Ohio, this project helped educate restaurant staff of locally-grown fish products that could be delivered to them fresh on a regular schedule.

This project indicated several current benefits to small-scale aquaculture producers and to the local food economy of Kentucky and Ohio. One current benefit came from the demand data for whole fish and fillets. These data were used in a transshipment model to predict the optimal amount of fish traded among farms, processing plant, and restaurants over the course of a month. The results show that restaurants that demand product on a bi-weekly basis caused sales of 1,430 pounds of whole and filleted trout and catfish per shipment. Restaurants that want deliveries

once a week caused sales of 810 pounds of whole and filleted trout, hybrid striped bass, and catfish per shipment. Restaurants that demand fish twice a month caused sales of an additional 386 pounds of whole and filleted fish among producers, processors, and restaurants. Restaurants that demand fish once a month caused sales of an additional 262 pounds of whole and filleted fish among producers, processors, and restaurants. Thus this project shows that if fish farmers and fish processing plants in Kentucky and Ohio were to supply independent restaurants with fresh whole fish and fillets, it would result in the sales of at least 15,714 pounds (7.86 tons) among farms, processors, and restaurants per month.

Another current benefit of this project is the knowledge that fish producers and processors near urban areas are suited to supply these restaurants with small volumes fresh product throughout the year. This is important for states such as Kentucky and Ohio where aquaculture is a small-scale industry. This project underscores the advantage of having production and processing facilities near urban demand centers, as opposed to more rural locations that were excluded from the transshipment model.

This project creates opportunities of future research in development the local food economy for aquaculture products. One topic for future research is the characterization of other local demands for fish from farmers' markets, CSA operations, grocers, and ethnic grocers. These data, in addition to the restaurant demand information generated by this project, will help producers allocate water resources to production of specific species of fish that will address this local demand for aquaculture products.

Another future research topic, borne out of the results of this project, is the technological and economic feasibility of using decommissioned drinking water and wastewater treatment

plants located near cities to supply the urban demand for fresh fish. These facilities, usually owned by municipal governments, are endowed with large cement tanks and/or earthen ponds, supplies of treated water, plumbing, water pumps, electricity hookups, buildings, and access roads. As the size of a city grows, older water treatment plants become inadequate to meet the increased demand for treated water. Often city governments find that building new, larger, and technologically-current plants to be cost effective over expanding or demolishing existing plants. In recent years, Kentucky has made significant investments into investigating feasibility, productivity, and food safety of using these decommissioned plants for aquaculture. The results have showed that catfish, tilapia, hybrid striped bass, and paddlefish can be grown in these plants and the potential contaminants in the fish were all well below advisory levels. Given that these plants are located on the outskirts of cities, they are ideally suited to supplying urban demand for fresh fish. Additionally, these plants create opportunities for beginning farmers and socially-disadvantaged farmers to enter the aquaculture industry which has traditionally kept out many of these types of farmers because of the high initial investment requirements of traditional aquaculture farms. A future project should investigate the costs and income possibilities of using these plants to supply fresh fish to an urban economy.

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Table 1. Fillet dressout percentages and preferred size ranges for top three species (rainbow trout, hybrid striped bass, and catfish) as reported by surveyed restaurants.

Fish type	Fillet dressout	Small fish	Medium fish	Large fish
Trout	40%	139 g Fillet	139 - 252 g Fillet	> 252. g Fillet
		0.68 kg Whole	0.68 - 1.27 kg Whole	≥ 1.28 kg Whole
Hyb. Striped Bass	35%	139 g Fillet	139 - 252 g Fillet	> 252 g Fillet
		0.82 kg Whole	0.83 - 1.45 kg Whole	≥ 1.46 kg Whole
Catfish	45%	139 g Fillet	139-252 g Fillet	> 252 g Fillet
		0.63 kg Whole	0.64-1.13 kg Whole	≥ 1.14 kg Whole

Table 2. Names, locations, supply parameters of fish farms used in the transshipment model.

Names	Location	Supply parameters
F1	KY	Hybrid Striped Bass 35,000 lbs/year
F2	OH	Trout 50,000 lbs/year
F3	OH	Hybrid Striped Bass 50,000 lbs/year; Trout 50,000 lbs/year
F4	KY	Catfish 101,250 lbs/year
F5	KY	Trout 100,000 lbs/year
F6	KY	Trout 100,000 lbs/year
F7	KY	Catfish 101,250 lbs/year
F8	KY	Catfish 151,875 lbs/year
F9	KY	Trout 100,000 lbs/year
F10	KY	Catfish 101,250 lbs/year
F11	KY	Catfish 168,750 lbs/year
F12	KY	Catfish 101,250 lbs/year
F13	KY	Catfish 22,500 lbs/year

Table 3. Names, locations, fish types, and demand parameters of restaurants responding to the survey.

Names	Location	Preferred fish types[a]	Demand frequency	Fillet demand[b]	Whole fish demand[b]
R1	KY	T and HSB	weekly	20	0
R2	KY	T and CC	weekly	15	0
R1	KY	T and HSB	weekly	0	19
R4	KY	T and HSB	monthly	0	10
R5	KY	T and HSB	weekly	15	15
R6	KY	T	weekly	0	19
R7	KY	HSB	weekly	0	0
R8	KY	T and HSB	monthly	0	100
R9	OH	T and HSB	bimonthly	20	0
R3	OH	T, CC, and HSB	weekly	15	19
R11	KY	T and CC	weekly	0	22
R12	KY	T and CC	biweekly	75	0
R13	KY	HSB	seasonally	0	0
R14	KY	T and HSB	weekly	15	0
R15	OH	T and HSB	weekly	0	19
R16	OH	T and HSB	seasonally	0	0
R17	KY	T and CC	seasonally	0	0
R18	OH	T	weekly	0	20
R19	OH	T and HSB	bimonthly	0	20
R20	OH	T and HSB	daily	0	0
R21	KY	T and CC	biweekly	75	0
R22	OH	T and HSB	triweekly	0	0
R5	KY	HSB	weekly	15	19
R24	OH	T and CC	biweekly	0	30
R25	KY	T	biweekly	75	0

Table 3. Continued.

Names	Location	Preferred fish types[a]	Demand frequency	Fillet demand[b]	Whole fish demand[b]
R26	OH	HSB, BG, LB	monthly	10	0
R27	KY	HSB	weekly	10	0
R28	OH	HSB	weekly	15	0

[a]T represents rainbow trout, CC represents channel catfish, and HSB represents hybrid striped bass

[b]Demand volume is reported in pounds

Table 4. Names and locations of certified fish processors used in the transshipment model.

Names	Locations
P1	KY
P2	OH
P3	KY
P4	KY
P5,F3	OH
P6	KY
P7,F2	OH
P8	KY
P9	KY
P10	KY

Table 5. Results of transshipment model for least-cost shipping of whole fish and fillets from farms to restaurants, via processors. These results pertain to shipment during the middle of the first week of a month to meet demand from restaurants that want biweekly deliveries.

			Amount shipped in pounds		
From	To	Distance(miles)	Trout	HSB[a]	Catfish
From farms to processors (whole fish):					
F4	P1	94			185
F4	P8	121			185
F6	P9	36	625		
From farms to restaurants (whole fish):					
F2	R24	30	30		
F4	R24	212			30
From processors to restaurants (fillets):					
P8	R12	46			75
P1	R21	15			75
P9	R12	16	75		
P9	R21	83	75		
P9	R25	7	75		

[a]HSB stands for Hybrid Striped Bass

Table 6. Results of transshipment model for least-cost shipping of whole fish and fillets from farms to restaurants, via processors. These results pertain to shipment during the end of the first week of a month to meet demand from restaurants that want biweekly and weekly deliveries

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
From farms to processors (whole fish):					
F1	P1	6		238	
F3	F3	0	42	95	
F4	P1	95			259
F6	P9	36	722		
From farms to restaurants (whole fish):					
F1	R1	20		19	
F1	R2	31		15	
F1	R3	80		19	
F1	R4	80		19	
F1	R5	43		19	
F2	R24	30	30		
F3	R24	65	19		
F3	R3	83	19		
F3	R4	80	19		
F3	R18	36	19		
F4	R3	140			19
F4	R11	86			22
F4	R24	212			30
F9	R1	64	19		
F9	R2	60	15		
F9	R11	63	22		

Table 6. Continued.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
From processors to restaurants (fillets):					
P1	R1	83		20	
P1	R2	13			15
P1	R2	38		15	
P1	R3	93			15
P1	R14	88		15	
P1	R21	15			75
P1	R5	45		15	
P1	R27	85		10	
F3	R3	95	15	15	
F3	R28	137		15	
P8	R12	46			75
P9	R1.	10	20		
P9	R12	16	75		
P9	R14	2	15		
P9	R21	83	75		
P9	R25	7	75		

[a]HSB stands for Hybrid Striped Bass

Table 7. Results of transshipment model for least-cost shipping of whole fish and fillets from farms to restaurants, via processors. These results pertain to shipment during the middle of a month to meet demand from restaurants that want biweekly, weekly, and bimonthly deliveries.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
From farms to processors (whole fish):					
F1	P1	6		238	
F2	F2	0	56		
F3	F3	0	42	159	
F4	P1	95			259
F4	P8	121			185
F6	P9	36	722		
From farms to restaurants (whole fish):					
F1	R1	20		19	
F1	R2	20		15	
F1	R3	276		19	
F1	R4	91		19	
F1	R19	79		20	
F1	R5	43		19	
F2	R24	30	30		
F3	R6	85	19		
F3	R3	83	19		
F3	R4	80	19		
F3	R18	36	20		
F3	R19	84	20		
F4	R3	141			19
F4	R11	85			22
F4	R24	212			30

Table 7. Continued.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
F9	R1	64	19		
F9	R2	60	15		
F9	R11	63	22		
<u>From processors to restaurants (fillets):</u>					
P1	R1.	83		20	
P1	R2	13			15
P1	R2	38		15	
P1	R3	93			15
P1	R14	88		15	
P1	R21	15			75
P1	R5	45		15	
P1	R27	85		10	
F3	R9	172		20	
F3	R3	95	15	15	
F3	R28	137		15	
F2	R9	101	20		
P8	R12	46			75
P9	R1.	10	20		
P9	R12	16	75		
P9	R14	2	15		
P9	R21	83	75		
P9	R25	7	75		

[a]HSB stands for Hybrid Striped Bass

Table 8. Results of transshipment model for least-cost shipping of whole fish and fillets from farms to restaurants, via processors. These results pertain to shipment during the middle of a month to meet demand from restaurants that want biweekly, weekly, bimonthly, and monthly deliveries.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
From farms to processors (whole fish):					
F1	P1	6		238	
F2	F2	0	56		
F3	F3	0	42	191	
F4	P1	95			259
F4	P8	121			185
F6	P9	36	722		
From farms to restaurants (whole fish):					
F1	R1	20		19	
F1	R4	20		10	
F1	R2	30		15	
F1	R8	78		100	
F1	R3	80		19	
F1	R4	80		19	
F1	R19	79		20	
F1	R5	43		19	
F2	R24	167	30		
F3	R6	85	19		
F3	R8	84	100		
F3	R3	83	19		
F3	R4	80	19		
F3	R18	36	20		
F3	R19	84	20		

Table 8. Continued.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
F4	R3	141			19
F4	R11	85			22
F4	R24	212			30
F9	R1	64	19		
F9	R4	63	10		
F9	R2	60	15		
F9	R11	63	22		
<u>From processors to restaurants (fillets):</u>					
P3	R1.	83		20	
P1	R2	13			15
P1	R2	38		15	
P1	R3	93			15
P1	R14	88		15	
P1	R21	15			75
P1	R5	45		15	
P1	R27	85		10	
P5,F3	R9	172		20	
P5,F3	R3	95	15	15	
P5,F3	R26	172		10	
P5,F3	R28	137		15	
P3,F2	R9	101	20		
P8	R12	46			75
P9	R1.	10	20		
P9	R12	16	75		
P9	R14	2	15		

Table 8. Continued.

			Amount shipped in pounds		
From	To	Distance (miles)	Trout	HSB[a]	Catfish
P9	R21	83	75		
P9	R25	7	75		

[a]HSB stands for Hybrid Striped Bass

Figure Legend

Figure 1. Types of fish currently served in restaurants surveyed in Kentucky and Ohio.

Figure 2. Importance of aquaculture product attributes to restaurants surveyed in Kentucky and Ohio.

Figure 3. Delivery preferences for restaurants surveyed in Kentucky and Ohio.

Figure 4. Preferred form of trout for restaurants surveyed in Kentucky and Ohio.

Figure 5. Preferred size of whole trout for restaurants surveyed in Kentucky and Ohio.

Figure 6. Preferred size of trout fillets for restaurants surveyed in Kentucky and Ohio.

Figure 7. Willingness to pay for whole trout for restaurants surveyed in Kentucky and Ohio.

Figure 8. Willingness to pay for trout fillets for restaurants surveyed in Kentucky and Ohio.

Figure 9. Preferred form of hybrid striped bass for restaurants surveyed in Kentucky and Ohio.

Figure 10. Preferred size of whole hybrid striped bass for restaurants surveyed in Kentucky and Ohio.

Figure 11. Preferred size of hybrid striped bass fillets for restaurants surveyed in Kentucky and Ohio.

Figure 12. Willingness to pay for whole hybrid striped bass for restaurants surveyed in Kentucky and Ohio.

Figure 13. Willingness to pay for hybrid striped bass fillets for restaurants surveyed in Kentucky and Ohio.

Figure 14. Preferred form of catfish for restaurants surveyed in Kentucky and Ohio.

Figure 15. Preferred size of whole catfish for restaurants surveyed in Kentucky and Ohio.

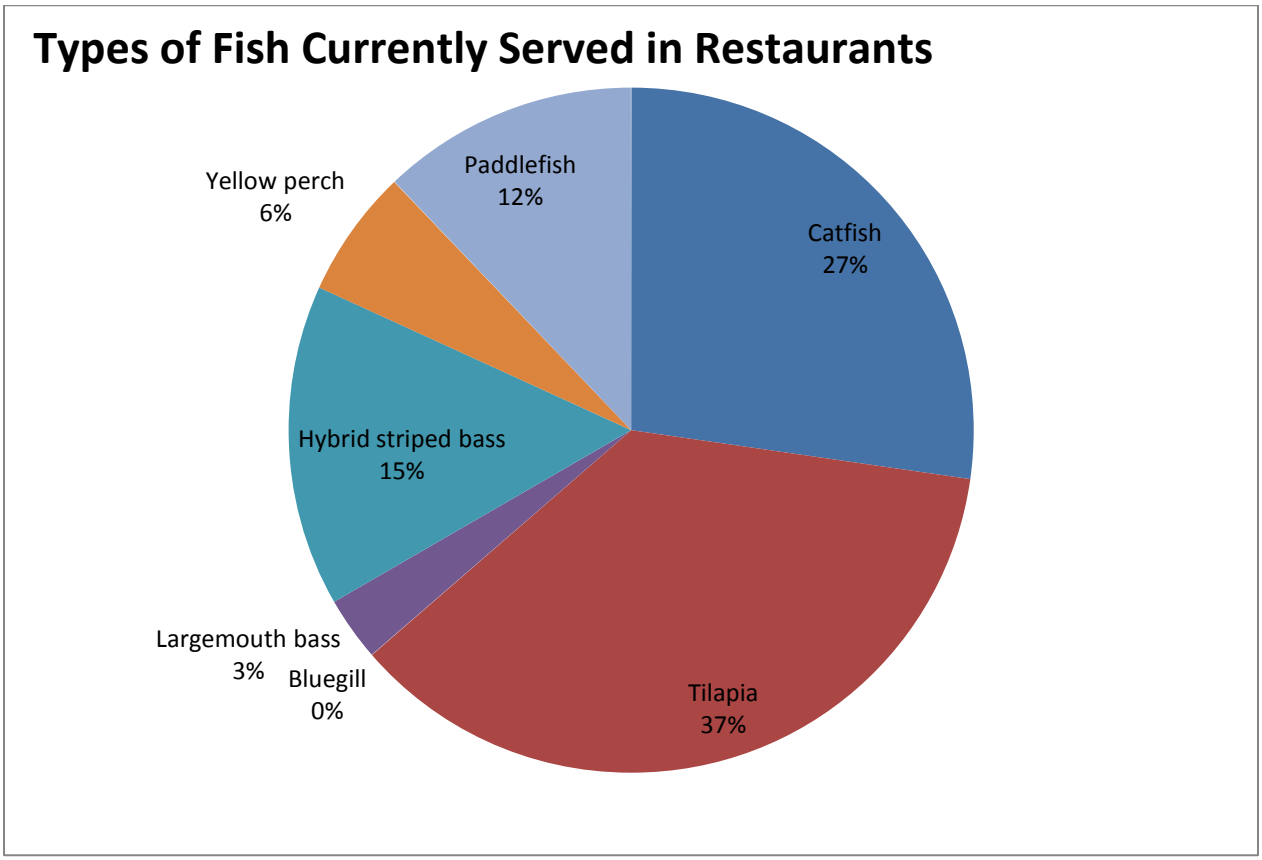
Figure 16. Preferred size of catfish fillets for restaurants surveyed in Kentucky and Ohio.

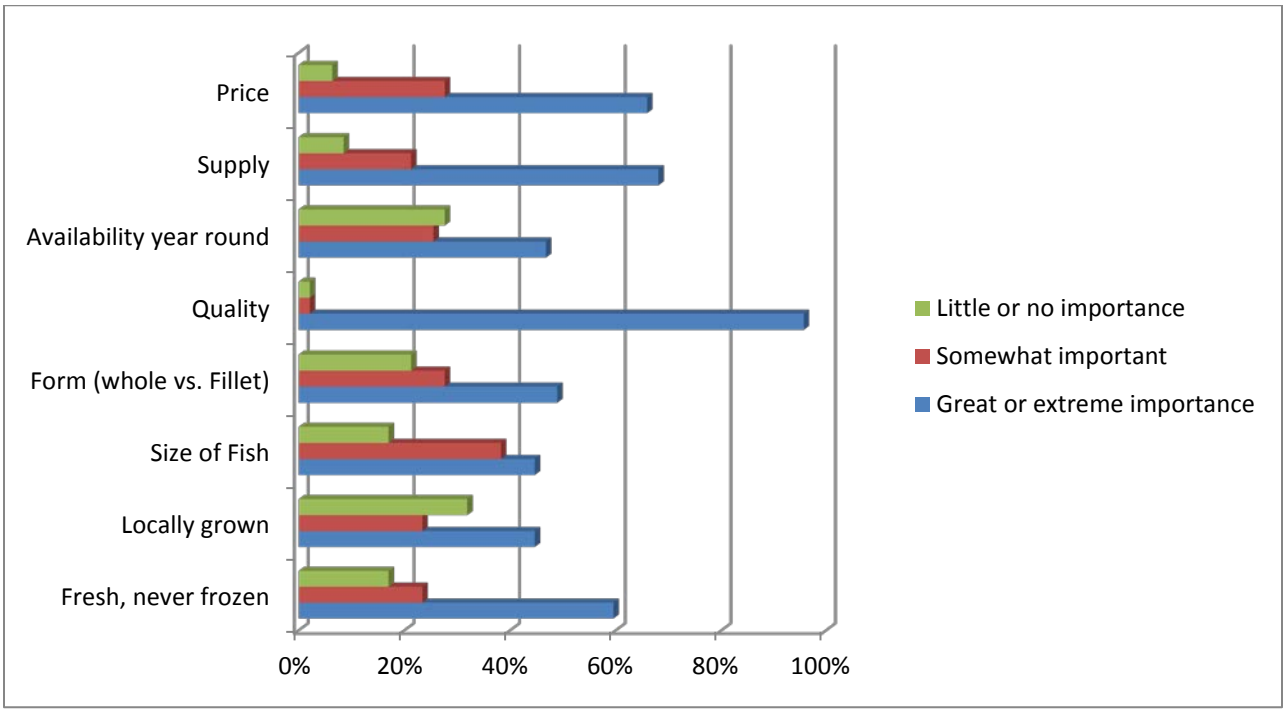
Figure 17. Willingness to pay for whole catfish for restaurants surveyed in Kentucky and Ohio.

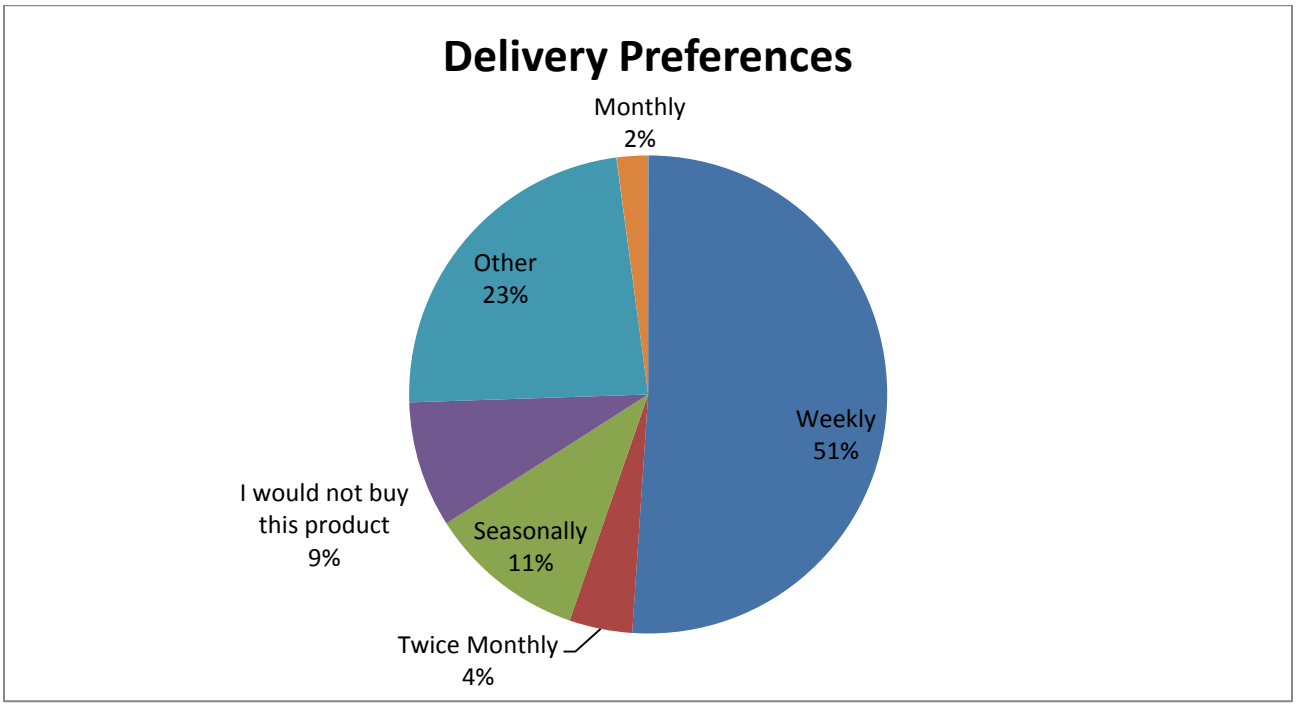
Figure 18. Willingness to pay for catfish fillets for restaurants surveyed in Kentucky and Ohio.

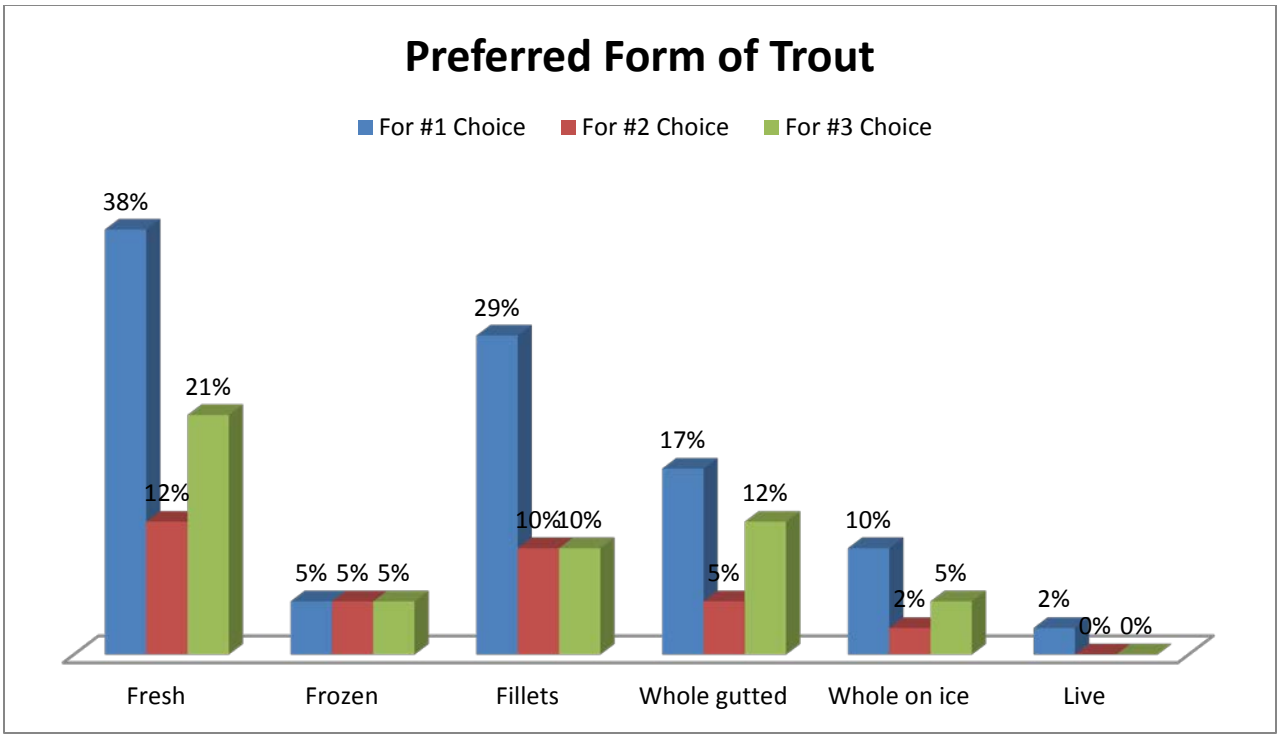
Figure 19. Surveyed restaurants in Kentucky and Ohio's first choice of fish compared with the socio-economic status of their restaurant's customers.

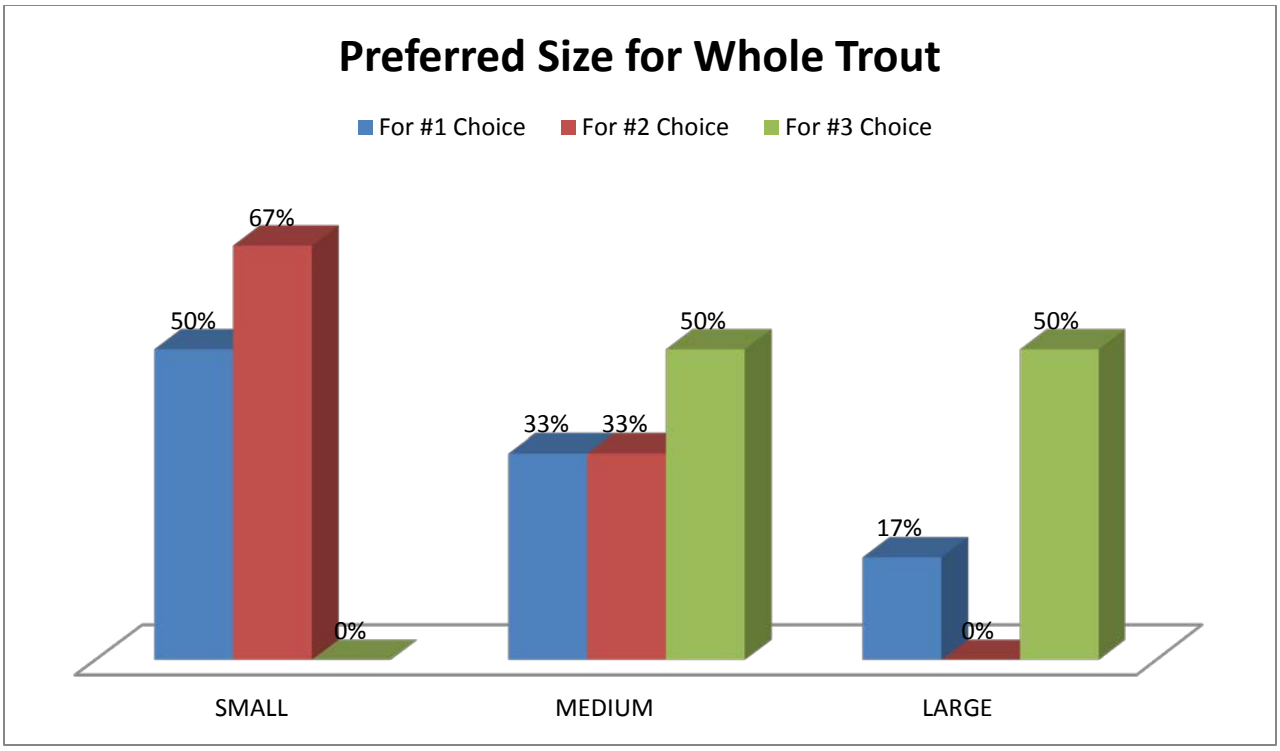
Figure 20. The relative locations of fish farms, processors, and restaurants used in the transshipment model and the corresponding routing of whole fish and fillets associated with shipment to restaurants that want bi-weekly deliveries (Table 5).

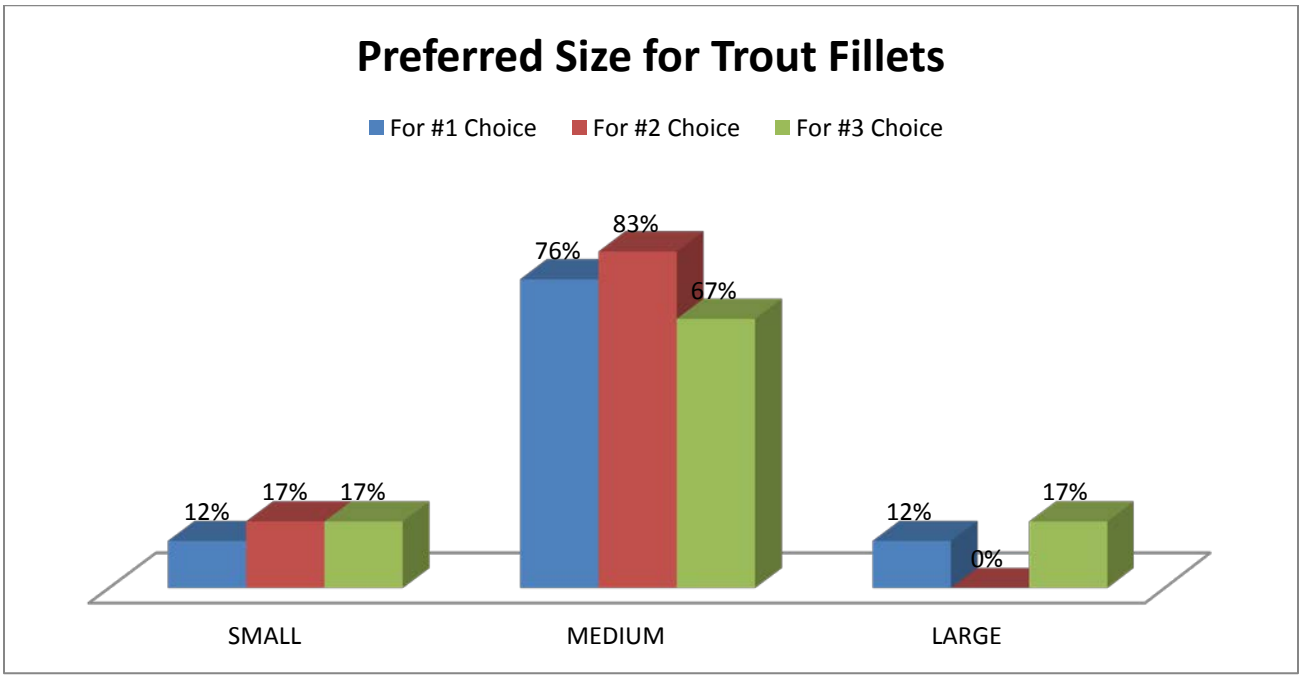

Types of Fish Currently Served in Restaurants
Paddlefish
12%
Yellow perch
6%
Catfish
27%
Hybrid striped bass
15%
Largemouth bass
3%
Bluegill
0%
Tilapia
37%

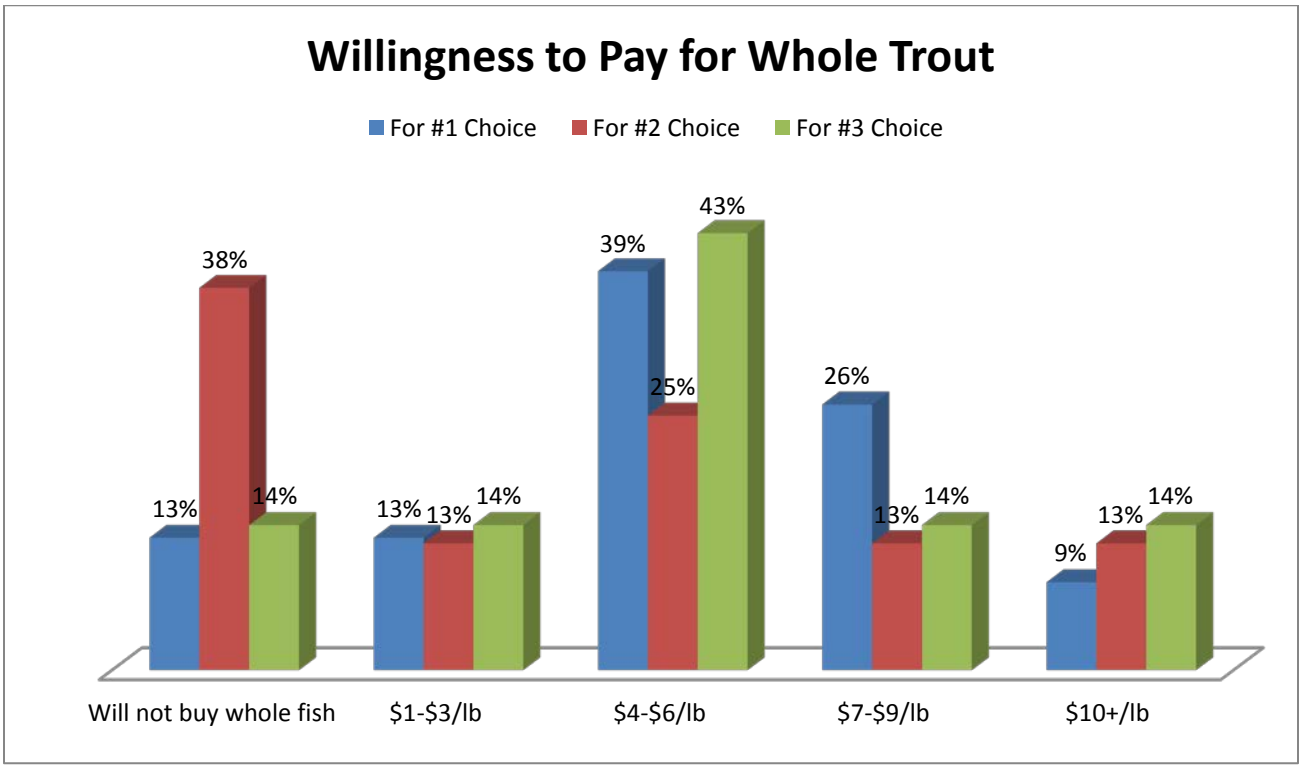

Price
Supply
Availability year round
Quality
Form (whole vs. Fillet)
Size of Fish
Locally grown
Fresh, never frozen
0%
20%
40%
60%
80%
100%
Little or no importance
Somewhat important
Great or extreme importance

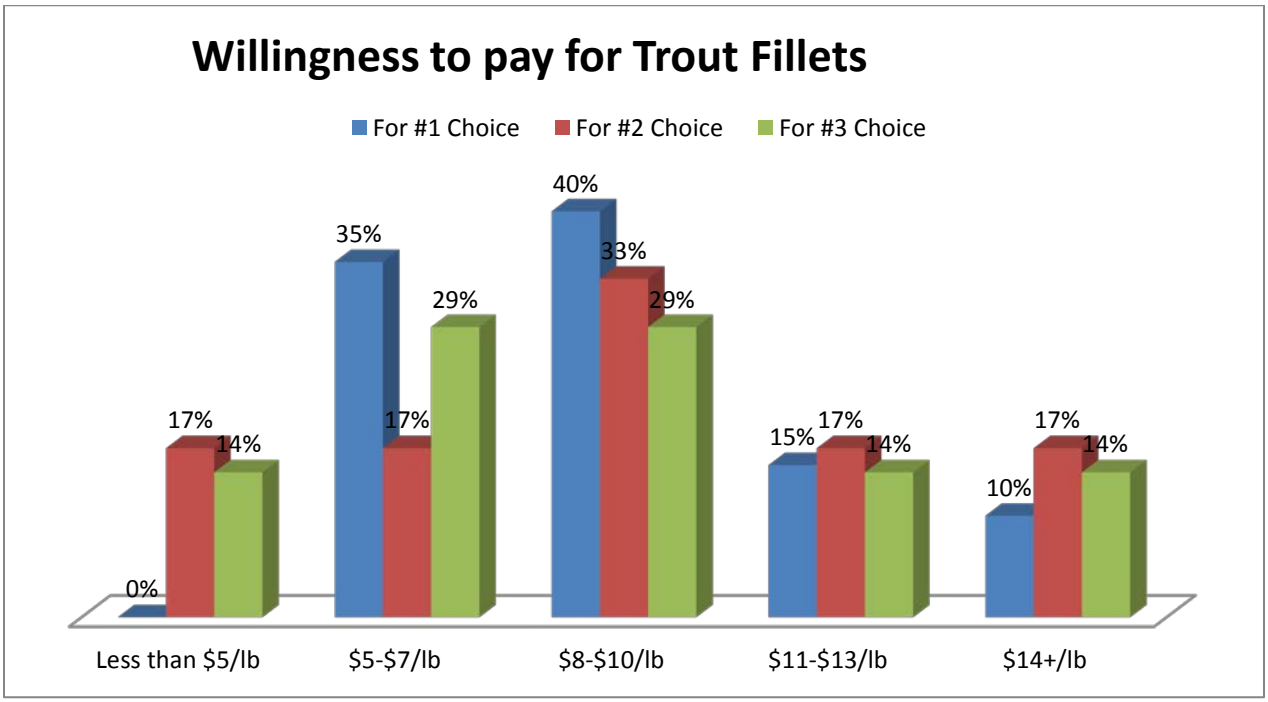

Delivery Preferences
Monthly
2%
Other
23%
Weekly
51%
I would not buy
this product
9%
Seasonally
11%
Twice Monthly
4%

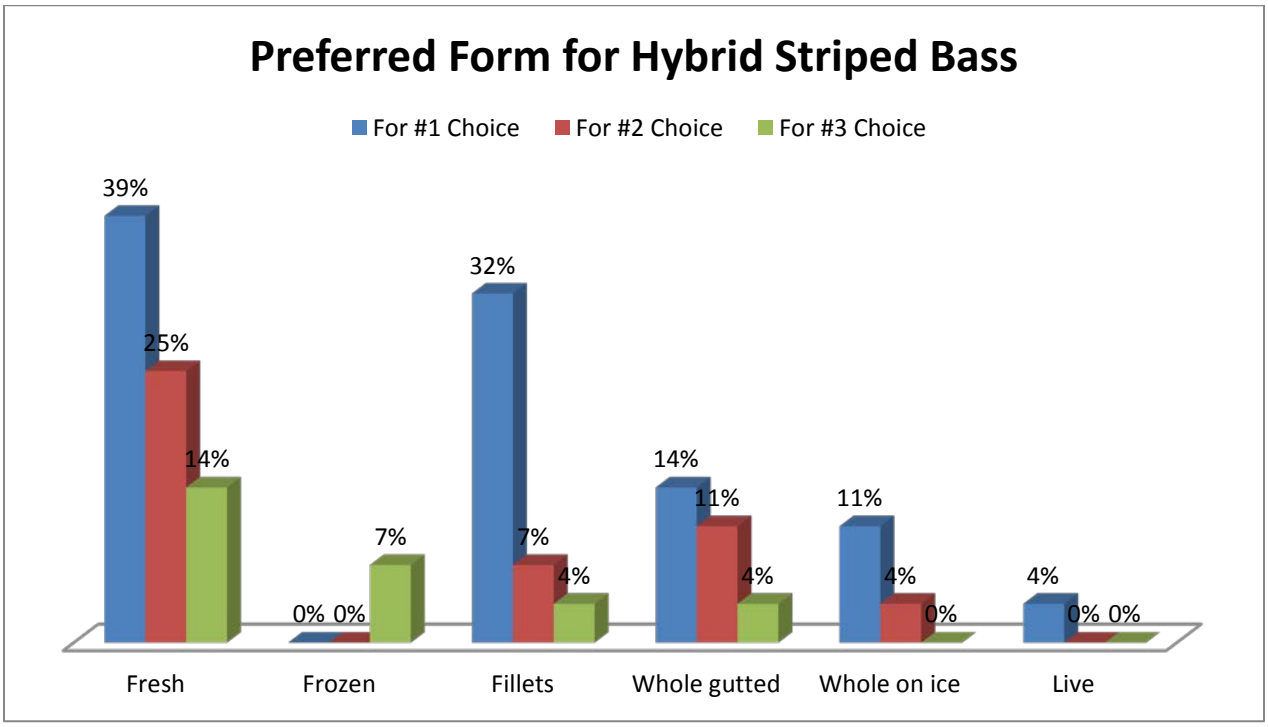

Preferred Form of Trout
For #1 Choice
For #2 Choice
For #3 Choice
38%
12%
21%
5% 5% 5%
29%
10%
10%
17%
5%
12%
10%
2%
5%
2%
0% 0%
Fresh
Frozen
Fillets
Whole gutted
Whole on ice
Live

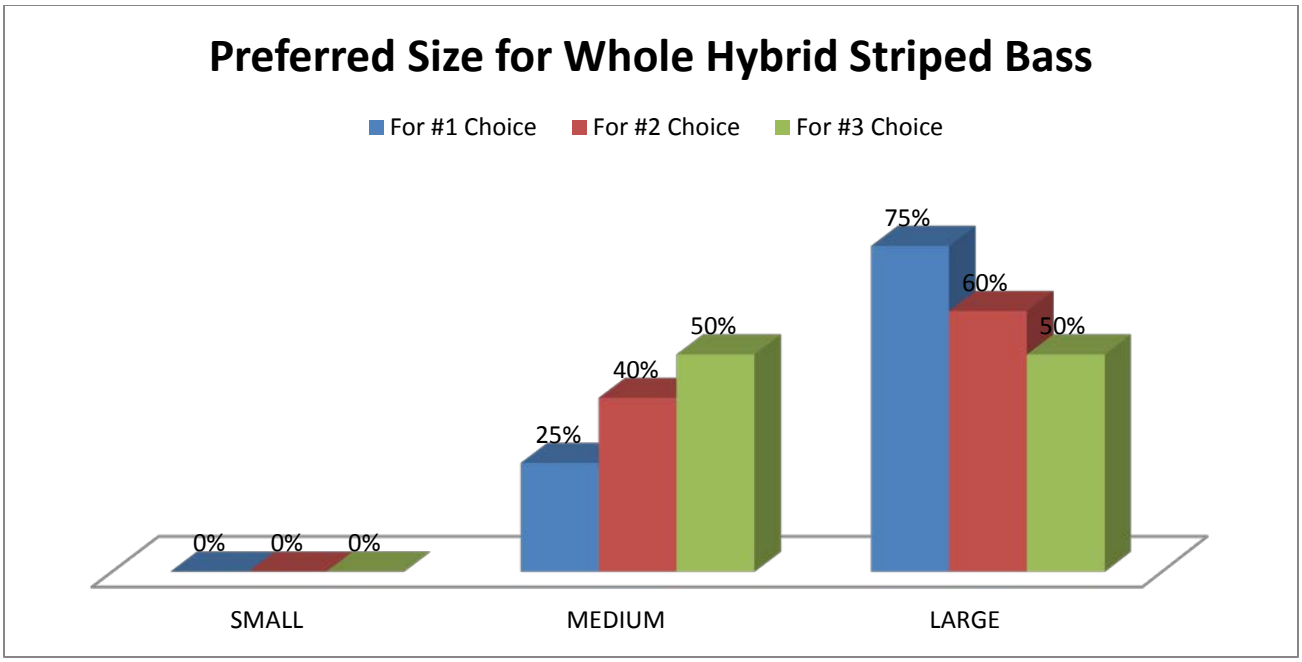

Preferred Size for Whole Trout
For #1 Choice
For #2 Choice
For #3 Choice
50%
67%
0%
33%
33%
50%
17%
0%
50%
SMALL
MEDIUM
LARGE

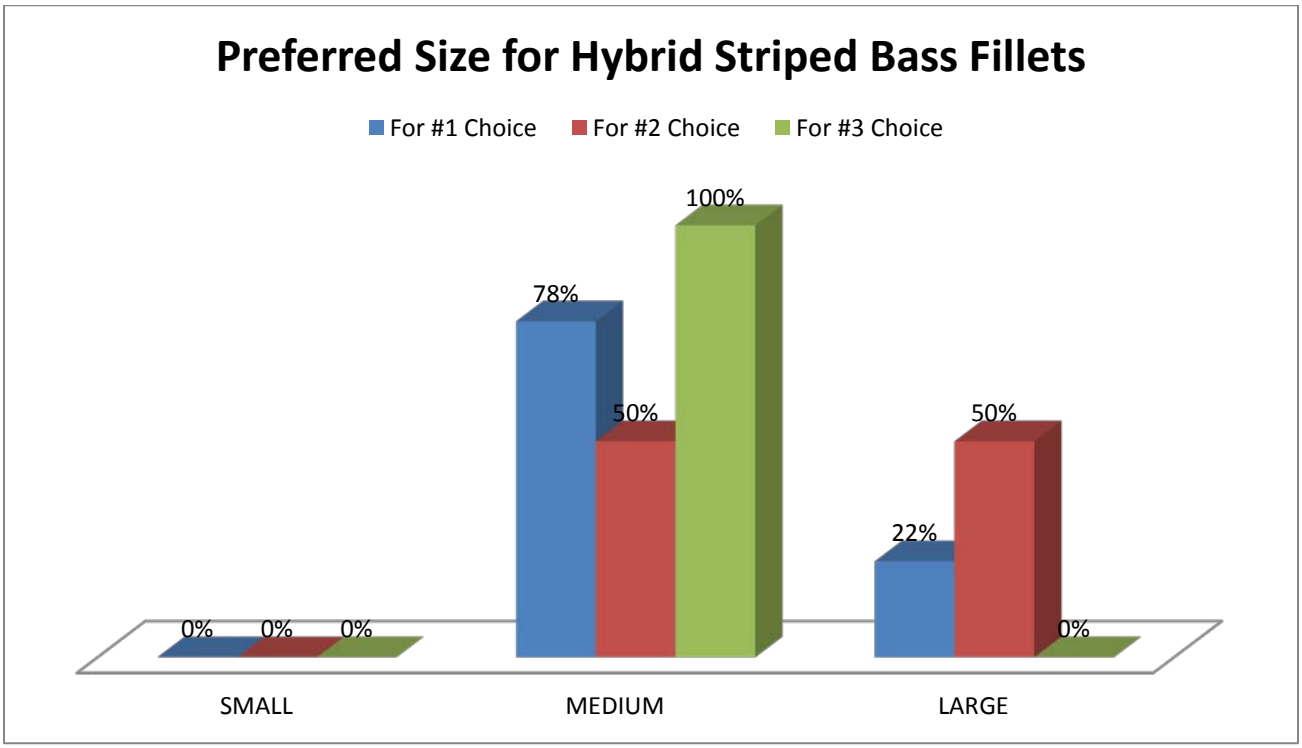

Preferred Size for Trout Fillets
For #1 Choice
For #2 Choice
For #3 Choice
12%
17%
17%
76%
83%
67%
12%
0%
17%
SMALL
MEDIUM
LARGE

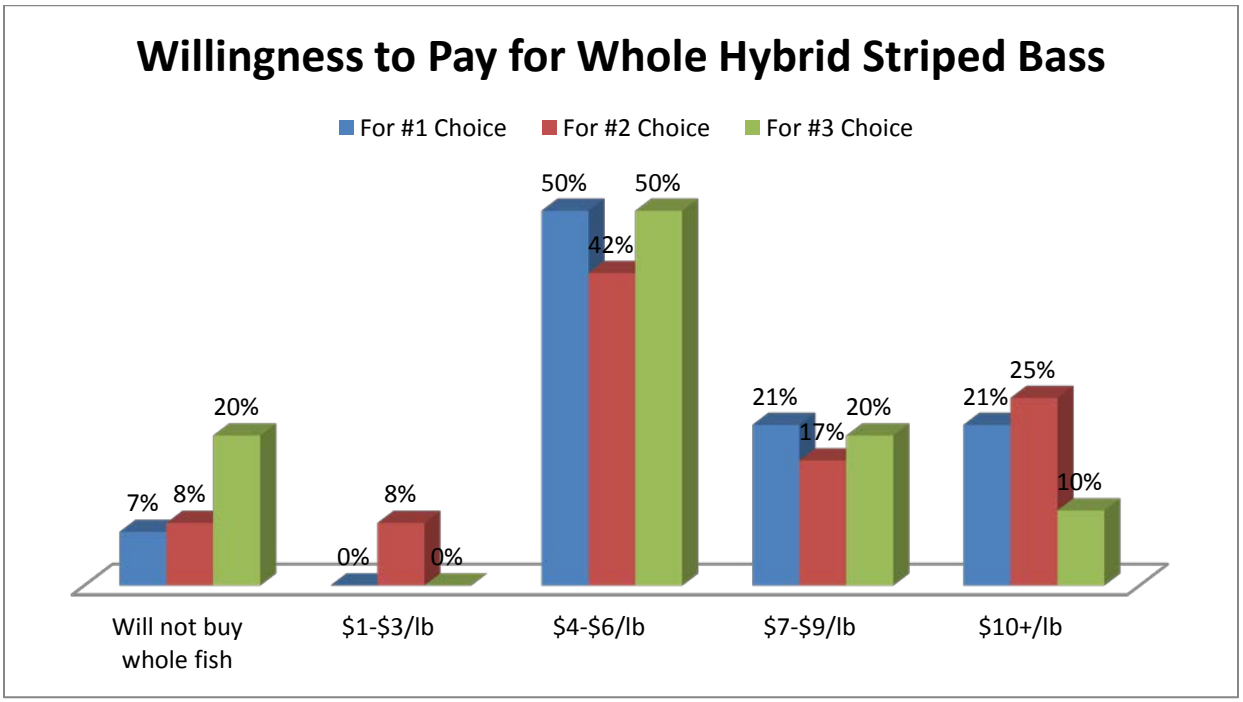

Willingness to Pay for Whole Trout
For #1 Choice
For #2 Choice
For #3 Choice
13%
38%
14%
13%
13%
14%
39%
25%
43%
26%
13%
14%
9%
13%
14%
Will not buy whole fish
$1-$3/lb
$4-$6/lb
$7-$9/lb
$10+/lb

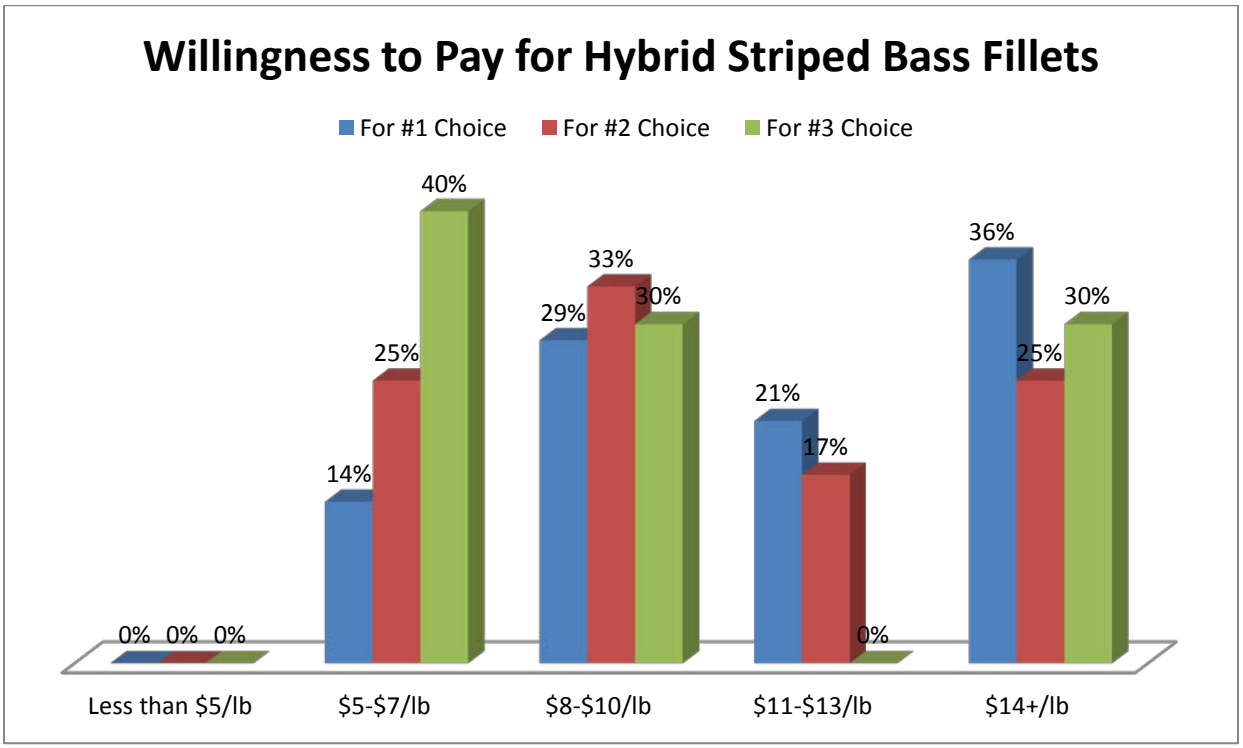

Willingness to pay for Trout Fillets
For #1 Choice
For #2 Choice
For #3 Choice
0%
17%
14%
35%
17%
29%
40%
33%
29%
15%
17%
14%
10%
17%
14%
Less than $5/lb
$5-$7/lb
$8-$10/lb
$11-$13/lb
$14+/lb

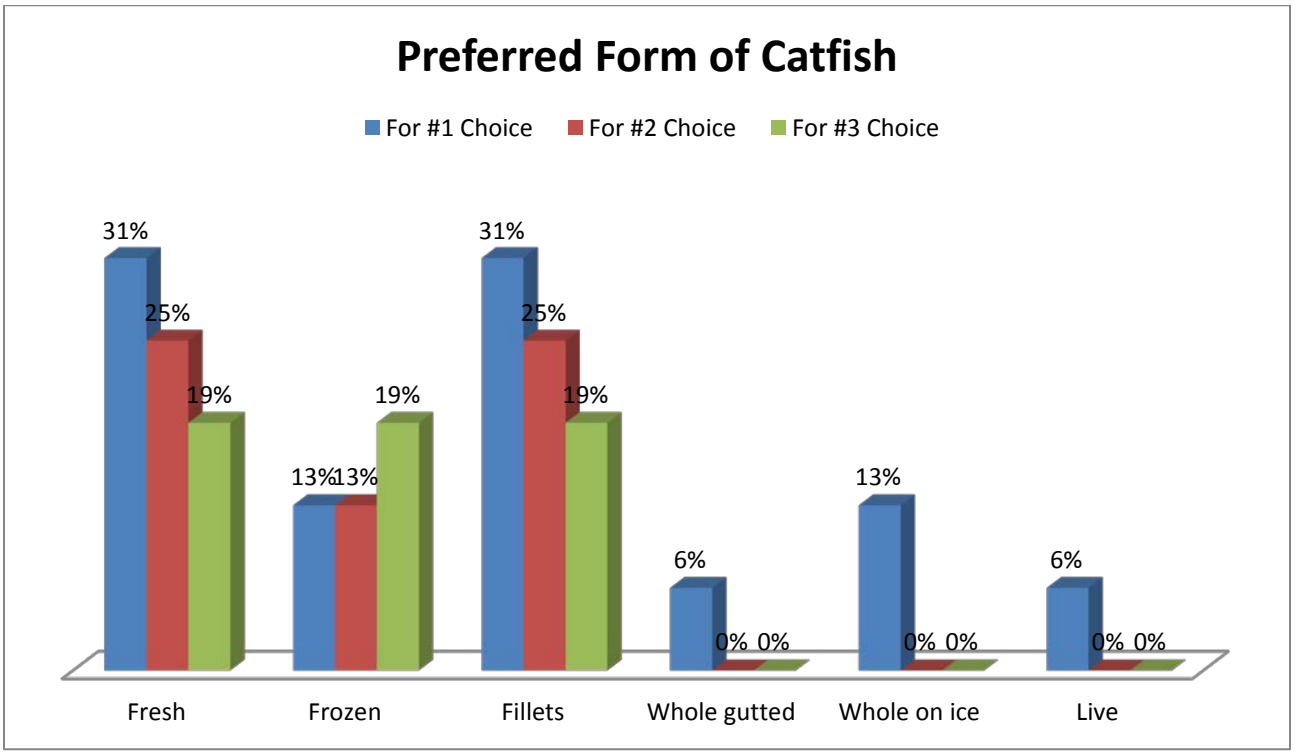

Preferred Form for Hybrid Striped Bass
For #1 Choice
For #2 Choice
For #3 Choice
39%
25%
14%
0%
0%
7%
32%
7%
4%
14%
11%
4%
11%
4%
0%
4%
0%
0%
Fresh
Frozen
Fillets
Whole gutted
Whole on ice
Live

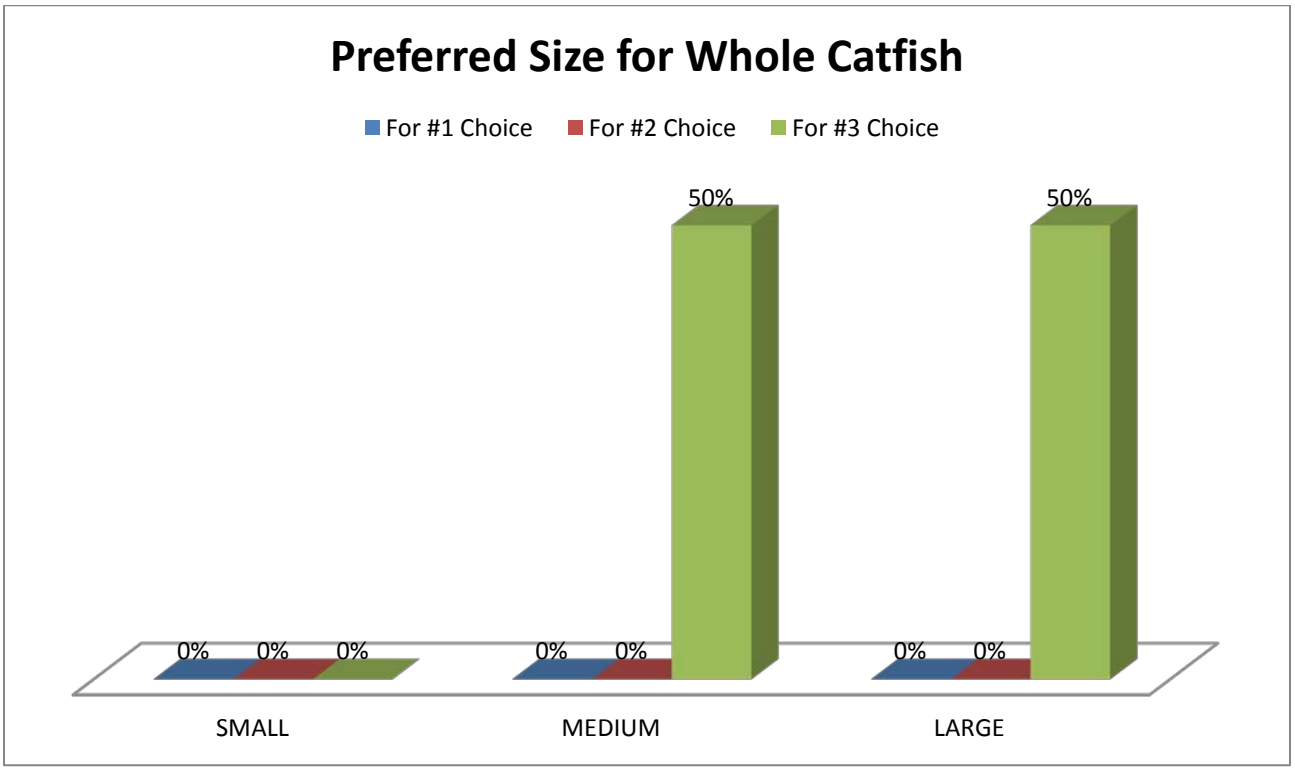

Preferred Size for Whole Hybrid Striped Bass
For #1 Choice
For #2 Choice
For #3 Choice
0%
0%
0%
25%
40%
50%
75%
60%
50%
SMALL
MEDIUM
LARGE

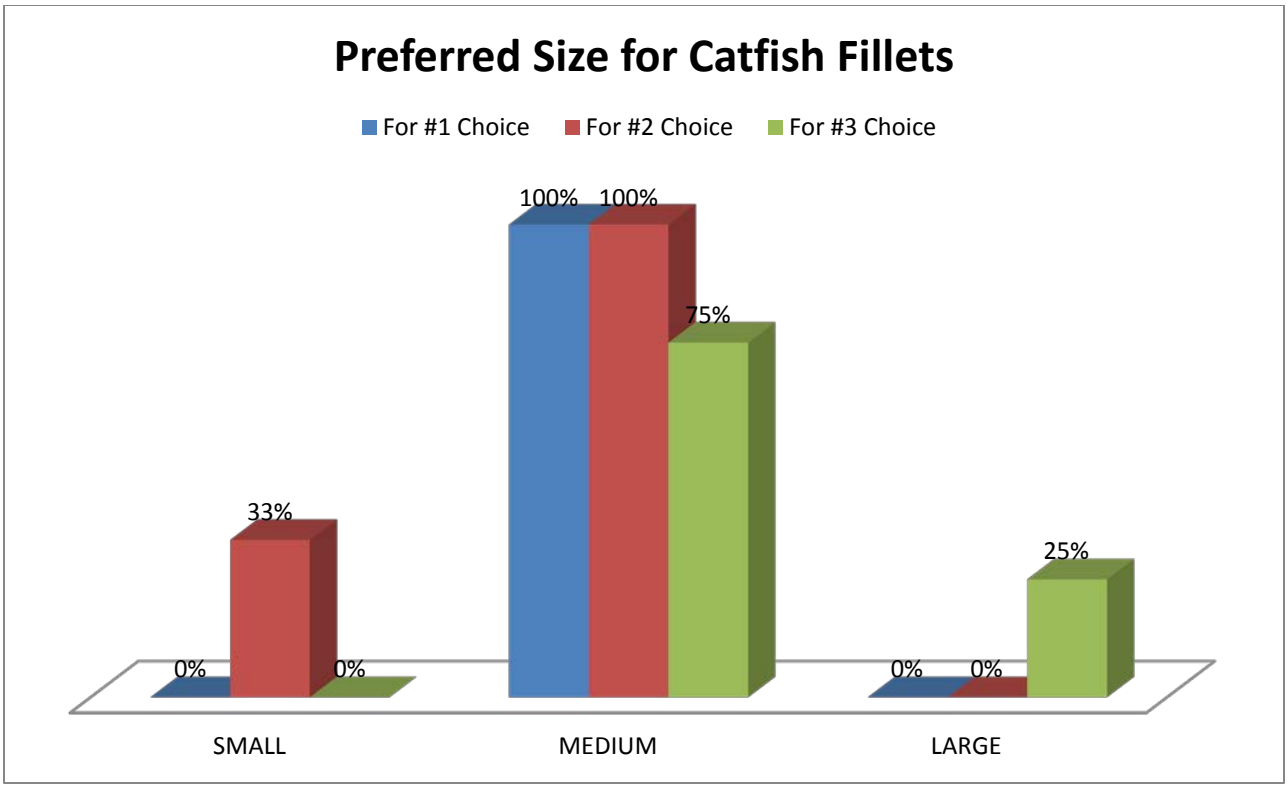

Preferred Size for Hybrid Striped Bass Fillets
For #1 Choice
For #2 Choice
For #3 Choice
0%
0%
0%
78%
50%
100%
22%
50%
0%
SMALL
MEDIUM
LARGE

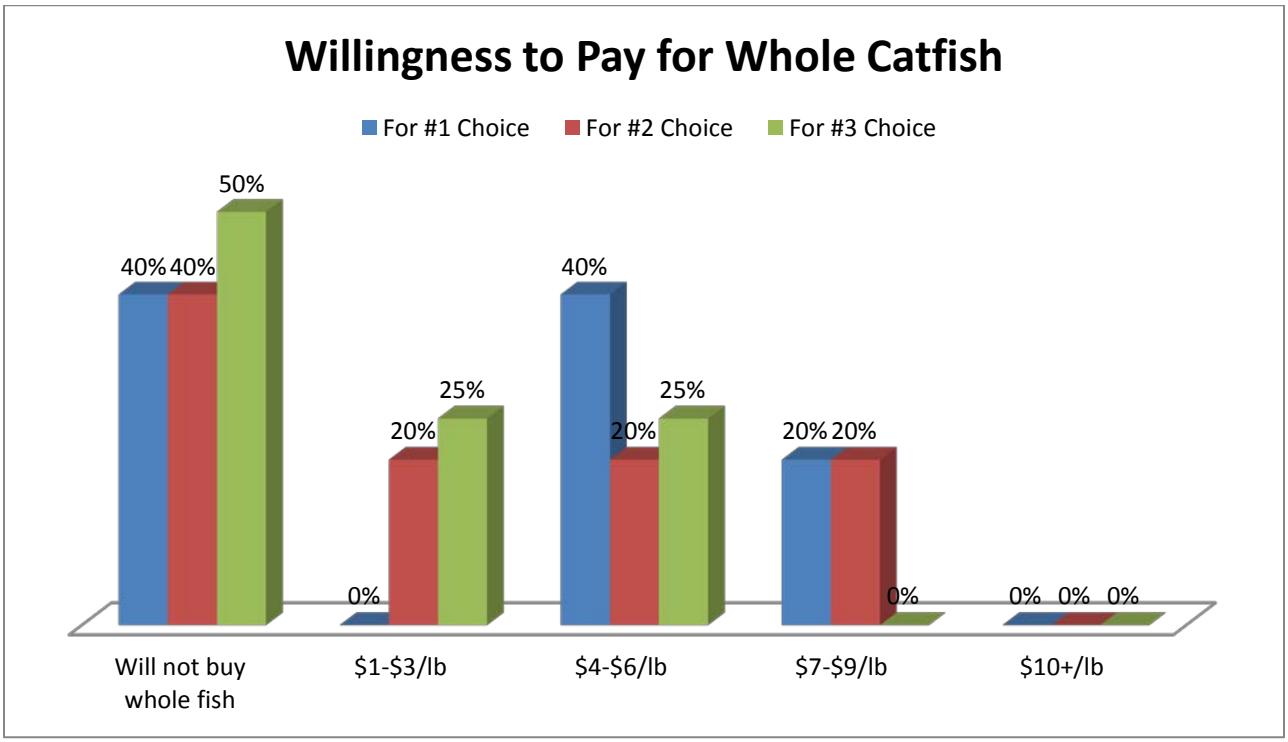

Willingness to Pay for Whole Hybrid Striped Bass
For #1 Choice
For #2 Choice
For #3 Choice
7%
8%
20%
0%
8%
0%
50%
42%
50%
21%
17%
20%
21%
25%
10%
Will not buy whole fish
$1-$3/lb
$4-$6/lb
$7-$9/lb
$10+/lb

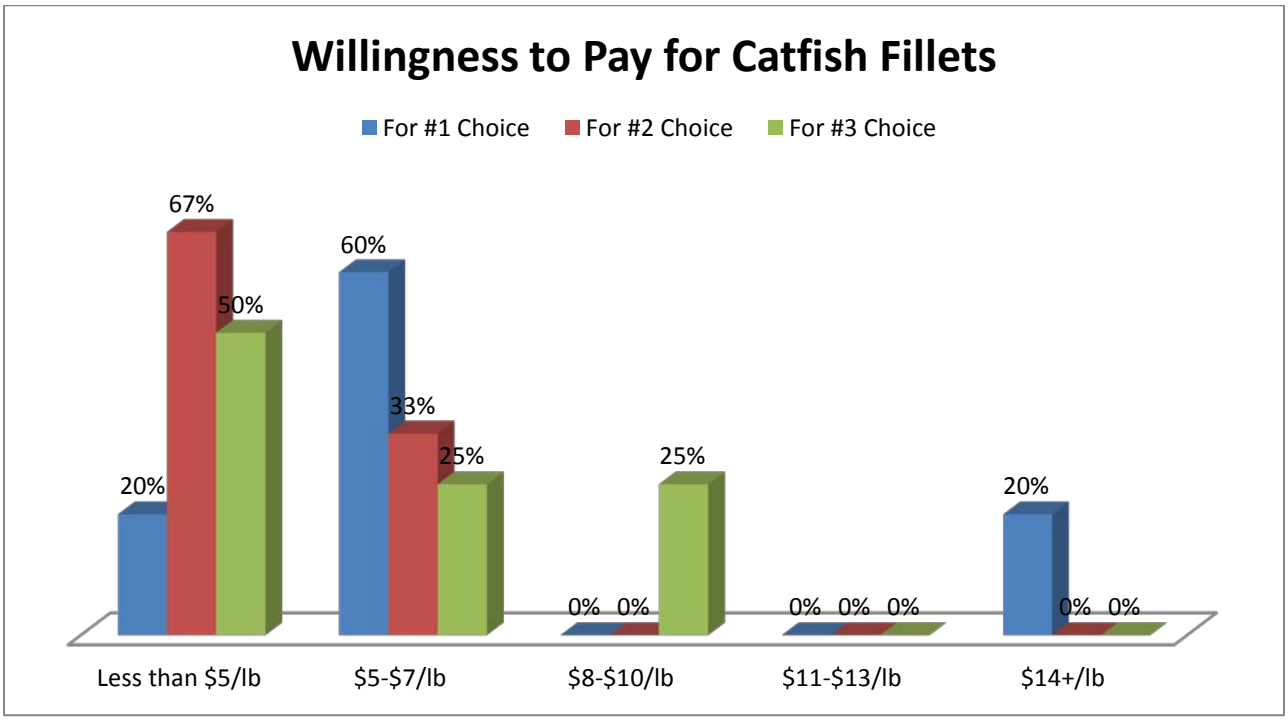

Willingness to Pay for Hybrid Striped Bass Fillets
For #1 Choice
For #2 Choice
For #3 Choice
0%
0%
0%
14%
25%
40%
29%
33%
30%
21%
17%
0%
36%
25%
30%
Less than $5/lb
$5-$7/lb
$8-$10/lb
$11-$13/lb
$14+/lb

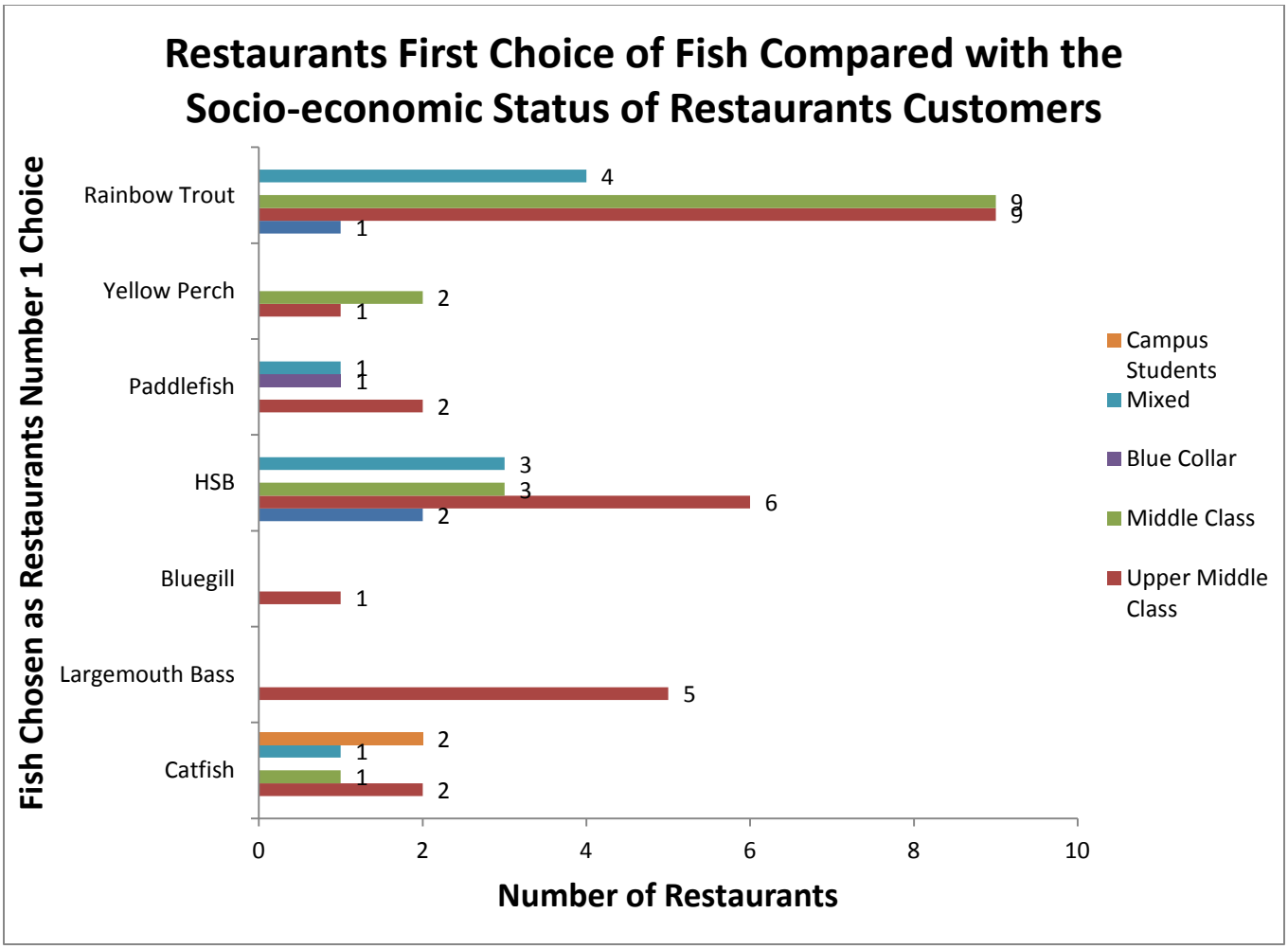

Preferred Form of Catfish
For #1 Choice
For #2 Choice
For #3 Choice
31%
25%
19%
13%
13%
19%
31%
25%
19%
6%
0%
0%
13%
0%
0%
6%
0%
0%
Fresh
Frozen
Fillets
Whole gutted
Whole on ice
Live

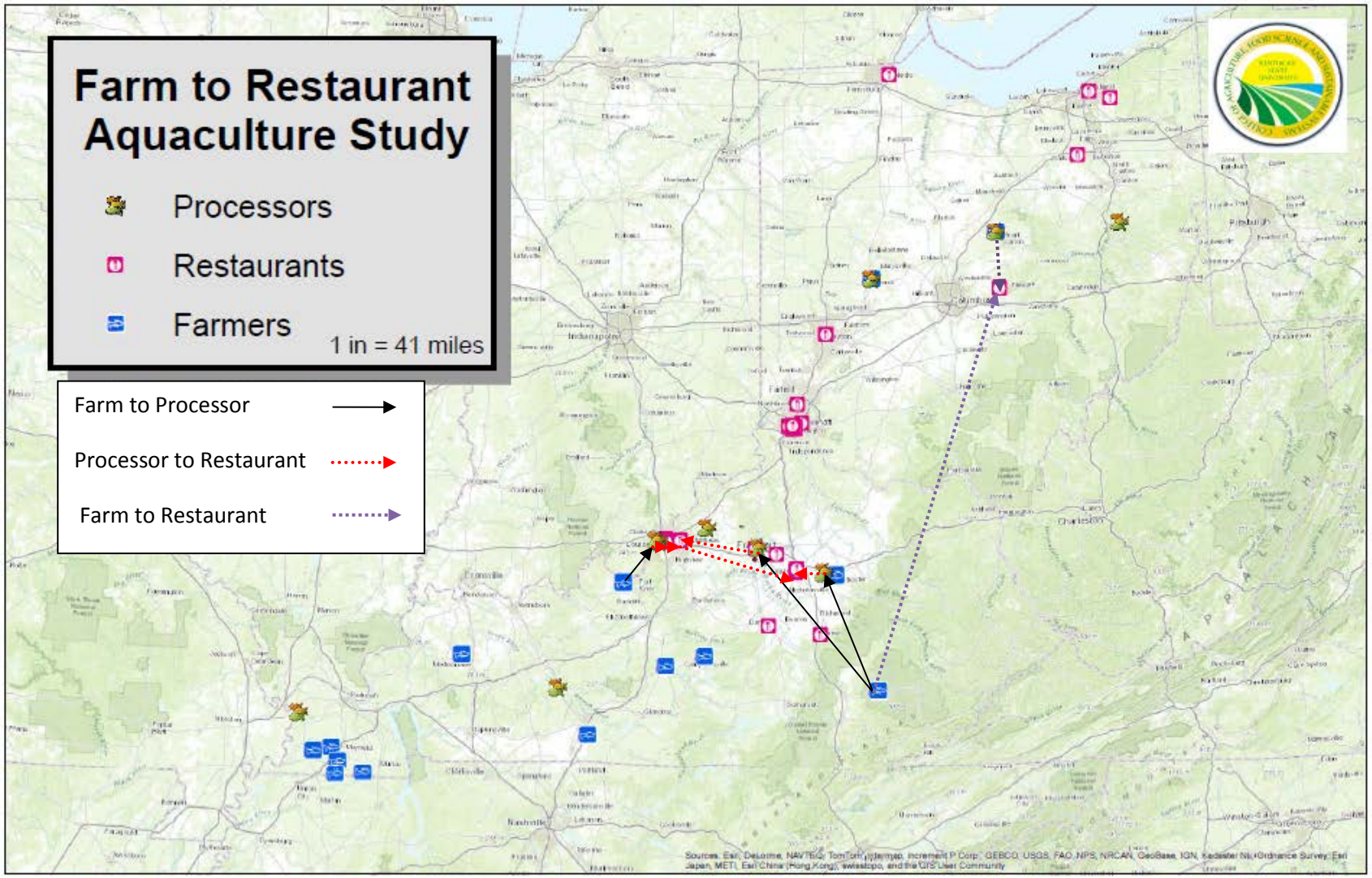

Preferred Size for Whole Catfish
For #1 Choice
For #2 Choice
For #3 Choice
0%
0%
0%
0%
0%
50%
0%
0%
50%
SMALL
MEDIUM
LARGE


Preferred Size for Catfish Fillets
For #1 Choice
For #2 Choice
For #3 Choice
100%
100%
75%
33%
25%
0%
0%
0%
0%
SMALL
MEDIUM
LARGE


Willingness to Pay for Whole Catfish
For #1 Choice
For #2 Choice
For #3 Choice
40%
40%
50%
0%
20%
25%
40%
20%
25%
20%
20%
0%
0%
0%
0%
Will not buy whole fish
$1-$3/lb
$4-$6/lb
$7-$9/lb
$10+/lb


Willingness to Pay for Catfish Fillets
For #1 Choice
For #2 Choice
For #3 Choice
67%
50%
20%
60%
33%
25%
0%
0%
25%
0%
0%
0%
20%
0%
0%
Less than $5/lb
$5-$7/lb
$8-$10/lb
$11-$13/lb
$14+/lb


Restaurants First Choice of Fish Compared with the Socio-economic Status of Restaurants Customers
Fish Chosen as Restaurants Number 1 Choice
Rainbow Trout
Yellow Perch
Paddlefish
HSB
Bluegill
Largemouth Bass
Catfish
4
9
9
1
2
1
1
1
2
3
3
6
2
1
5
2
1
1
2
0
2
4
6
8
10
Number of Restaurants
Campus Students
Mixed
Blue Collar
Middle Class
Upper Middle Class


Farm to Restaurant Aquaculture Study
Processors
Restaurants
Farmers
1 in = 41 miles
Farm to Processor
Processor to Restaurant
Farm to Restaurant

FSMIP2012RestaurantQuestionnaire

SurveyMonkey

1. Does your restaurant currently have freshwater fish on the menu?

	Response Percent	Response Count
Yes	42.5%	17
No	**57.5%**	**23**
	answered question	**40**
	skipped question	**0**

2. If yes, please check all species offered.

	Response Percent	Response Count
Catfish	**47.1%**	**8**
Tilapia	41.2%	7
Bluegill	0.0%	0
Largemouth bass	5.9%	1
Hybrid striped bass	17.6%	3
Yellow perch	5.9%	1
Paddlefish	17.6%	3
Other (please specify)	**47.1%**	**8**
	answered question	**17**
	skipped question	**23**

3. Please rate the importance of each of the following attributes for the seafood you currently purchase.

	None	Little	Moderate	Great	Extreme	Rating Count
Fresh, never frozen	8.6% (3)	8.6% (3)	25.7% (9)	**28.6% (10)**	**28.6% (10)**	35
Locally grown	11.4% (4)	**25.7% (9)**	**25.7% (9)**	**25.7% (9)**	11.4% (4)	35
Size of fish	8.6% (3)	8.6% (3)	34.3% (12)	**37.1% (13)**	11.4% (4)	35
Form (whole vs. fillet)	8.8% (3)	17.6% (6)	29.4% (10)	**35.3% (12)**	8.8% (3)	34
Quality	2.9% (1)	0.0% (0)	2.9% (1)	17.1% (6)	**77.1% (27)**	35
Availability year round	11.4% (4)	20.0% (7)	25.7% (9)	**28.6% (10)**	14.3% (5)	35
Supply	2.9% (1)	5.7% (2)	22.9% (8)	**48.6% (17)**	20.0% (7)	35
Price	2.9% (1)	2.9% (1)	28.6% (10)	**48.6% (17)**	17.1% (6)	35
					answered question	**35**
					skipped question	**5**

4. How often would you prefer delivery of fresh, locally raised fish?

	Response Percent	Response Count
Weekly	**44.4%**	**16**
Twice monthly	5.6%	2
Monthly	2.8%	1
Every other month	0.0%	0
Seasonally	8.3%	3
Whenever I can get it	2.8%	1
I would not buy this product	11.1%	4
Other (please specify)	25.0%	9
	answered question	**36**
	skipped question	**4**

5. Which is the most important attribute of a locally sourced aquaculture product? Check the 1st box next to your most important attribute; Check the 2nd box next to your second most important attribute, and so on until you have ranked all four attributes.

	1st	2nd	3rd	4th	Rating Count
Freshness	28.6% (10)	**54.3% (19)**	5.7% (2)	11.4% (4)	35
Taste	**71.4% (25)**	17.1% (6)	8.6% (3)	2.9% (1)	35
Size of fish	2.9% (1)	20.0% (7)	**42.9% (15)**	34.3% (12)	35
Locally grown product	20.0% (7)	8.6% (3)	34.3% (12)	**37.1% (13)**	35
				Comments	3
				answered question	**35**
				skipped question	**5**

6. What types of freshwater fish locally-grown in Kentucky and Ohio would you be interested in trying in your restaurant? Please check boxes below to tell us which fish types are your number 1, 2, and 3 choices:

	Number 1 choice	Number 2 choice	Number 3 choice	Rating Count
Channel catfish	**37.5% (6)**	**37.5% (6)**	25.0% (4)	16
Largemouth bass	21.4% (3)	**42.9% (6)**	35.7% (5)	14
Bluegill	16.7% (1)	**50.0% (3)**	33.3% (2)	6
Hybrid striped bass	**43.5% (10)**	26.1% (6)	30.4% (7)	23
Paddlefish	20.0% (2)	30.0% (3)	**50.0% (5)**	10
Yellow perch	11.8% (2)	41.2% (7)	**47.1% (8)**	17
Rainbow trout	**58.1% (18)**	19.4% (6)	22.6% (7)	31
			answered question	**35**
			skipped question	**5**

7. For choice NUMBER 1, please tell us what product form you prefer (check all that apply).

		Response Percent	Response Count
Fresh		**68.6%**	**24**
Frozen		11.4%	4
Fillets		48.6%	17
Whole gutted		25.7%	9
Whole on ice		17.1%	6
Live		2.9%	1
Other (please specify)		0.0%	0
		answered question	**35**
		skipped question	**5**

8. What is your preferred size (whole, fillets, lbs, oz) of product for Choice Number 1?

	Response Percent	Response Count
whole fish (lbs)	48.1%	13
fillets (ozs)	**88.9%**	**24**
	answered question	**27**
	skipped question	**13**

9. What is the maximum price ($/lb) that you will pay for whole fish of Choice Number 1?

	Response Percent	Response Count
Will not buy whole fish	15.2%	5
Less than $2/lb	0.0%	0
$2/lb	3.0%	1
$3/lb	0.0%	0
$4/lb	15.2%	5
$5/lb	**21.2%**	**7**
$6/lb	15.2%	5
$7/lb	3.0%	1
$8/lb	6.1%	2
$9/lb	6.1%	2
$10/lb	9.1%	3
More than $10/lb	6.1%	2
	answered question	**33**
	skipped question	**7**

10. What is the maximum that you will pay ($/lb) for fresh fillets of Choice Number 1 fish?

	Response Percent	Response Count
Less than $5/lb	3.2%	1
$5/lb	6.5%	2
$6/lb	9.7%	3
$7/lb	**19.4%**	**6**
$8/lb	16.1%	5
$9/lb	9.7%	3
$10/lb	9.7%	3
$11/lb	0.0%	0
$12/lb	6.5%	2
$13/lb	6.5%	2
$14/lb	3.2%	1
$15/lb	6.5%	2
More than $15/lb	3.2%	1
	answered question	**31**
	skipped question	**9**

11. For choice NUMBER 2, please tell us what product form you prefer (check all that apply).

	Response Percent	Response Count
Fresh	**78.1%**	**25**
Frozen	21.9%	7
Fillets	50.0%	16
Whole gutted	25.0%	8
Whole on Ice	12.5%	4
Live	6.3%	2
Other (please specify)	0.0%	0
	answered question	**32**
	skipped question	**8**

12. What is your preferred size (whole, fillets, lbs, oz) of product for Choice Number 2?

	Response Percent	Response Count
Whole Fish (lbs)	42.3%	11
Fillets (ozs)	**92.3%**	**24**
	answered question	**26**
	skipped question	**14**

13. What is the maximum price ($/lb) that you will pay for whole fish of Choice Number 2?

	Response Percent	Response Count
Will not buy whole fish	**20.0%**	**6**
Less than $2/lb	0.0%	0
$2/lb	0.0%	0
$3/lb	13.3%	4
$4/lb	16.7%	5
$5/lb	10.0%	3
$6/lb	10.0%	3
$7/lb	16.7%	5
$8/lb	3.3%	1
$9/lb	3.3%	1
$10/lb	3.3%	1
More than $10/lb	3.3%	1
	answered question	**30**
	skipped question	**10**

14. What is the maximum that you will pay ($/lb) for fresh fillets of Choice Number 2 fish?

	Response Percent	Response Count
Less than $5/lb	14.8%	4
$5/lb	11.1%	3
$6/lb	3.7%	1
$7/lb	14.8%	4
$8/lb	**18.5%**	**5**
$9/lb	3.7%	1
$10/lb	7.4%	2
$11/lb	3.7%	1
$12/lb	7.4%	2
$13/lb	7.4%	2
$14/lb	0.0%	0
$15/lb	3.7%	1
More than $15/lb	3.7%	1
	answered question	**27**
	skipped question	**13**

15. For choice NUMBER 3, please tell us what product form you prefer (check all that apply).

	Response Percent	Response Count
Fresh	**70.0%**	**21**
Frozen	26.7%	8
Fillets	43.3%	13
Whole gutted	23.3%	7
Whole on ice	13.3%	4
Live	3.3%	1
Other (please specify)	3.3%	1
	answered question	**30**
	skipped question	**10**

16. What is your preferred size (whole, fillets, lbs, oz) of product for Choice Number 3?

	Response Percent	Response Count
Whole fish (lbs)	47.8%	11
Fillets (ozs)	**87.0%**	**20**
	answered question	**23**
	skipped question	**17**

17. What is the maximum price ($/lb) that you will pay for whole fish of Choice Number 3?

	Response Percent	Response Count
Will not buy whole fish	**28.0%**	**7**
Less than $2/lb	0.0%	0
$2/lb	4.0%	1
$3/lb	4.0%	1
$4/lb	12.0%	3
$5/lb	20.0%	5
$6/lb	8.0%	2
$7/lb	12.0%	3
$8/lb	8.0%	2
$9/lb	0.0%	0
$10/lb	4.0%	1
More than $10/lb	0.0%	0
	answered question	**25**
	skipped question	**15**

18. What is the maximum that you will pay ($/lb) for fresh fillets of Choice Number 3 fish?

	Response Percent	Response Count
Less than $5/lb	7.7%	2
$5/lb	15.4%	4
$6/lb	11.5%	3
$7/lb	7.7%	2
$8/lb	**19.2%**	**5**
$9/lb	15.4%	4
$10/lb	7.7%	2
$11/lb	0.0%	0
$12/lb	0.0%	0
$13/lb	3.8%	1
$14/lb	0.0%	0
$15/lb	11.5%	3
More than $15/lb	0.0%	0
	answered question	**26**
	skipped question	**14**

19. How would you best classify the socio-economic status of your customers?

	Response Percent	Response Count
Wealthy	5.6%	2
Upper Middle Class	**36.1%**	**13**
Middle Class	27.8%	10
Blue Collar	0.0%	0
Mixed	22.2%	8
Other (please specify)	8.3%	3
	answered question	**36**
	skipped question	**4**

20. What is the total number of seats in your restaurant?

	Response Count
	35
answered question	**35**
skipped question	**5**

21. Would you be interested in receiving a sample of locally raised aquaculture products and participating in a survey regarding the quality of the product?

	Response Percent	Response Count
Yes	**72.2%**	**26**
No	27.8%	10
If yes, please put your contact information here.		20
answered question		**36**
skipped question		**4**

RESTAURANT PERCEPTIONS OF LOCALLY GROWN FRESHWATER SEAFOOD IN KENTUCKY AND OHIO

Richard Bryant*, Siddhartha Dasgupta, Angela Caporelli, Laura Tiu

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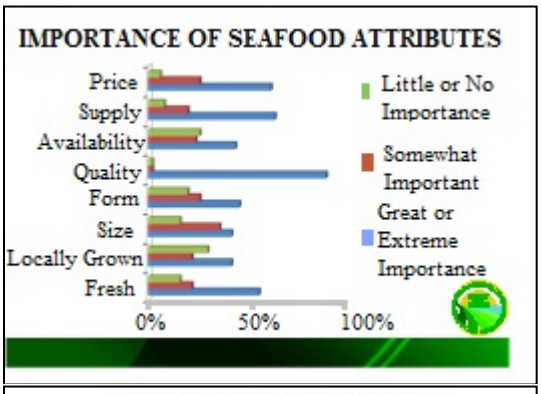
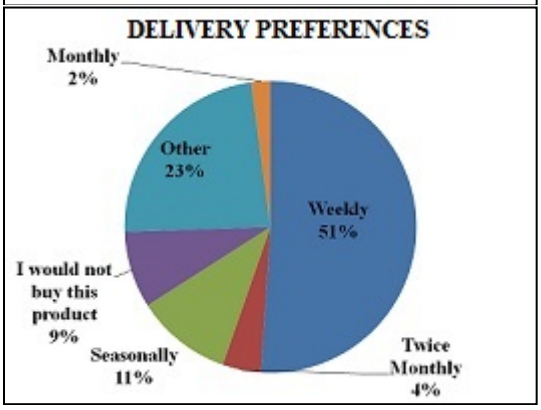
Small-scale aquaculture of Kentucky and Ohio are reliant on direct and niche marketing in order to be profitable. Since local growers can supply fresh fish, marketing to restaurants is an area where small-scale producers could be competitive with respect to cheaper, frozen seafood.

This project documents the demand for fresh aquaculture products from independent restaurants and educates producers about effective local seafood distribution. This was done by surveying restaurants on their preferences for seafood products that are currently being grown locally. Restaurants were also asked to indicate what seafood attributes were important to them.

Results showed than product quality, consistent supply, and taste were the most important attributes to the restaurants. Weekly delivery of locally-grown seafood was preferred by over half of the restaurants.

Of the various fish types being offered for sale, restaurants preferred trout, hybrid striped bass, and catfish. Small whole trout at $4-$6/lb and medium fillets at $8-$10/lb were the most preferred sizes and prices for trout. Large whole hybrid striped bass at $4-$6/lb and medium fillets at $5-$7/lb are the most preferred sizes and prices for hybrid striped bass. The third most preferred products are fresh and filleted catfish. Although medium and large whole fish are preferred, the majority said they would not buy whole catfish.





MARKETING OF SMALL SCALE AQUACULTURE PRODUCTS IN KENTUCKY

Richard Bryant*, Siddhartha Dasgupta

Demographics of surveyed consumers

- Survey conducted in 2 cities of KY with a high Hispanic concentration: Lexington and Shelbyville (N= 73)
- 58% Male
- Average household size = 4
- Mexico 52%; Peru 39%
- 77% <40 years old
- 32% in “factory work” & 20% in agriculture

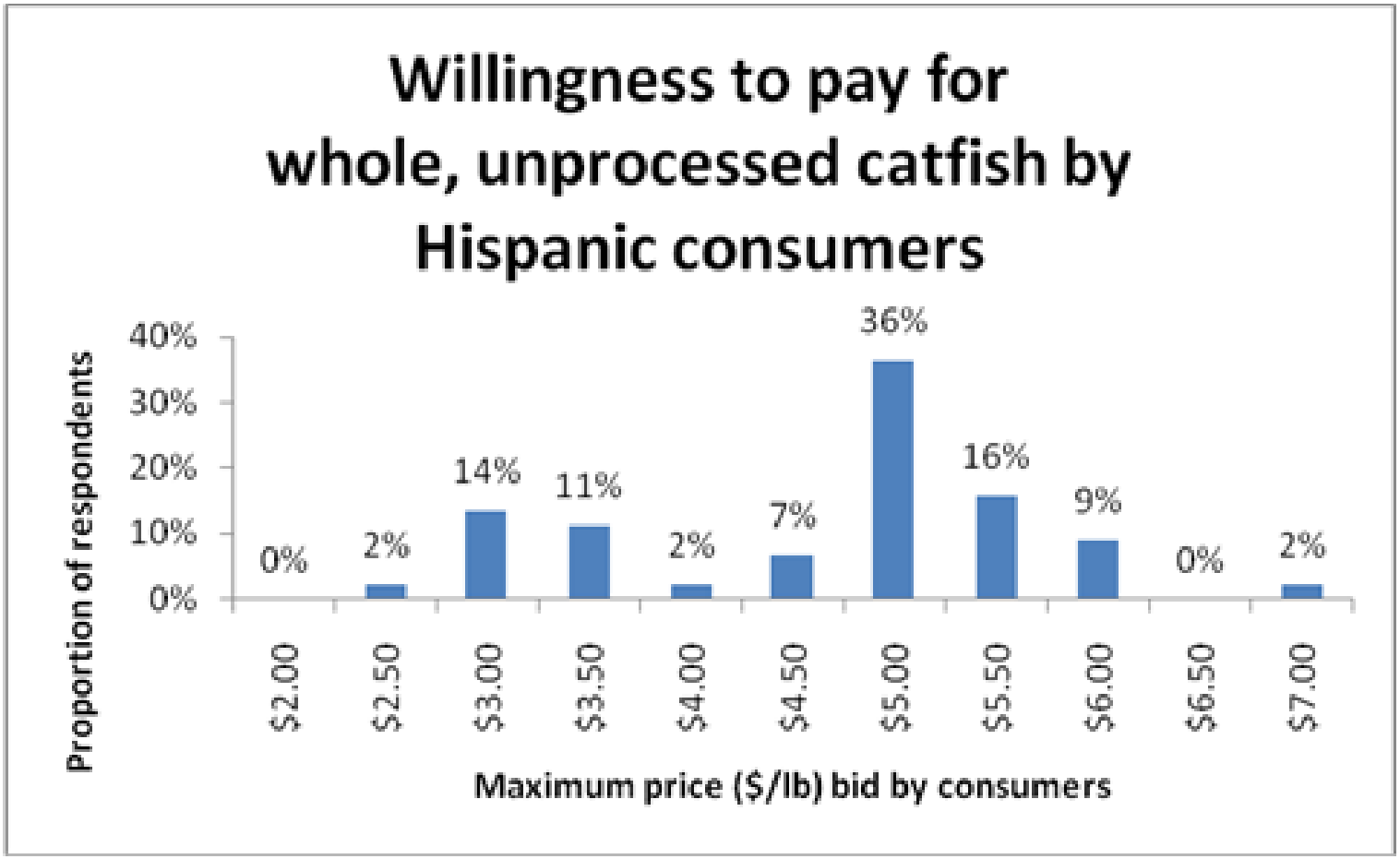
Fish eating habits:

- 56% cook fish at home weekly
- 71% prefer freshwater fish
- 68% like eating catfish “A Lot”
- 20% like eating catfish but not “A lot”

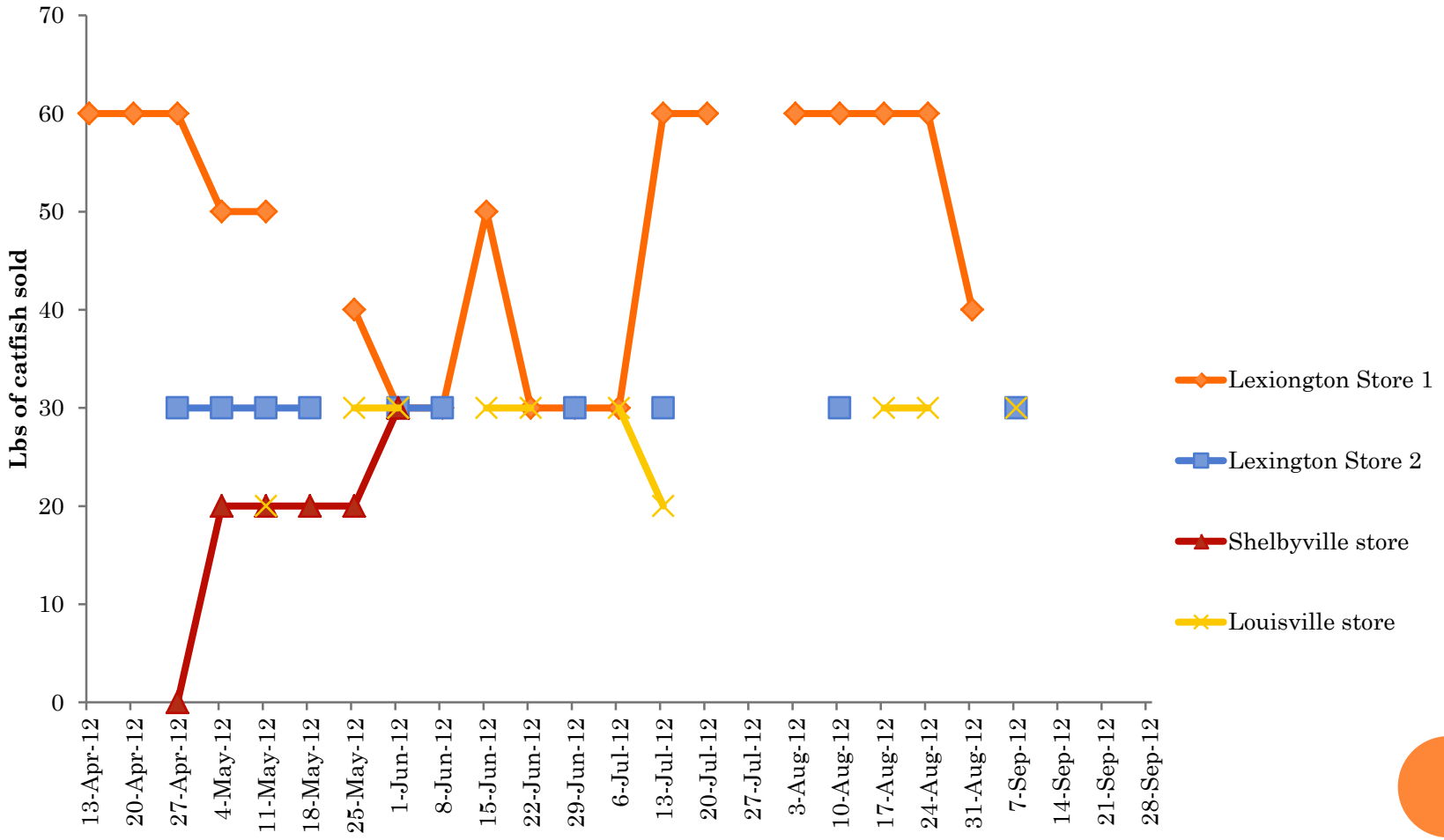
Catfish preference:

- Live fish preferred by 25%
- Fresh gutted fish preferred by 53%
- Fresh fillets preferred by 15%
- They do not like frozen catfish (nor frozen fillets)
- “Will you buy fresh gutted catfish?”
  - 84% YES
  - 3% NO

Distribution of willingness to pay for fresh unprocessed catfish on ice:



Sales of unprocessed catfish on ice in Hispanic grocery stores in Lexington, Shelbyville, and Louisville, KY



Sales of unprocessed catfish on ice in Hispanic grocery stores in Lexington, Shelbyville, and Louisville, KY

- Average weekly demand per store = 30 lb.
- Store will pay $1.50-$1.70/lb for unprocessed catfish on ice.
- Preferred size = 1.5-2lb fish.

Results from survey done at several community supported agriculture (CSA) operations in KY

- N= 60
- Each CSA consumer was given 2 fresh catfish fillets, along with a simple recipe.
- The consumers were asked to eat the fish, and then answer a set of questions.
- A payment-card approach was used to determine their willingness to pay for fresh catfish fillets.

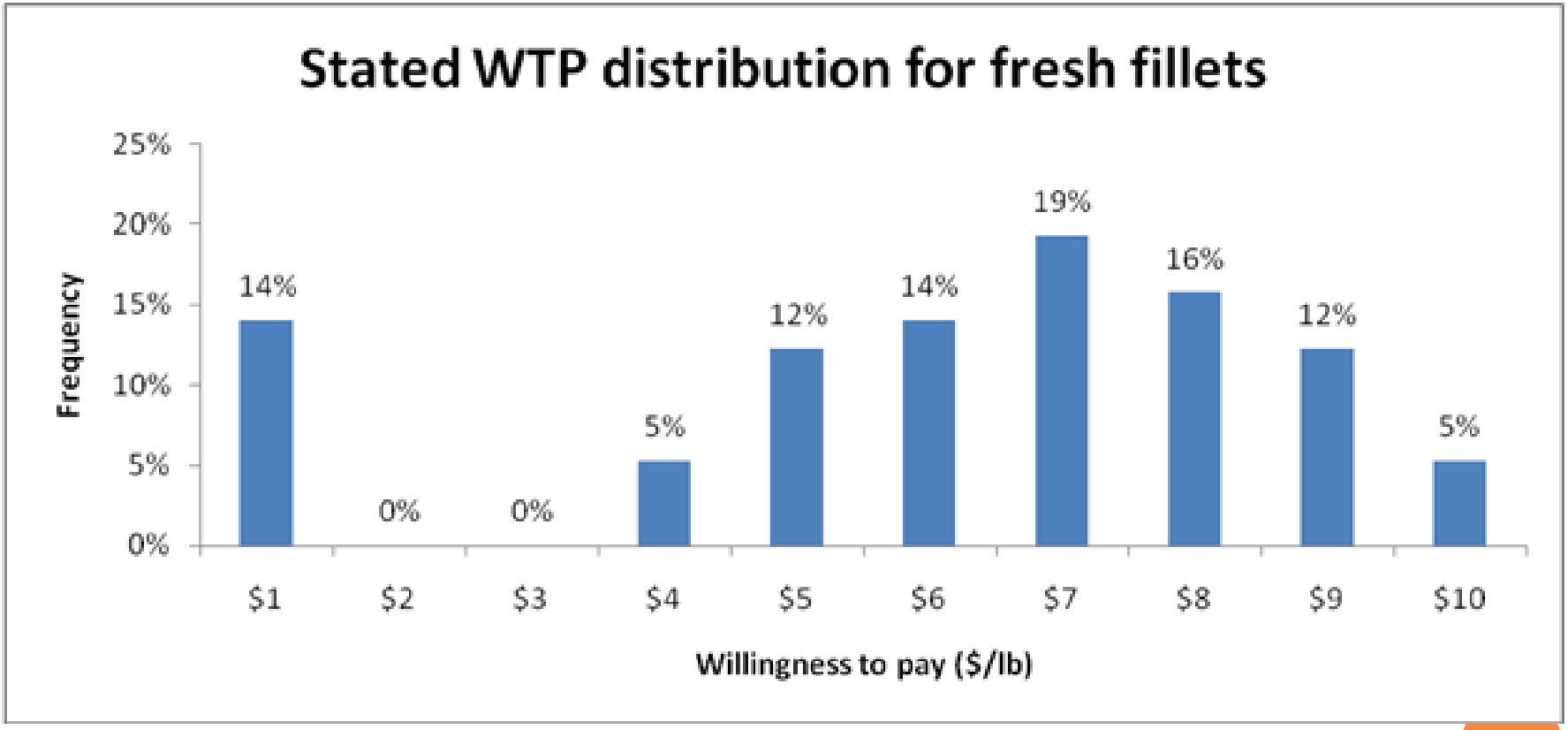
Demographics of surveyed CSA consumers:

- 97% of CSA consumers were Caucasian
- Education (proxy of income): 60% had either graduate degrees or professional degrees
- 53% of respondents were female
- 53% of respondents live in a suburban area
- 60% of respondents were 50 years old or older
- Average household size = 2.68

Preferences for fish and catfish

- 93% indicated that they like to eat freshwater fish
- 13% ate catfish once per month; 45% ate catfish a few times a year; 42% ate catfish less often than “a few times a year”
- With respect to the sample of fresh fillets they received;
  - Taste: 92% either “loved it” or “liked it”
  - Texture: 82% either “loved it” or “liked it”
  - Freshness: 97% either “loved it” or “liked it”
- 67% consider regular or year-round availability of a product is important
- 75% want their CSA to offer fresh, locally-grown catfish fillets as a future protein

Stated willingness to pay for fresh catfish fillets:



Stated willingness to pay for fresh catfish fillets:

- Demand for fresh catfish fillets: 72% of CSA consumers indicated that they will be willing to buy 1-10lb of fillets per month
- 17% of respondents said that they will not buy any catfish fillets
- 3% of respondents will buy more than 10 lbs of catfish fillets per month

Conclusions

- Hispanic markets are a good avenue for selling whole fish to grocers with a “carneceria” (butcher shop).
- Suppliers could get weekly orders of 20-60 lbs/week, at a price ranging from $1.50/lb to $1.70/lb.
- Fresh catfish from Kentucky farms could be sold directly to consumers at a price of $3.00/lb or higher.
- Community Supported Agriculture projects could be a potential market for Kentucky catfish fillets.

Improving Market Access for Small-Scale Seafood Producers

Richard Bryant, Siddhartha Dasgupta, Angela Caporelli, Laura Tiu

Kentucky State University

College of Agriculture, Food Science and Sustainable Systems

Cooperative Extension Program

- The USDA Agricultural Marketing Service provides funds for improvement in aquaculture marketing
- Project goals:
  - Feasibility of a small-scale seafood marketing system
  - Using low to moderate investment
  - Selling to fresh/live seafood markets in Kentucky and Ohio

Questionnaire Participants

- Kentucky and Ohio Restaurants
- 289 restaurants emailed(165 in Kentucky and 124 in Ohio)
- 50 questionnaires hand delivered in Cincinnati, Ohio
- Ohio Restaurant Association's "News Bites" e-publication
- 52 responses (39 from Kentucky, 13 from Ohio)

Questionnaire

- Restaurants were asked:
  - the types of freshwater fish they currently served
  - preferences for seafood characteristics:
    - Freshness
    - Taste
    - Form (whole on ice, live, fillets, etc.)
    - Size of fish
    - Locally grown product
  - price (willingness to pay)
  - preferred delivery schedule

Questionnaire

- The questionnaire focused on fish cultured in Kentucky and/or Ohio:
  - Catfish
  - Largemouth Bass
  - Bluegill
  - Hybrid Striped Bass
  - Paddlefish
  - Yellow Perch
  - Rainbow Trout

Preferred Attributes of Local Seafood

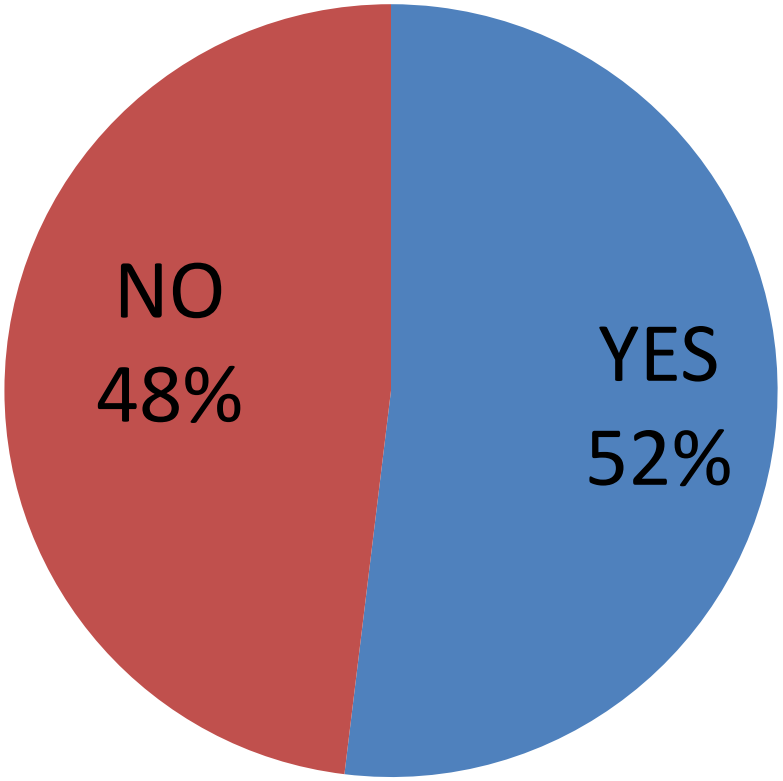
- Restaurants were asked to indicate preferred:
  - Fish species
  - Product form(whole on ice, live, fillets, etc.)
  - Product size
  - Price (willingness to pay)
  - Delivery schedule

RESULTS

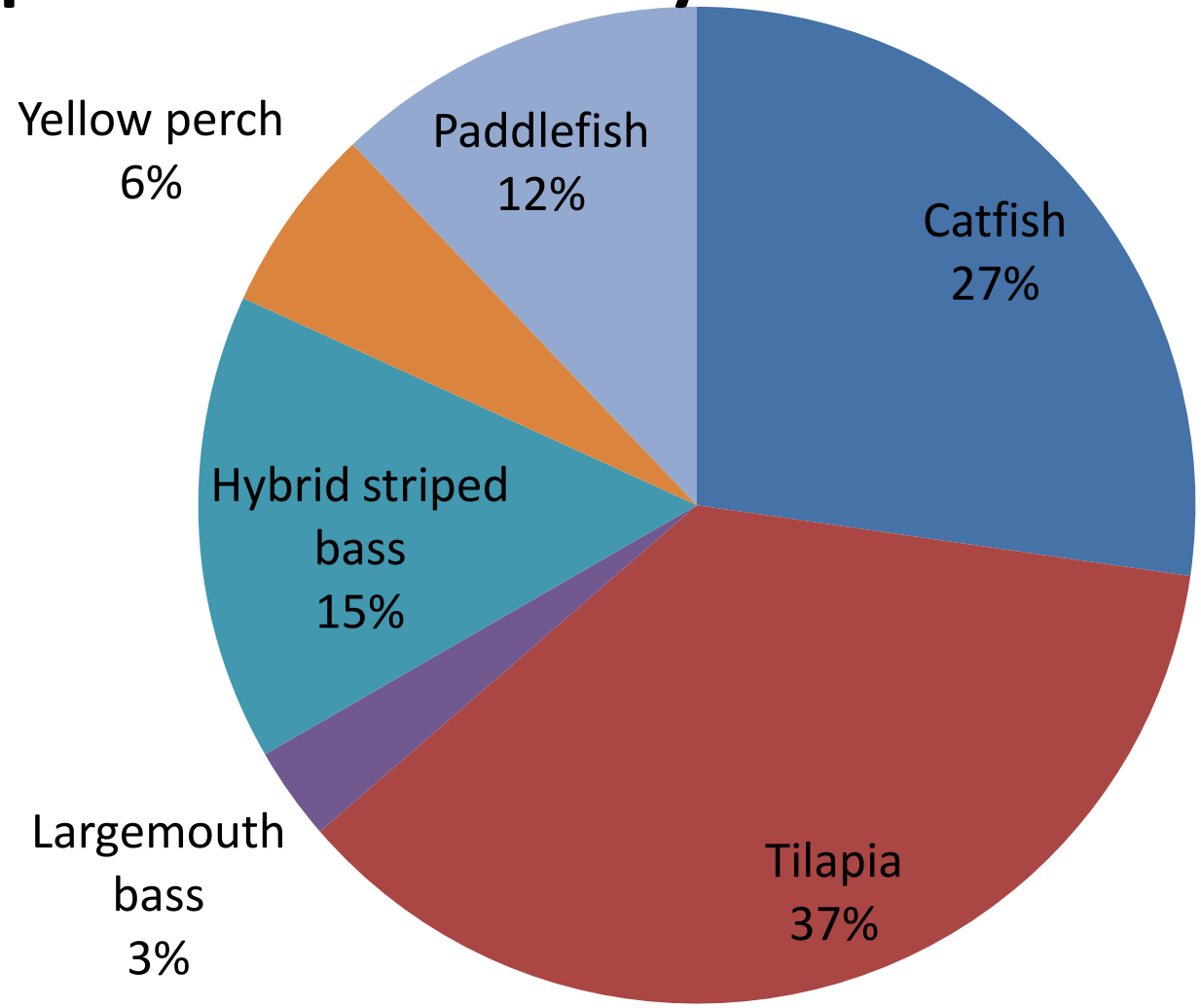
Preferred Species

- The restaurants chose Rainbow Trout (44%) as the fish they were most interested in trying at their restaurant
- The second was Hybrid Striped Bass (27%) and the third was Channel Catfish (12%)

Proportion of Restaurants Offering Freshwater Fish



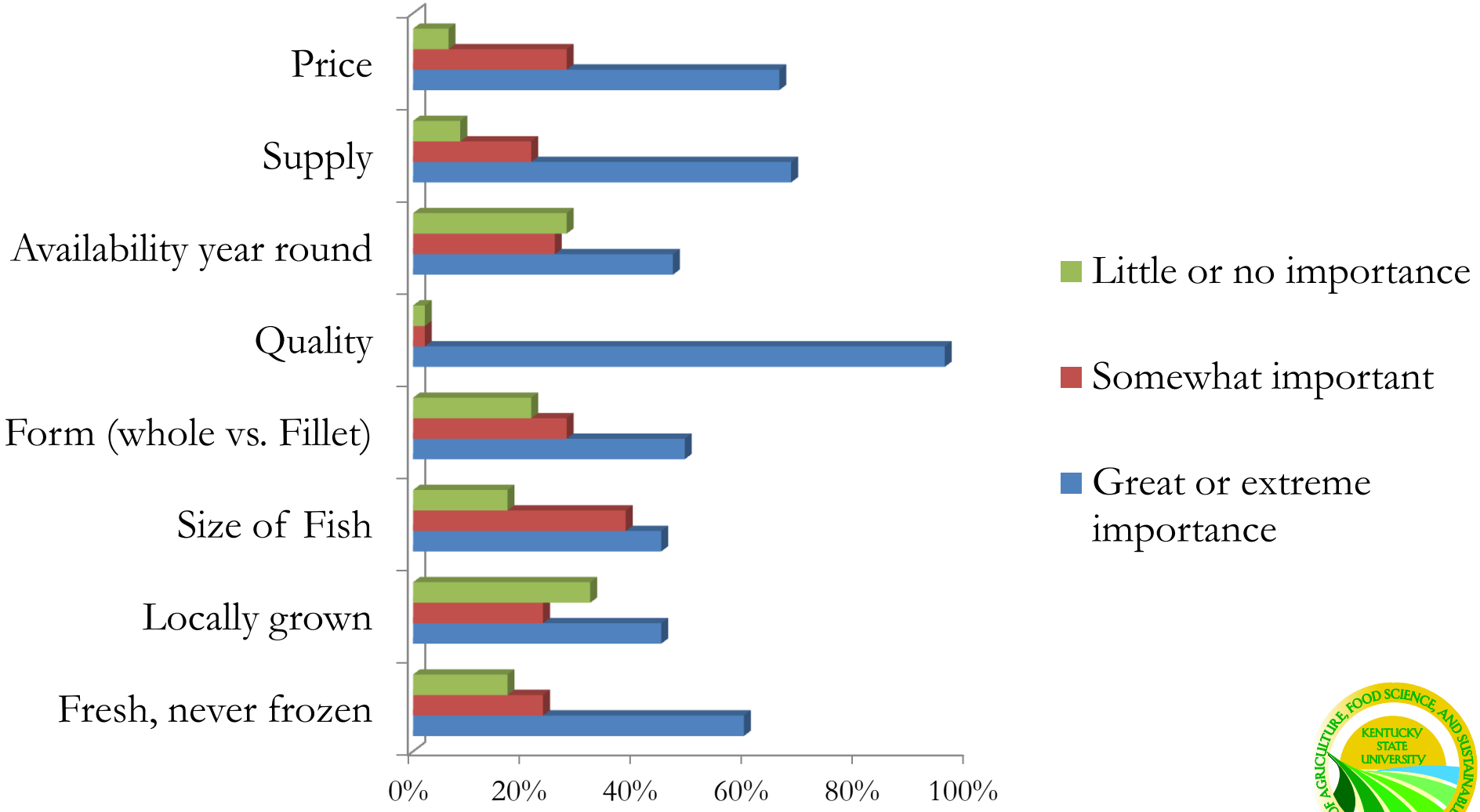
Types of Fish Currently Served in Restaurants



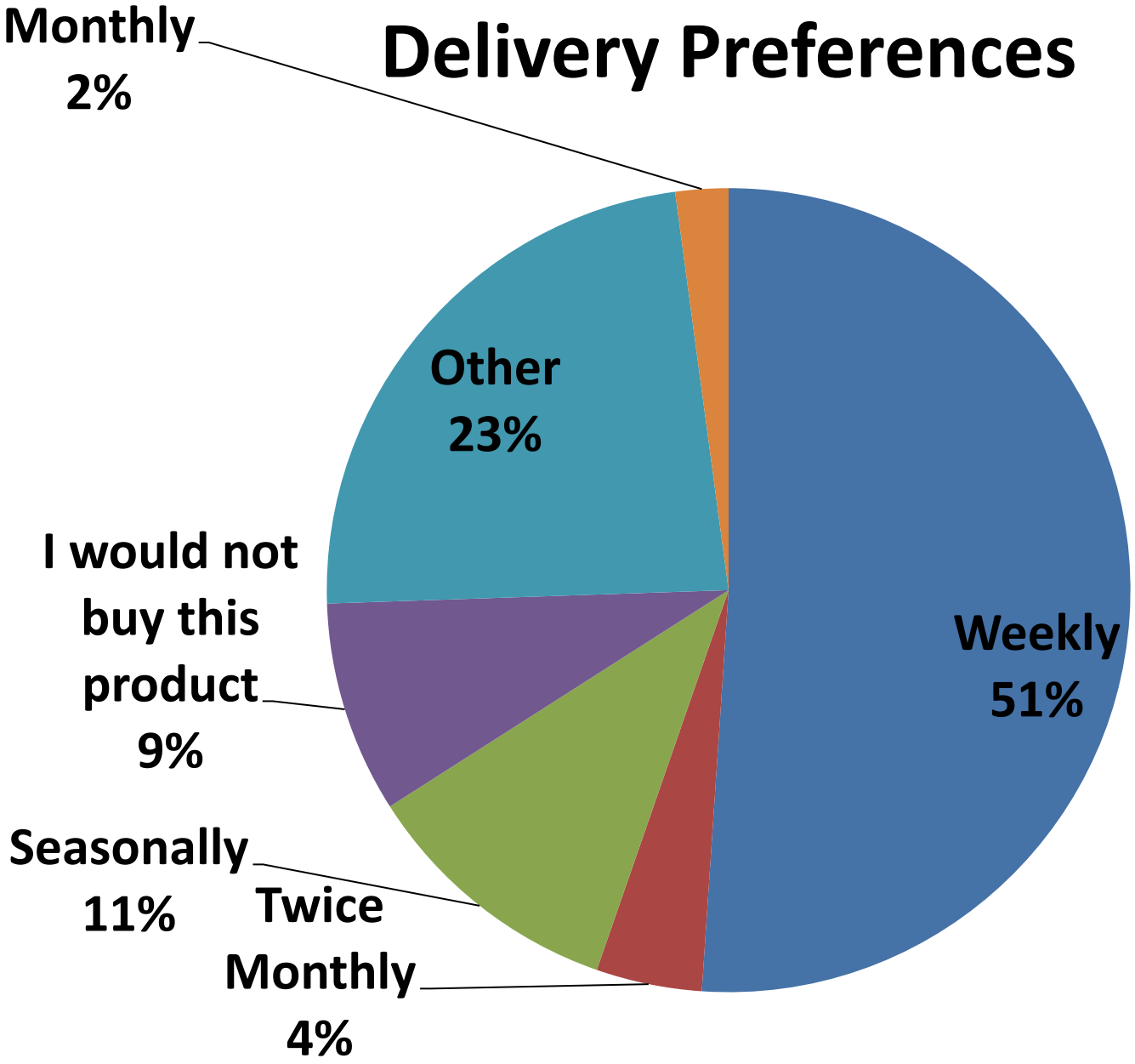
Importance of Seafood Attributes

- Restaurants rated the importance of attributes on this scale:
  - Not Important
  - Little
  - Moderate
  - Great
  - Extremely Important
- Attributes included:
  - Price
  - Supply
  - Availability year round
  - Quality
  - Form
  - Size
  - Locally grown
  - Fresh, not frozen

Importance of Seafood Attributes



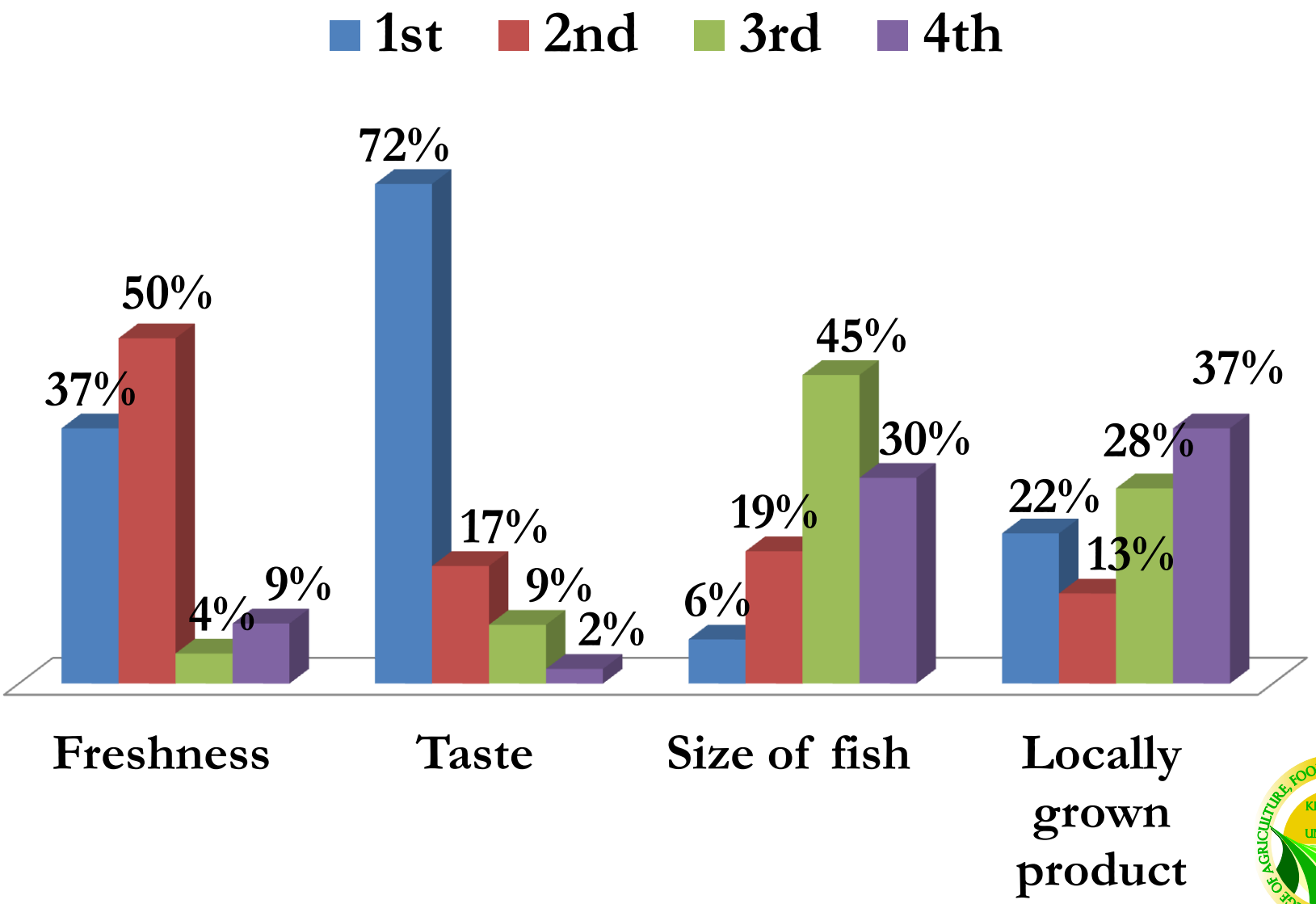
Delivery Preferences



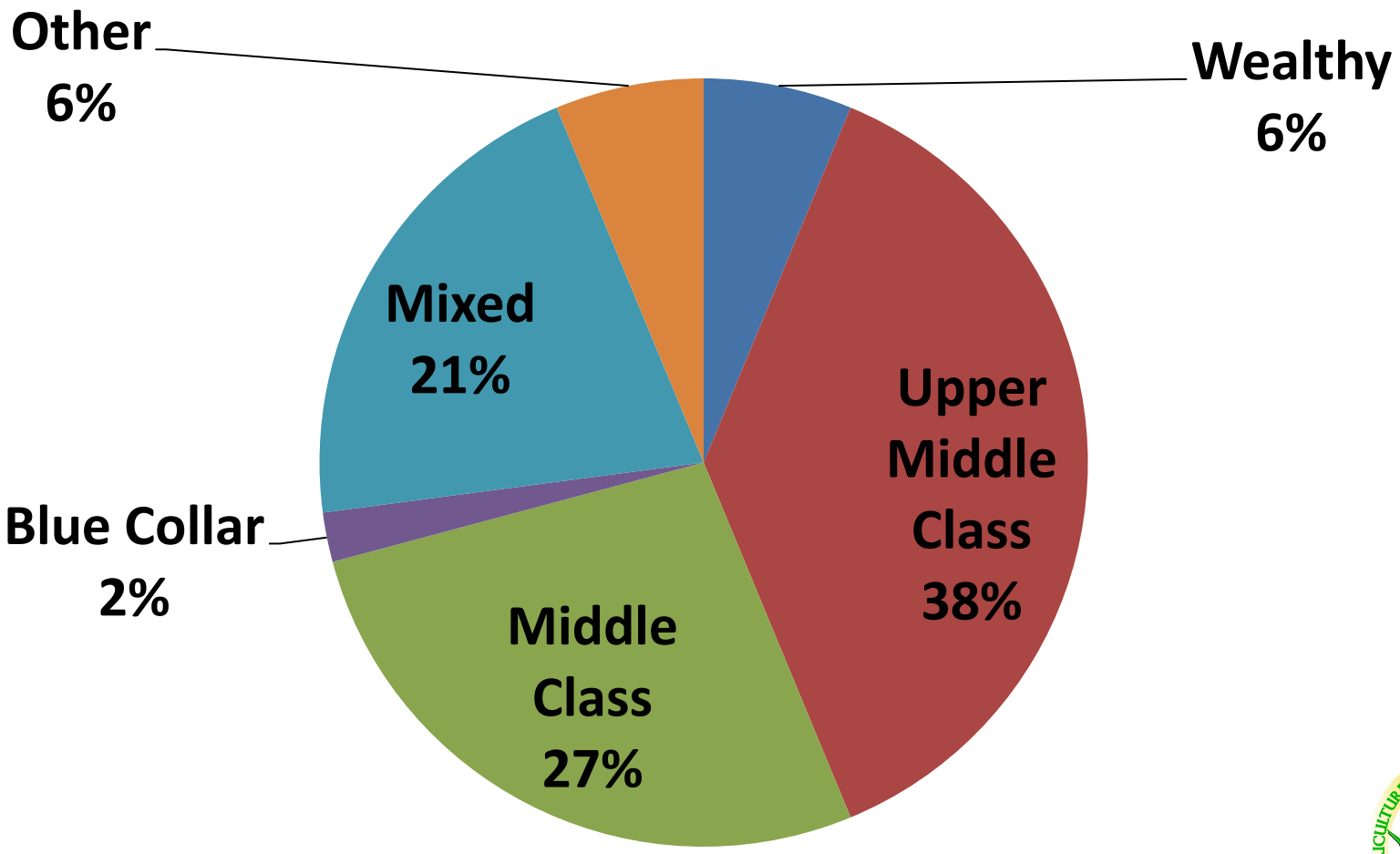
Attributes of Locally-Grown Fish

- Restaurants ranked four attributes of locally-sourced fish.
- Attributes included:
  - Freshness
  - Taste
  - Size
  - Locally-grown product

Attributes of Locally Grown Fish



Socio-economic Status of Restaurant Customers



Number of Seats

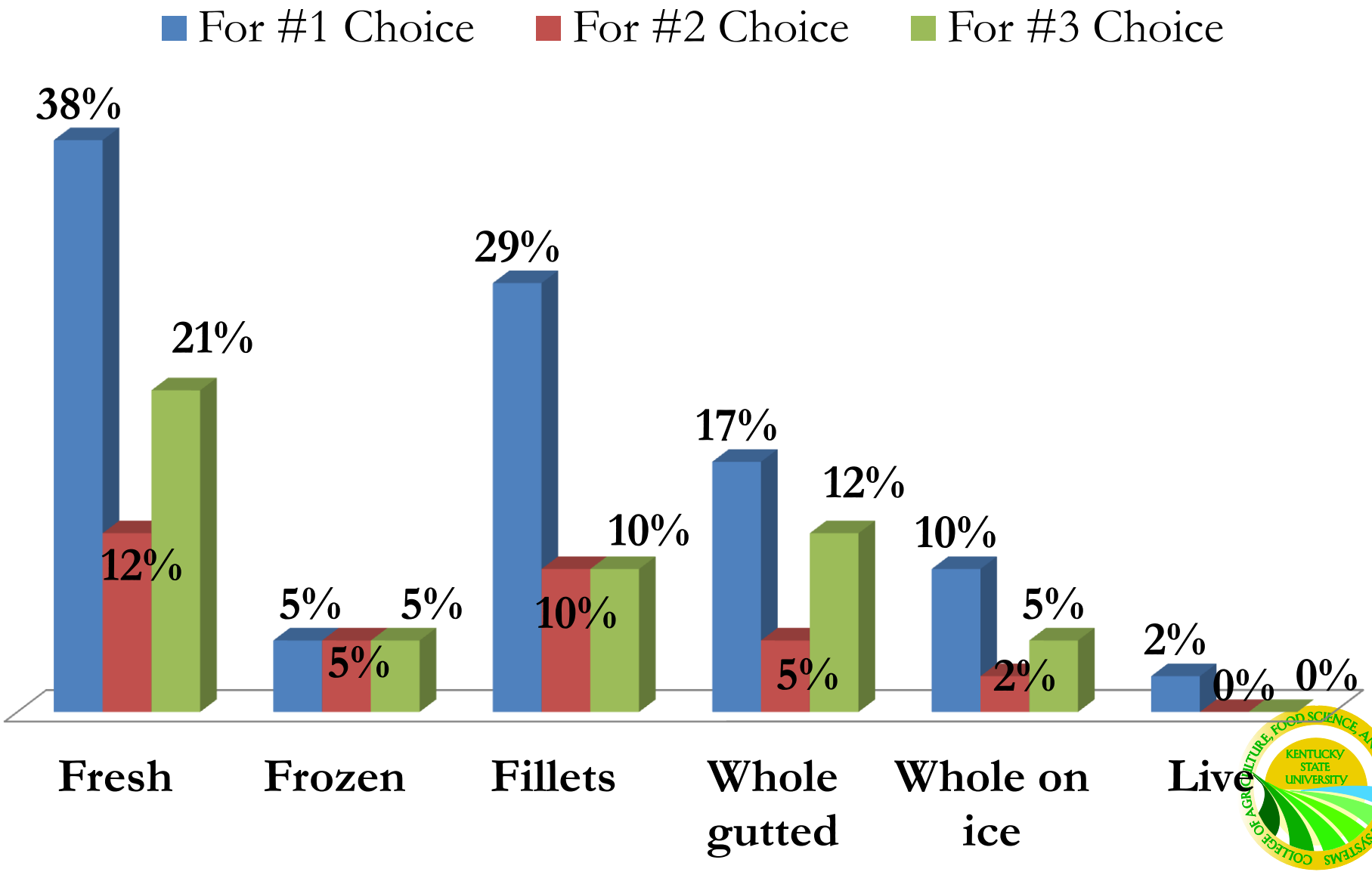
- Average: 132 seats
- Range: 20 – 600 seats

TROUT

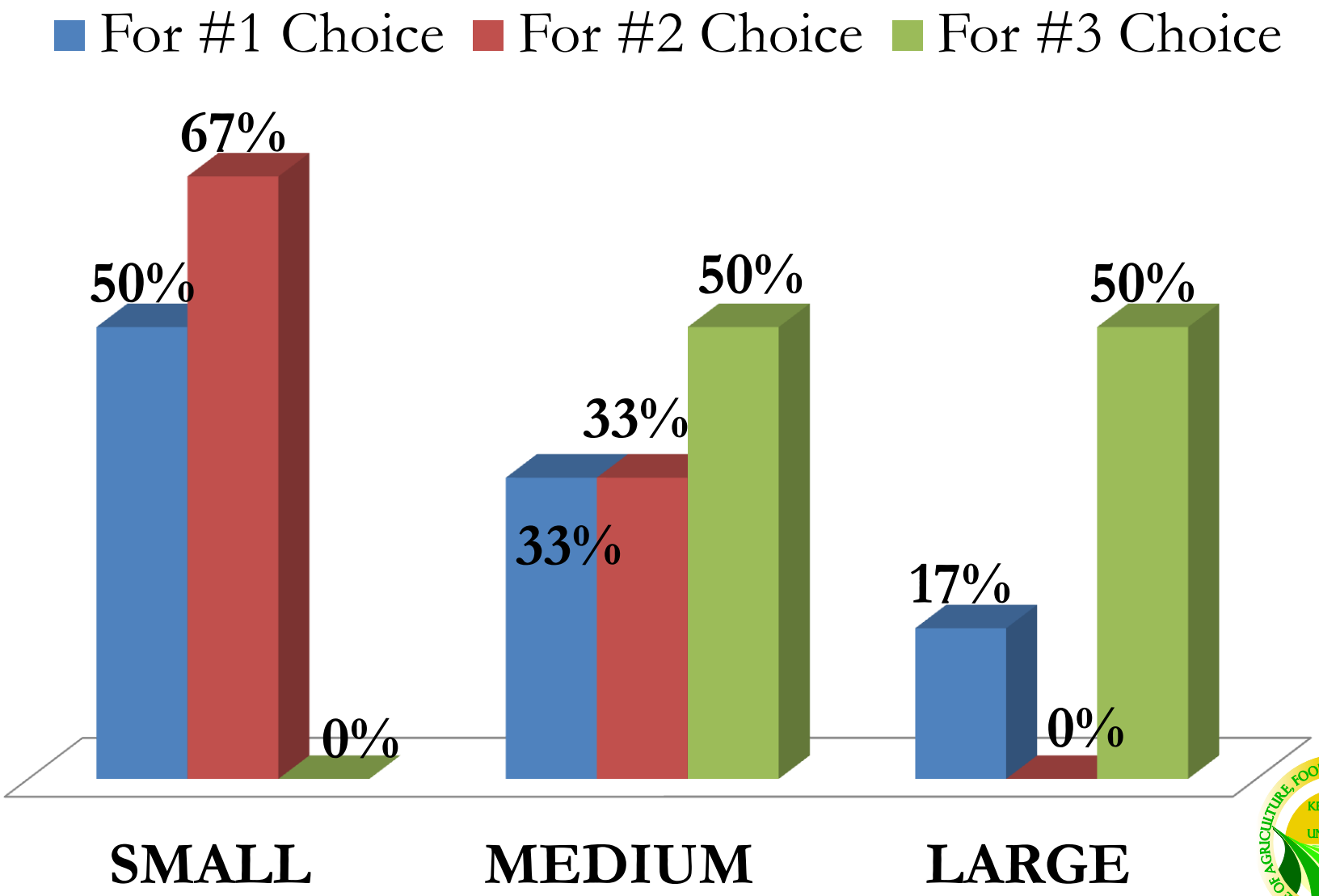
Trout Size (40% skin on fillet dress out)

- SMALL: 0-4.9 oz Fillet; 0-1.5 lbs Whole
- MEDIUM: 5-8.9 oz Fillet; 1.6-2.8 lbs Whole
- LARGE: 9 oz & up Fillet; 2.9 lbs & up Whole

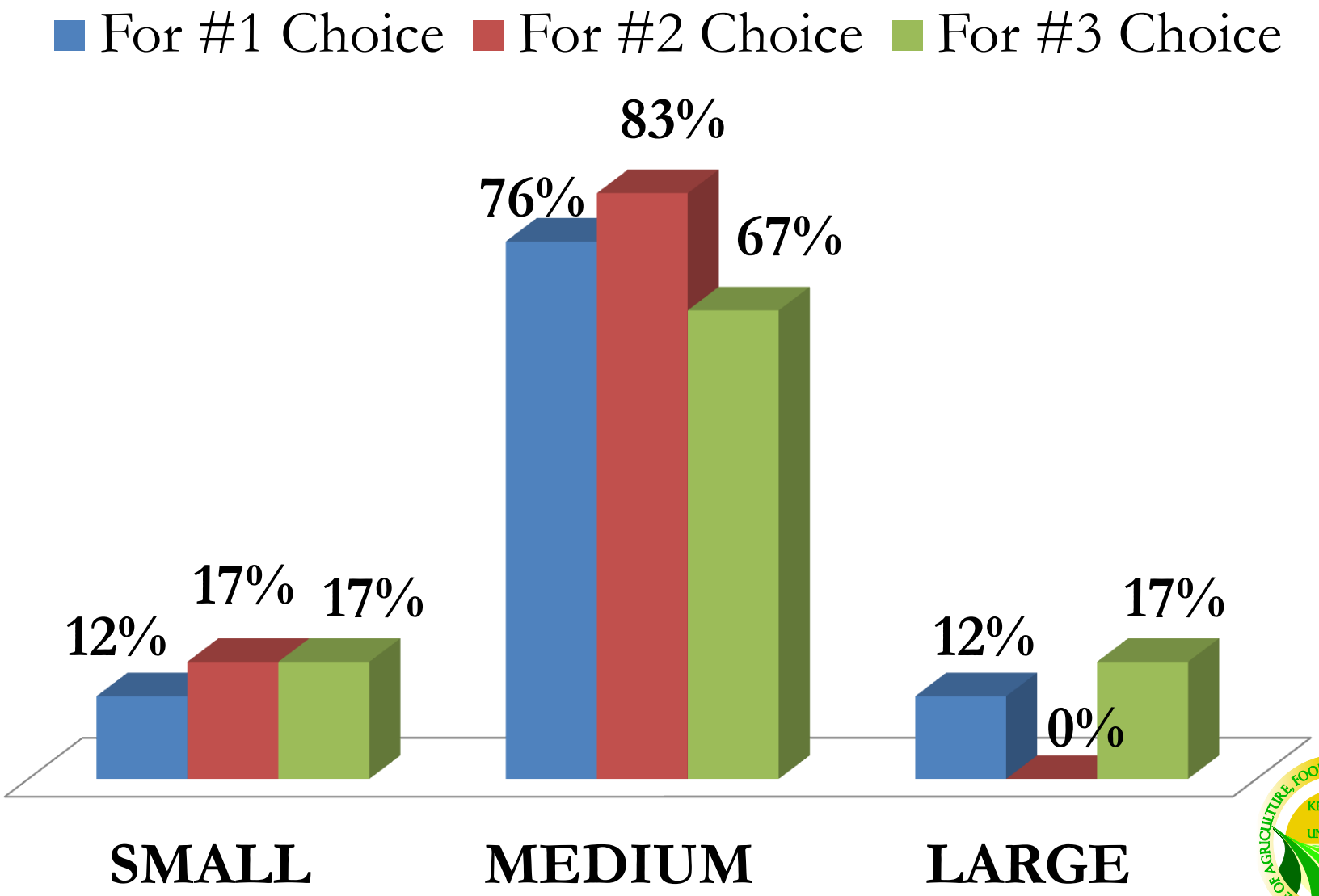
Preferred Form of Trout



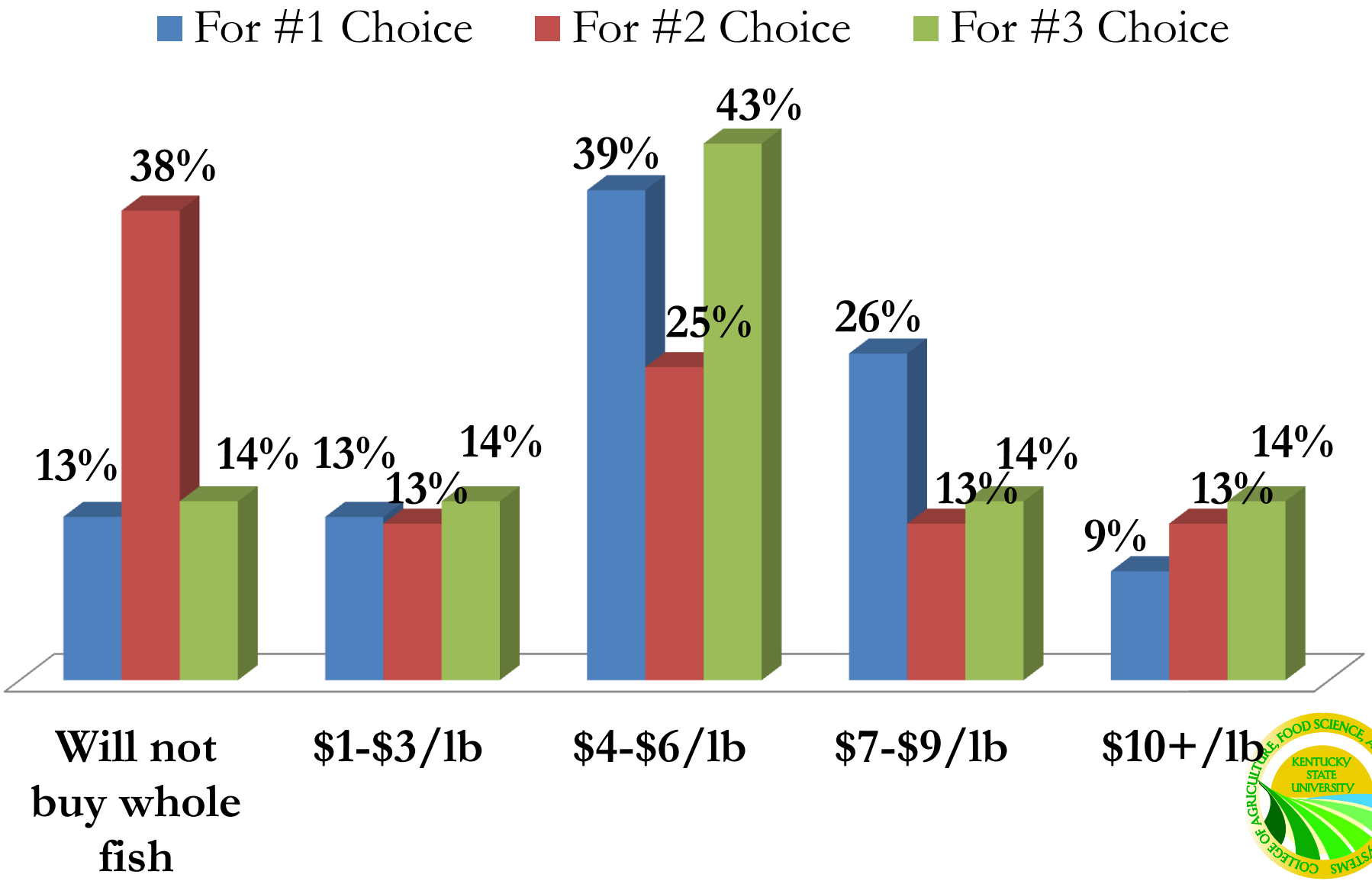
Preferred Size for Whole Trout



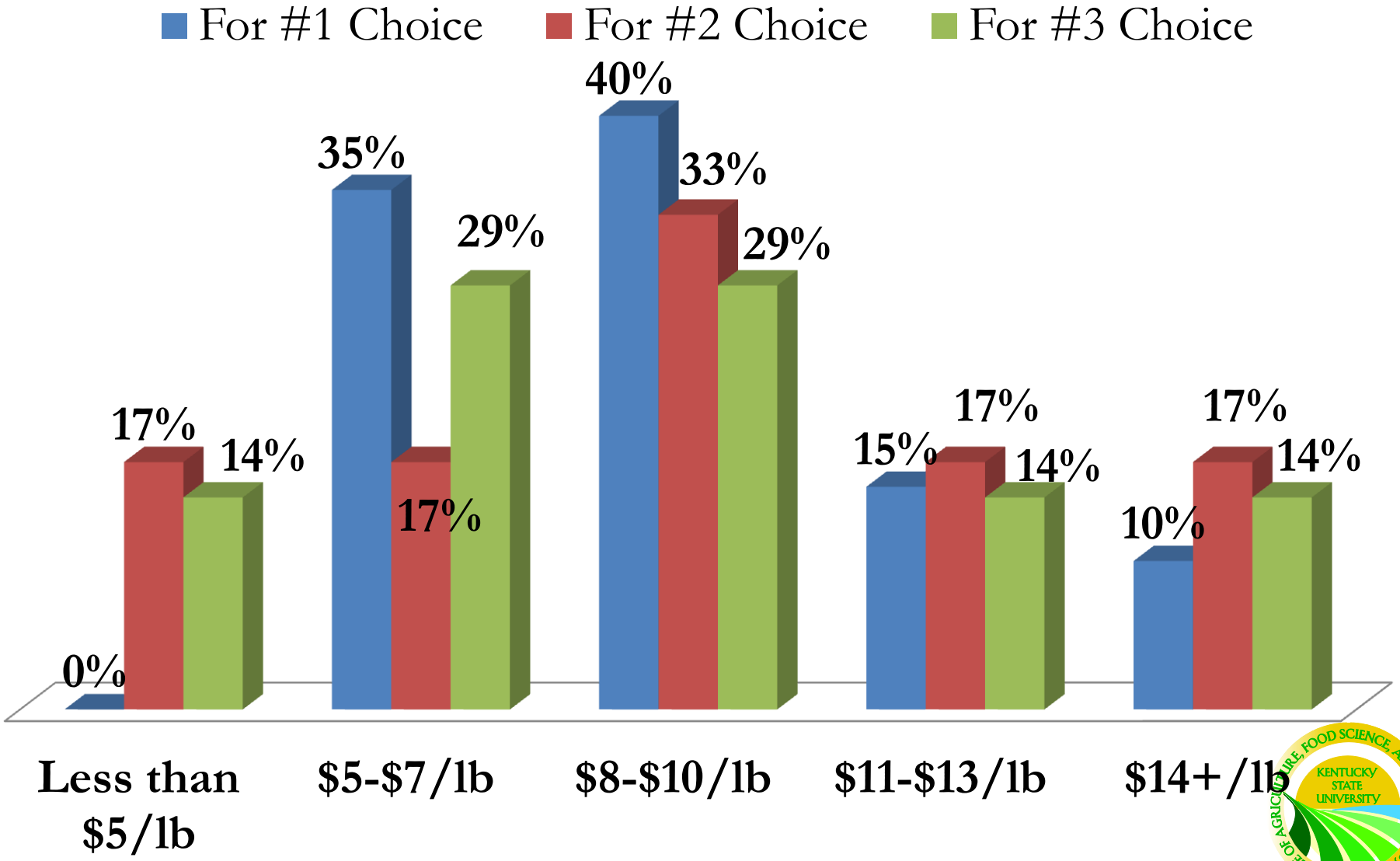
Preferred Size for Trout Fillets



Willingness to Pay for Whole Trout



Willingness to Pay for Trout Fillets

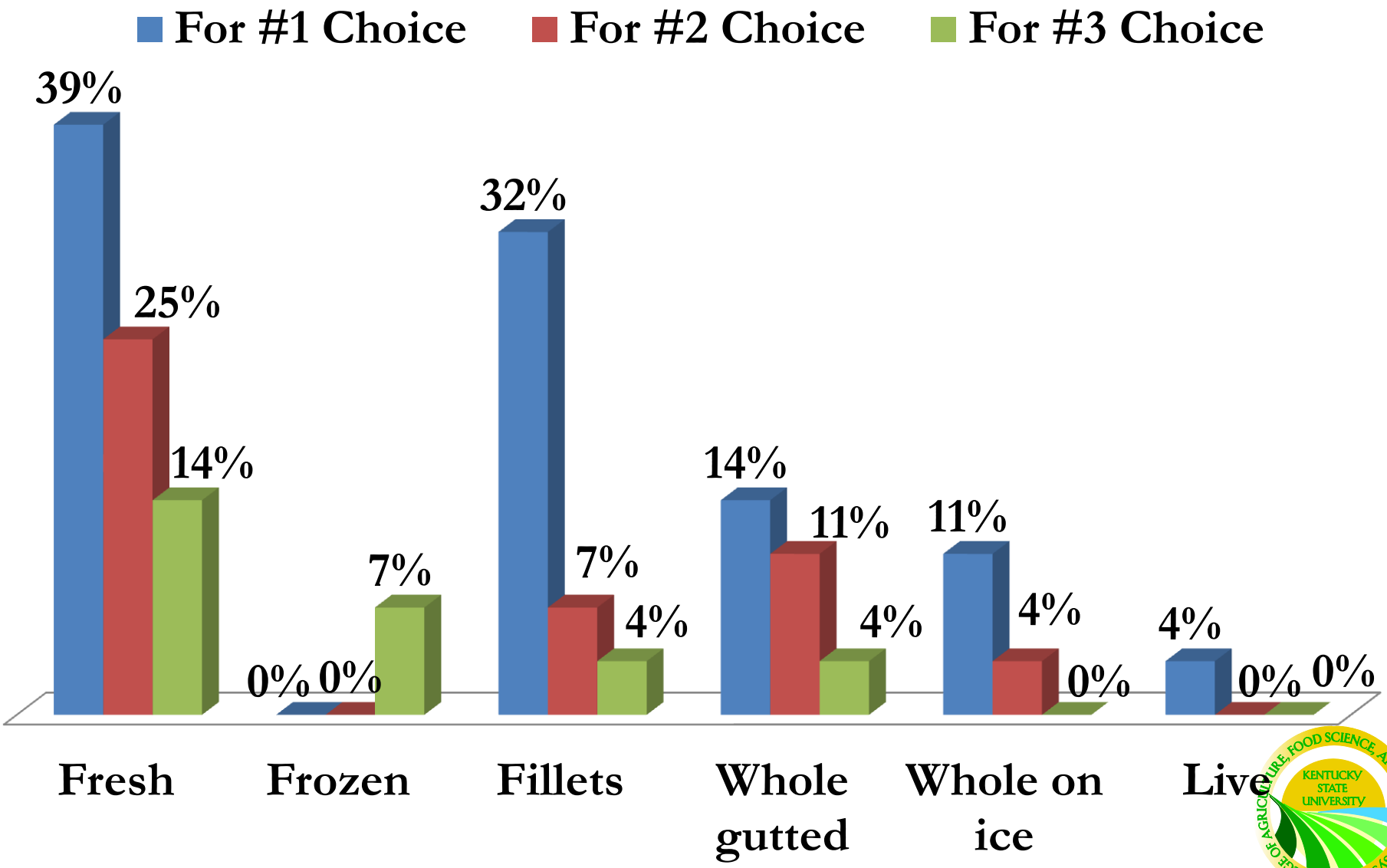


HYBRID STRIPED BASS

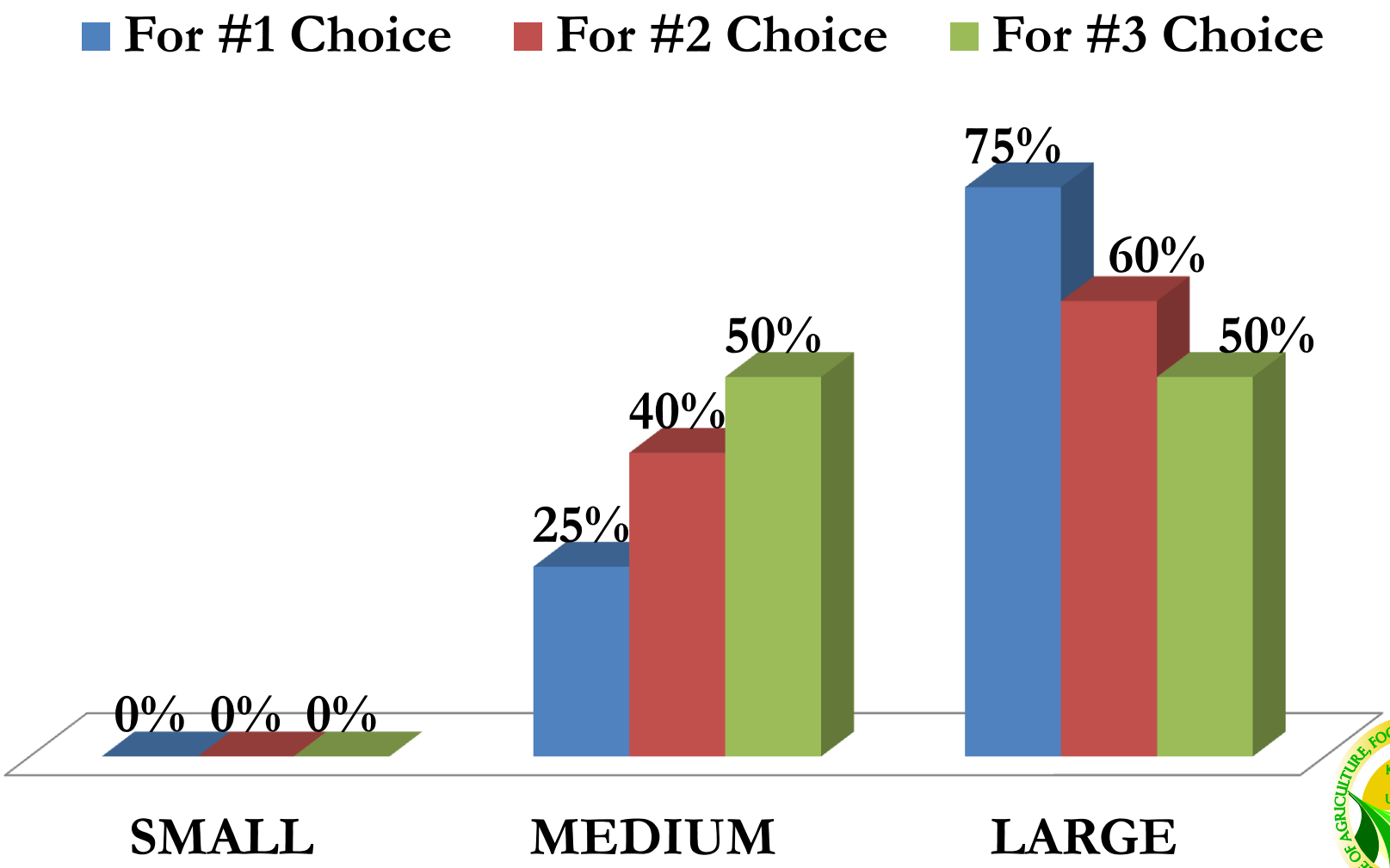
Hybrid Striped Bass Size (35% fillet dress out)

- SMALL: 0-4.9 oz Fillet; 0-1.8 lbs Whole
- MEDIUM: 5-8.9 oz Fillet; 1.9-3.2 lbs Whole
- LARGE: 9 oz & up Fillet; 3.3 lbs & up Whole

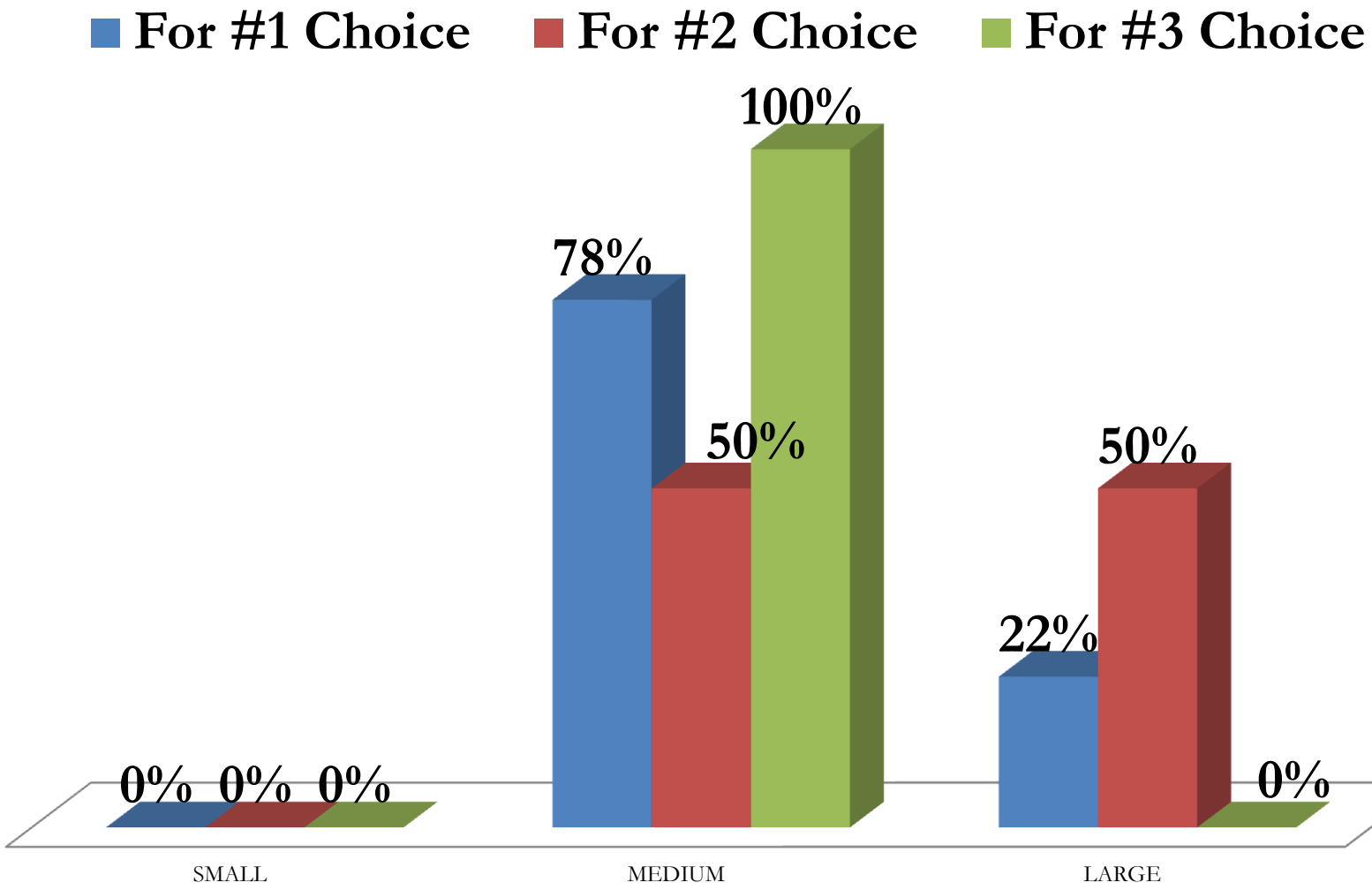
Preferred Form for Hybrid Striped Bass



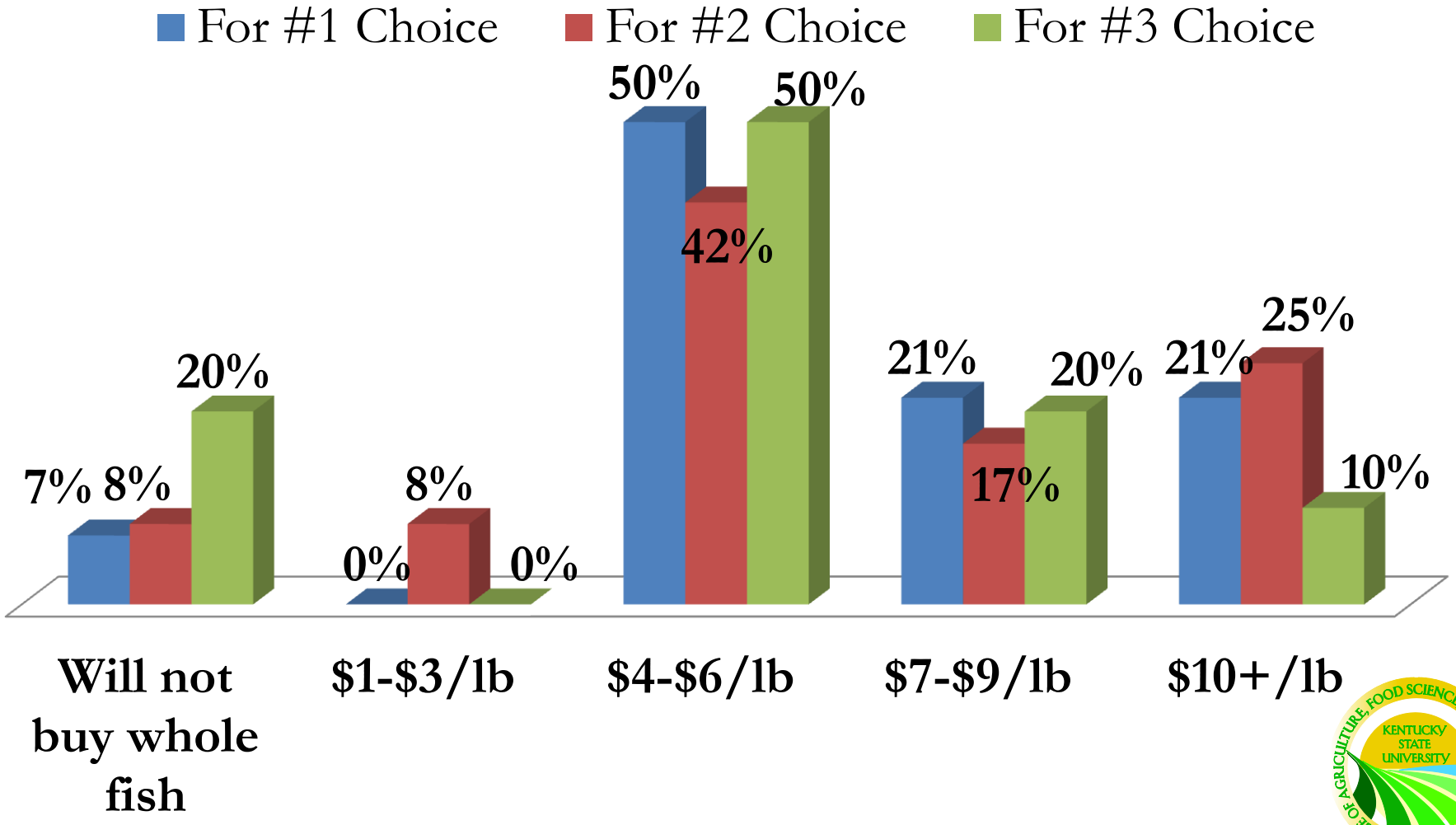
Preferred Size for Whole Hybrid Striped Bass



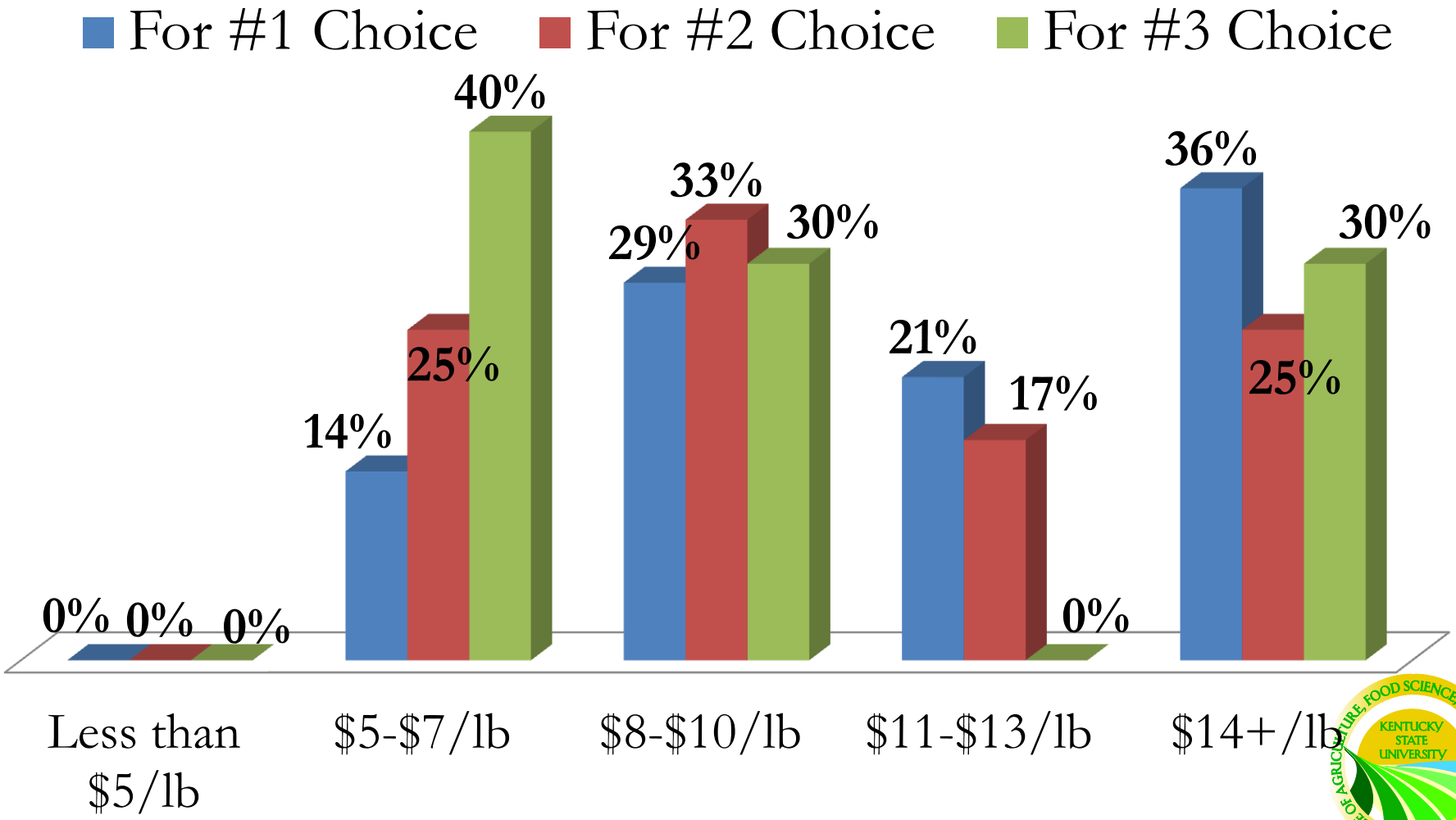
Preferred Size for Hybrid Striped Bass Fillets



Willingness to Pay for Whole Hybrid Striped Bass



Willingness to Pay for Hybrid Striped Bass Fillets

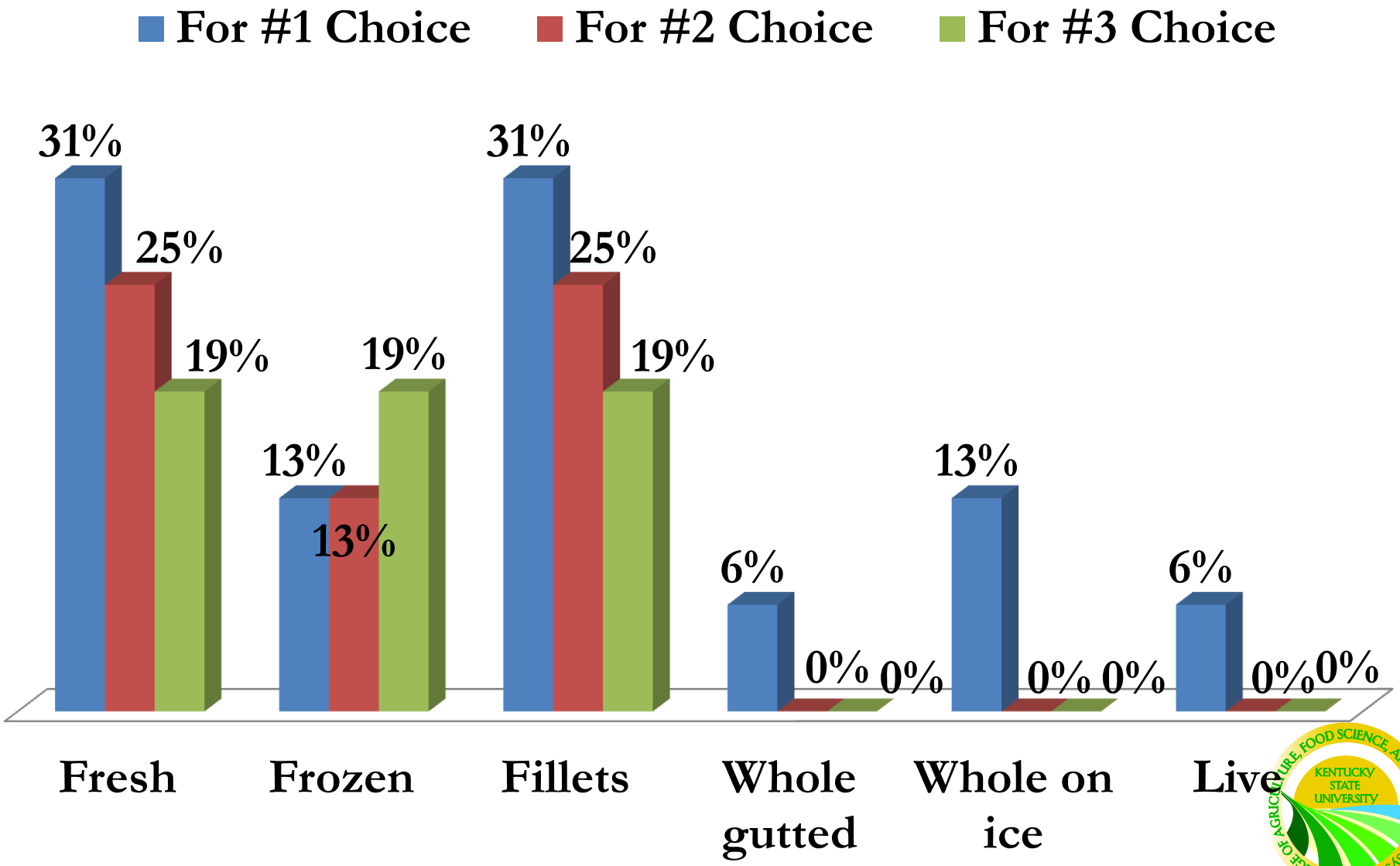


CATFISH

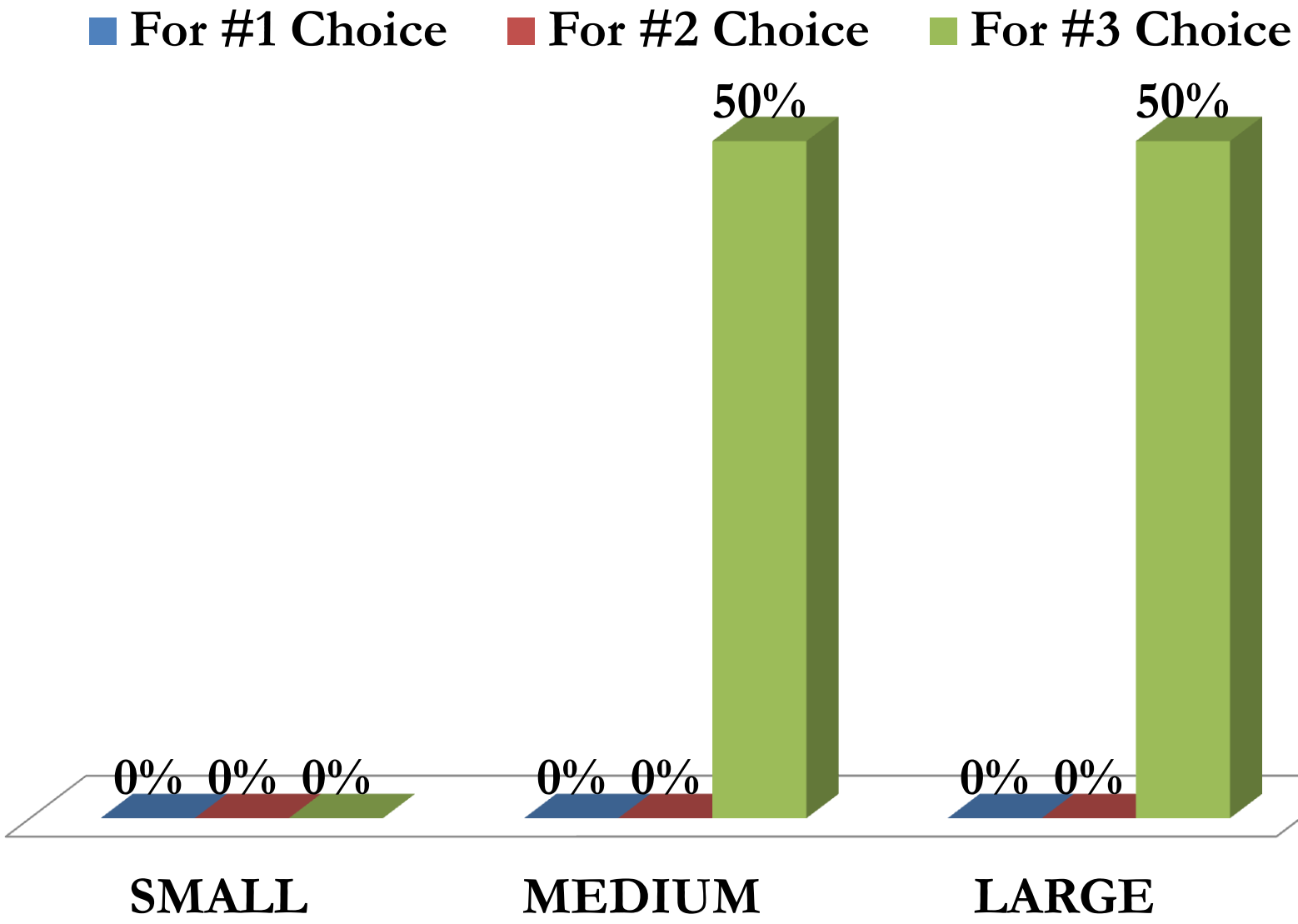
Catfish Size (45% fillet dress out)

- SMALL: 0-4.9 oz Fillet; 0-1.4 lbs Whole
- MEDIUM: 5-8.9 oz Fillet; 1.5-2.5 lbs Whole
- LARGE: 9 oz & up Fillet; 2.6 lbs & up Whole

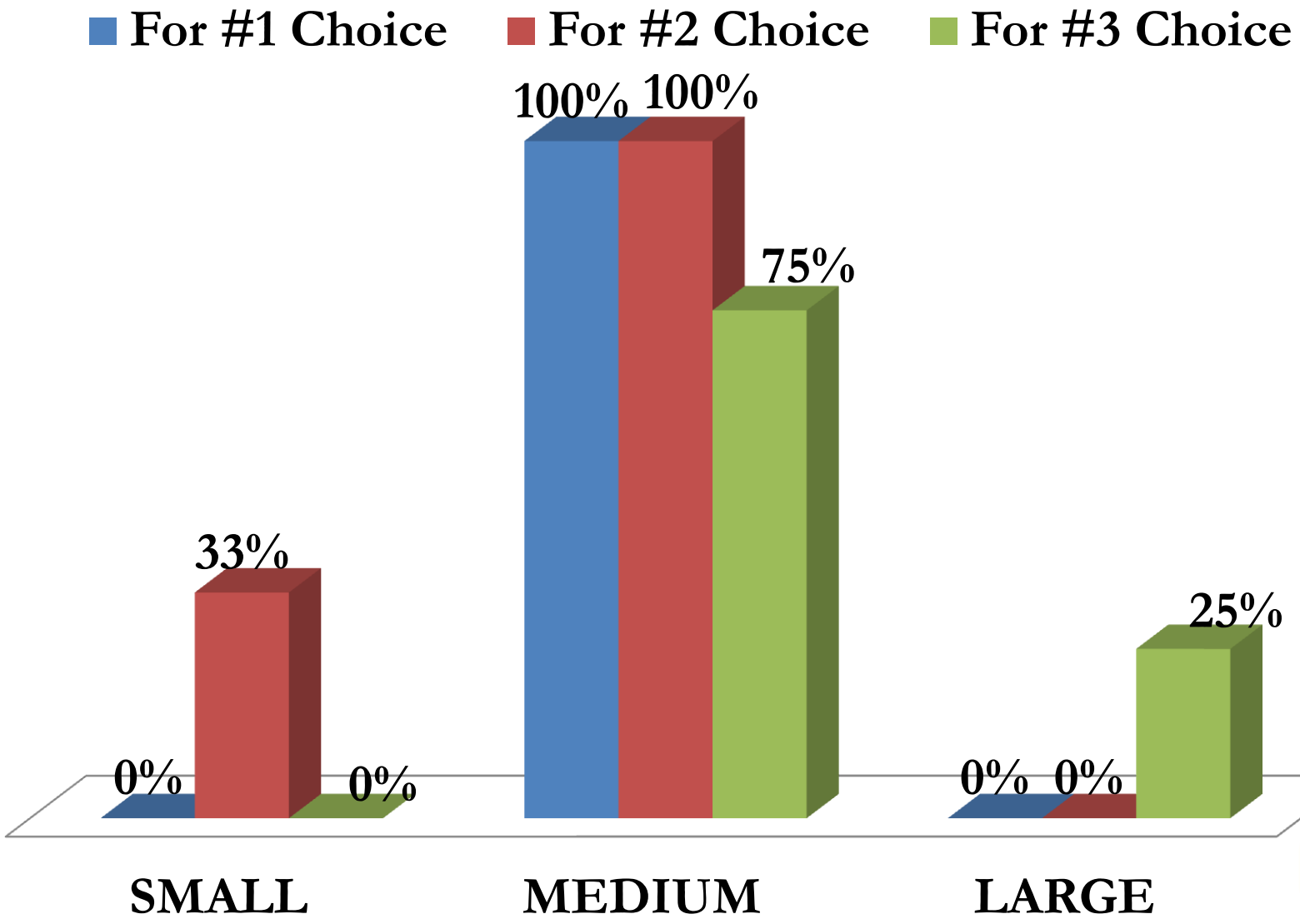
Preferred Form of Catfish



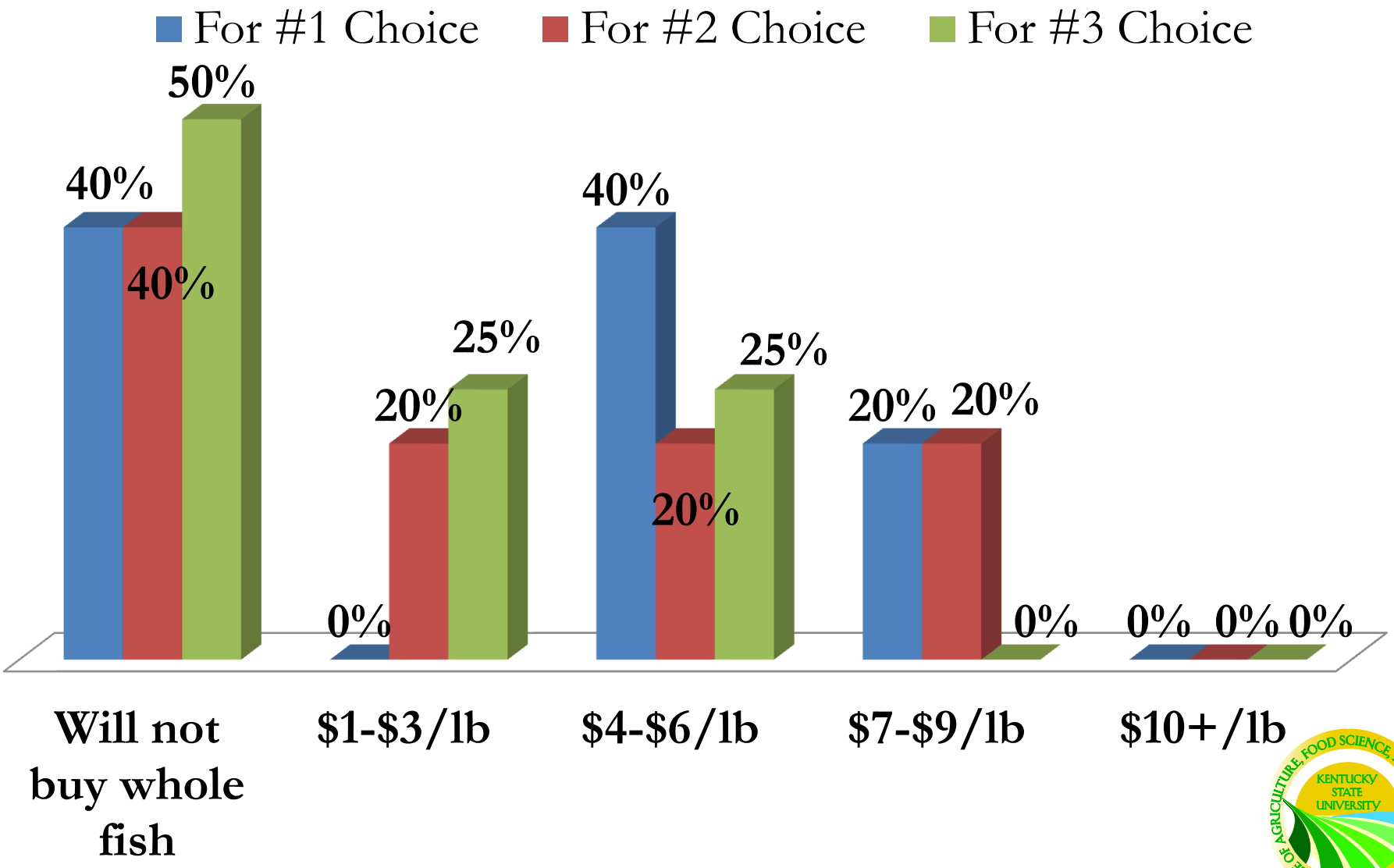
Preferred Size for Whole Catfish



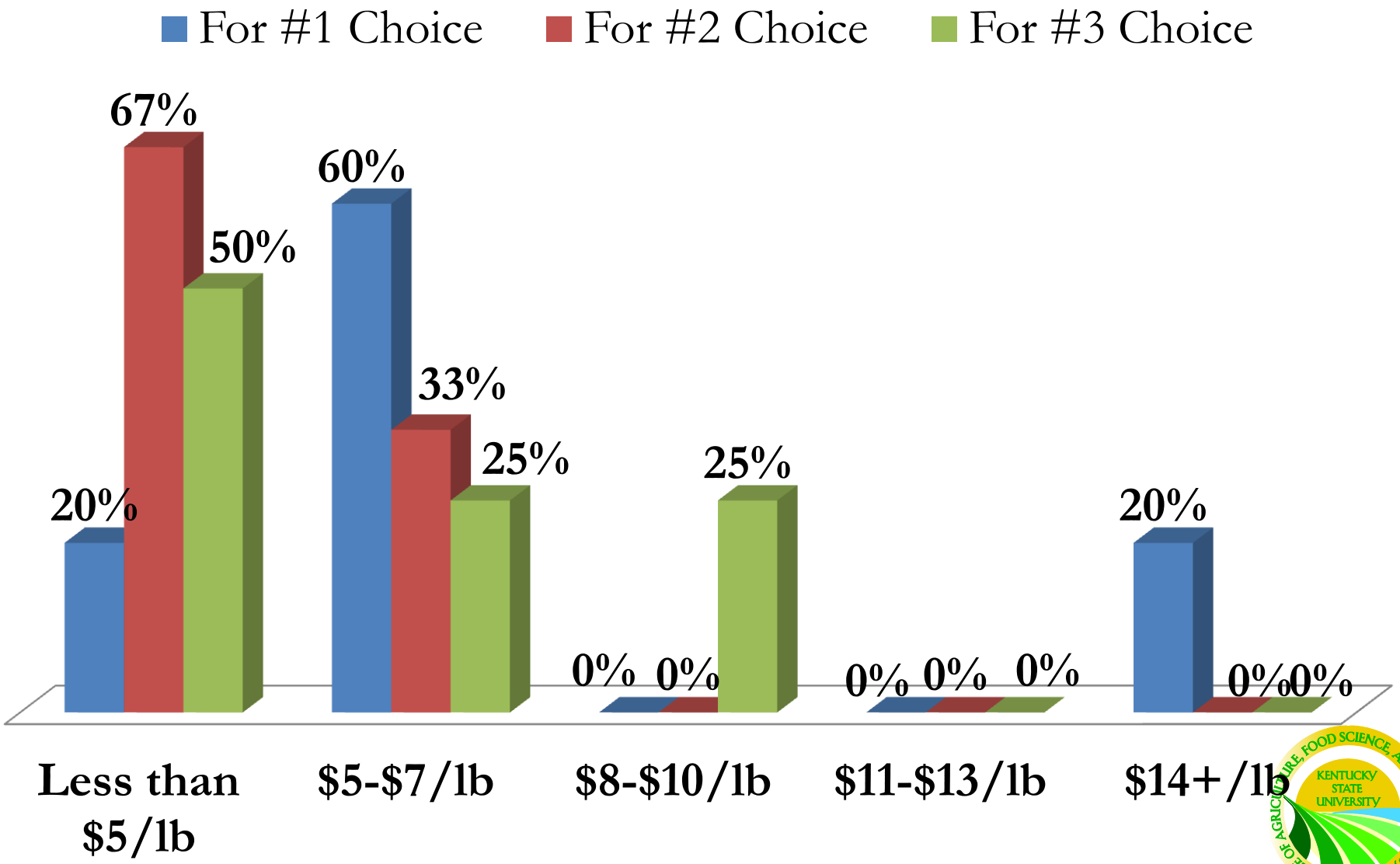
Preferred Size for Catfish Fillets



Willingness to Pay for Whole Catfish



Willingness to Pay for Catfish Fillets



CONCLUSIONS

- Quality and taste are the two most important attributes that restaurants are concerned about with seafood

CONCLUSIONS: TROUT

- Fresh and Filleted Trout are the most preferred form
- Small whole trout at $4-$6/lb preferred
- Medium fillets at $8-$10/lb preferred

CONCLUSIONS: HYBRID STRIPED BASS

- Fresh and Filleted Hybrid Striped Bass are the most preferred form
- Large whole Hybrid Striped Bass at $4-$6/lb are preferred
- Medium fillets at $5-$7/lb are preferred

CONCLUSIONS: CATFISH

- Fresh and Filleted Catfish are the most preferred form
- Although medium and large whole fish are preferred, the majority said they would not buy whole catfish
- Medium fillets were preferred at less than $5

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Alex Philipchik, Graduate Student, KSU

COOPERATIVE EXTENSION

Kentucky State University

UK University of Kentucky College of Agriculture

USDA Agricultural Marketing Service

Kentucky Proud Kentucky Department of Agriculture

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