

# Value Enhancement of Spiny Lobster (*Panulirus argus*) for the Live-Lobster Export Market

## Mejora del Valor de ka Langosta Espinosa (*Panulirus argus*) para el Mercado de Exportación De Langosta Viva

### Valorisation de la Langouste (*Panulirus argus*) pour le Marché d'Exportation du Homard Vivant

THOMAS R. MATTHEWS<sup>1</sup>, ANGELO JASON SPADARO<sup>2</sup>,  
RODNEY D. BERTELSEN<sup>1</sup> and LARRY YEE<sup>3</sup>

<sup>1</sup>*Fish and Wildlife Research Institute — Florida Fish and Wildlife Conservation Commission  
2796 Overseas Hwy., Suite 119, Marathon, Florida 33050 USA.*

*\*tom.matthews@myfwc.com*

<sup>2</sup>*The College of the Florida Keys  
5901 College Road, Key West, Florida 33040 USA.*

*angelo.spadaro@fkcc.edu*

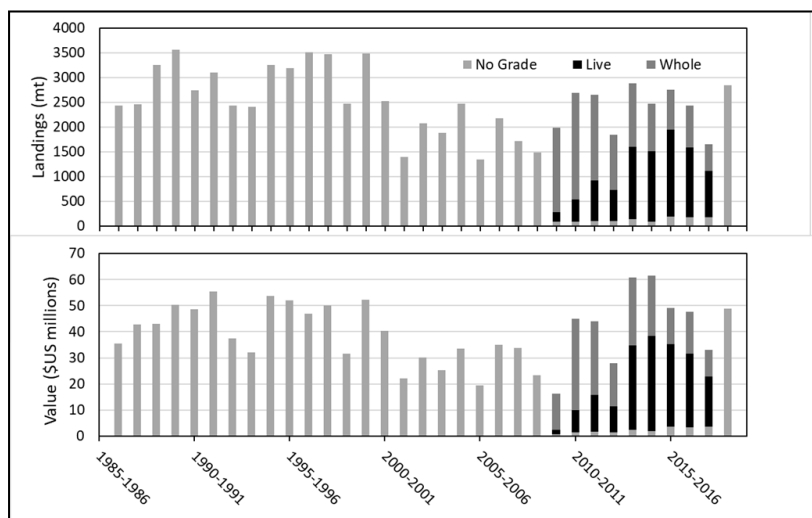
<sup>3</sup>*Elite Sky Seafood International  
1100 Overseas Hwy, Marathon, Florida 33050 USA.*

#### EXTENDED ABSTRACT

#### Introduction

In Florida, ex-vessel value of lobsters has ranged from \$13.8 to \$57.5 million dollars (US) each fishing season since 1999 (Figure 1). Landings of lobsters have declined nearly 20% in Florida and 12.5% in the Caribbean region since landings peaked in 1999 (Figure 1, FAO 2017). In recent years, the fishery for spiny lobsters in the Florida has maintained its value by shifting to the export of live lobsters (Figure 1). The increased value of Caribbean spiny lobster (*Panulirus argus*), particularly in the international live market, has renewed interest in the aquaculture of spiny lobster (Creswell 2005). The complex life history of spiny lobster (Goldstein et al. 2008) has, for the time being, generally constrained such enterprises to collection and captive grow-out of wild post larval lobster to marketable size (Creswell 2005). Another untested method involves the grow-out or “rehabilitation” of small, but otherwise legal-sized, and low-grade lobsters captured in the fishery. These small and low-grade lobsters are not desirable for the high-value international live market, but aquaculture operations seek to add value to these animals by either holding them for sale at a later date when value peaks or holding and feeding them in culture to both increase their size and grade. The price of spiny lobsters in Florida on some days can be 2- to 3-times higher for the live export market than for the whole market (Figure 2, FMFIS). Herein, we model the potential value of improving the grade and increasing the supply of large, high-quality spiny lobster for sale during peak value times.

There are three major impediments to the sale of Florida’s lobsters to the lucrative international live market. First, approximately 50% of the annual catch occurs in the first 50 days of the fishing season that begins on August 6 when

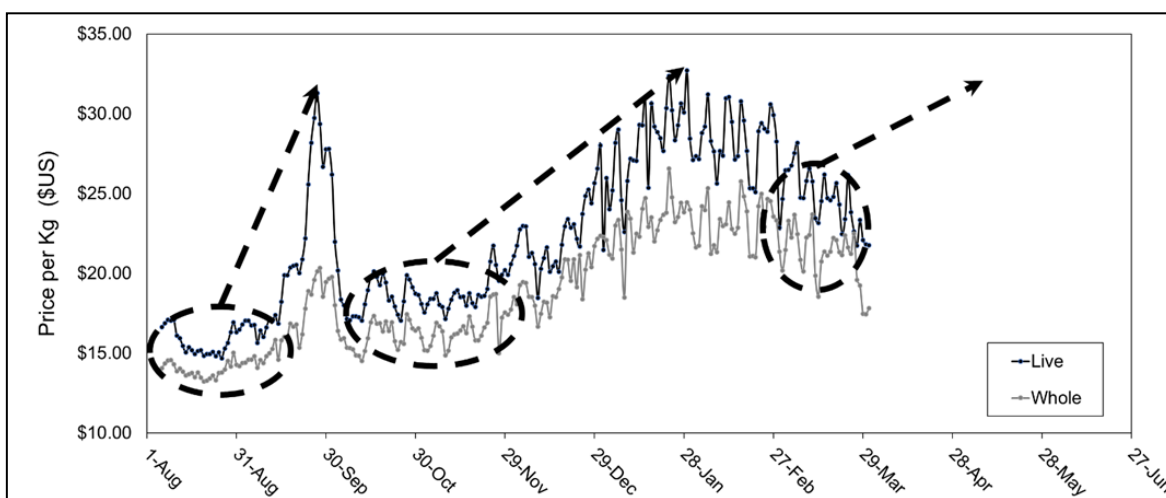


**Figure 1.** Landings (mt) and 2019 inflation adjusted value (\$US) of Caribbean spiny lobsters from Florida for each fishing season. Landings were differentiated by grade beginning in 2008. No-grade were lobster sold without differentiation of grade.

demand and price for lobsters is low (FMFIS). Second, the average size of lobsters landed in the Florida fishery is below 0.45 kg, but the preferred international market size for live lobsters is 0.5 kg or greater. And third, over 30% of lobsters were sold as whole (Figure 1) meaning the lobsters were not suitable for the high-value international live market. Whole grade includes lobsters with missing appendages and those that are too weak or unhealthy to survive shipment. Two factors thought to correspond with low health were high water temperatures in August and September (Butler et al 2018) and for lobsters landed after December, approximately 30% were emaciated and could not survive the rigors of live shipment (Larry Yee, pers. comm.). Thus, the Florida fishery is essentially providing the wrong-sized lobster at the wrong time of the year for the international live market. Lobster aquaculture presents an opportunity to reliably market larger, high-value lobsters, later in the fishing season or out of season when value and demand are highest. For example, lobsters caught from September 10<sup>th</sup> to 24<sup>th</sup> could be sold for over \$2 million (US) more on October 1 by holding live-grade lobsters for later sale and rehabilitating the whole-grade lobsters for the live market (Table 1). Over the last 5 years,

the price differential between whole and live lobsters in Florida indicates that a 30% to 50% increase in market value is possible if full exploitation of the live-lobster export market at peak price can be attained. Development of the capacity to hold, rehabilitate, or grow-out lobsters will help meet international demand for Florida’s lobsters and could stabilize domestic dockside value and increase fisher income throughout the fishing season. By marketing larger, healthier lobsters, the Florida fishery could increase market value and improve sustainability of the fishery.

Our public-private partnership is developing the regulatory requirements and the methods to hold or rehabilitate lobsters for sale at peak market value. There are several major fishery management concerns associated with possession of live lobsters that must be addressed to develop a reasonable and enforceable regulatory framework to ensure the sustainable management of lobster-rehabilitation aquaculture. These include the eventuality that female lobsters will spawn while in culture, thus violating the prohibition on possession of egg-bearing lobsters. Additionally, auditing requirements for possession and sale of lobsters during the closed fishing season do not consider the intended increase in weight of lobsters



**Figure 2.** Average daily price per kg of lobsters by grade for fishing seasons after the live market for lobsters was well established, 2013- 2016. Sale prices in circles represent bioeconomic model scenarios for holding or rehabilitation of lobsters for sale at subsequent times of peak price depicted by the arrows.

**Table 1.** Bioeconomic model output for delayed sale of lobsters captured from September 10 to 24 for target sale date of October 1. Price and landings values are averages for 2013 to 2016

Lobster Grade	Live	Whole
Mean Price/Kg (\$US)	\$19.51	\$16.16
Kg Landed	151,752	83,384
Current Value	\$2,962,109	\$1,376,130
Target Sale Date Price (October 1)	\$27.80	\$27.80
Price Increase	\$8.29	\$11.64
Value Added	\$1,258,024	\$970,59

rehabilitated for later sale at a greater weight. Environmental regulation of water quality and propagation of disease such as *Panulirus argus* Virus 1 (Behringer *et al* 2011) is a concern for both the spread of disease among lobsters in culture and risk of disease propagation to the environment and wild lobsters. These challenges are not unique to Florida. They are also relevant to the aquaculture of spiny lobsters in the Caribbean region and will require the development of novel methods and rigorous research to overcome.

A simple bio-economic model that includes the grade of lobsters, daily landings, and daily price fluctuations may be used to evaluate the potential for increased value of the lobster fishery when lobster health and amount of lobsters caught each day is better aligned with demand from the live export market (Figure 2). The model also includes the information needed to calculate the capacity required to hold or rehabilitate lobsters using the daily landings weights and time frames required to hold lobsters for sale at peak market price. The model parameters can be used to prioritize research to develop methods to either hold lobsters to maintain their grade or rehabilitate and grow lobsters to improve market grade, and ultimately identify which aquaculture techniques have the greatest potential to increase lobster value and enhance the value chain at all stages of a commercial lobster fishing industry. This bio-economic model can be applied to other lobster fisheries to identify which aquaculture techniques and marketing scenarios could be utilized to enhance fishery value in other locations.

In Florida, the aquaculture scenario that had the greatest potential to increase value in the fishery was holding live-grade lobsters landed during August and September for later sale in early October when market value for live lobsters peaked (Figure 2). Drivers of increased value in the model included the near 50% increased price of lobsters between these two time periods and the high landings of lobsters during the opening two months of the fishing season. The rehabilitation of whole-grade to live-grade lobsters during this same time period represented the second greatest value increase as whole-grade lobsters were 36% of the landings those months. This model does not consider the potential 50% weight increase in 30 days achieved in culture or losses from mortality (Creswell 1988, Lellis 1990).

The development of commercial lobster aquaculture in Florida has the potential to increase the value of lobster exports. However, it is not certain if these higher export values would directly benefit Florida's lobster fishers by increasing dockside prices. Development of aquaculture techniques to achieve increased value in the fishery are an alternative to changes in fishery practices that could more directly result in catch of larger lobsters at times of peak price or to improve lobster health for increased supply of lobsters to the live market.

**KEYWORDS:** Aquaculture, spiny lobster, public-private partnerships, Florida

## ACKNOWLEDGMENTS

This research was supported by the Atlantic States Marine Fisheries Commission contract number 19-0809. This research relied heavily of information provided by Steve Brown and Chris Bradshaw from Florida's Marine Fisheries Information System. Leroy Creswell provide guidance on lobster aquaculture history and methods. Emily Hutchinson and others provided many hours feeding lobsters and maintaining water quality in the Florida Fish and Wildlife Conservation Commission lobster culture facility.

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