Aquatic Invasions (2011) Volume 6, Supplement 1: S139–S142
doi: 10.3391/ai.2011.6.S1.031


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Aquatic Invasions Records

# Presence of Pacific white shrimp *Litopenaeus vannamei* (Boone, 1931) in the Southern Gulf of Mexico

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Received: 12 July 2011 / Accepted: 12 October 2011 / Published online: 27 October 2011

## Abstract

This is the first report of the presence of Pacific white shrimp *Litopenaeus vannamei* in the Southern Gulf of Mexico coast. Seven specimens were collected in the Carmen-Pajonal-Machona lagoons near La Azucena and Sanchez Magallanes in Tabasco, Mexico, during a shrimp monitoring program survey conducted in this area. Further sampling and monitoring are required to find evidence that confirms the establishment of a population of Pacific white shrimp *L. vannamei* in Southern Gulf of Mexico.

**Key words:** *Litopenaeus vannamei*, Pacific white shrimp, invasive species, Tabasco, Mexico

## Introduction

*Litopenaeus vannamei* (Boone, 1931) is native to the Eastern Pacific coast from the Gulf of California, Mexico to Tumbes, North of Peru (Pérez-Farfante and Kensley 1997) and is the most important penaeid shrimp species farmed worldwide (Alcivar-Warren et al. 2007). This condition has led to the introduction and presence of this shrimp in natural waters outside its natural geographic range. For example, the presence of *L. vannamei* has been reported in Texas, South Carolina and Hawaii, USA (Balboa et al. 1991; Wenner and Knott 1992; Howells 2001; O'Connor et al. 2008), Thailand (Senanan et al. 2007), Venezuela (Pérez et al. 2007), Brazil (Loebmann 2010), Puerto Rico (Perry 2011) and Vietnam (Binh et al. 2009).

The effects of escape and establishment of *L. vannamei* are unknown, but the main effects will be competition with native species of shrimp (Brigg et al. 2004).

On the Mexican coast of the Gulf of Mexico, Pacific white shrimp is farmed in all the coastal states. In Tabasco there are 43 shrimp farms covering 319.6 ha (Diario Oficial de la Federacion 2011). Almost all of these farms are located in the Southern part of the Machona Lagoon. Tabasco produced 193 t of *L. vannamei* in 2009 (Diario Oficial de la Federación 2011).

The main risk of escape and establishment of *L. vannamei* is competition with native species for habitat (space), feed or adverse interference with breeding behavior or breeding success (Briggs et al. 2004; Panutrakul et al. 2010).

This paper describes the first report of wild *L. vannamei* in the Mexican coast of the Gulf of Mexico.

## Methods

On Monthly samplings were conducted from September 2010 to August 2011 to estimate shrimp abundance in Sanchez Magallanes (18°17′34.37″N and 93°51′20.15″W) and La Azucena (18°05′04″N and 93°40′02″W), Tabasco, Mexico during a monitoring program of artisanal shrimp fishing. Sampling sites are shown in Figure 1. On February 21, 2011 seven


**Figure 1.** Map of Tabasco, Mexico showing the Carmen-Pajonal-Machona lagoons. A star indicates the site where Pacific white shrimp *Litopenaeus vannamei* specimens were caught and circles indicate sampling points.

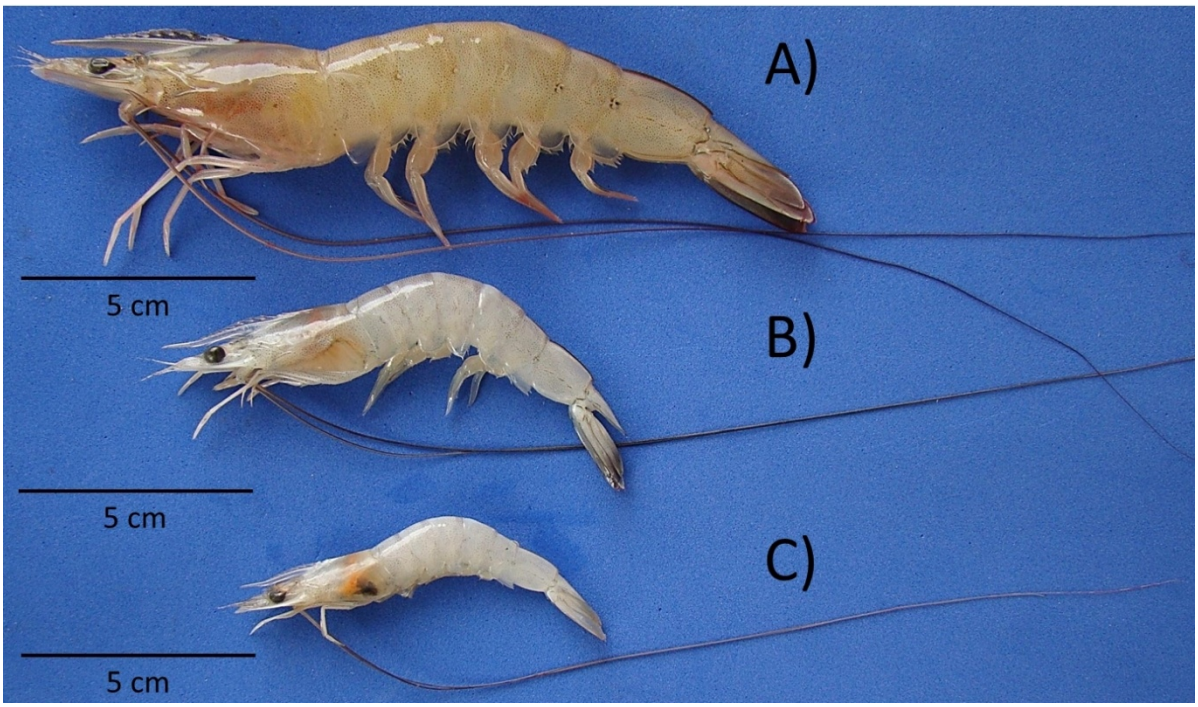


**Figure 2.** Lateral view of **A**) Pacific white shrimp *Litopenaeus vannamei* **B**) and **C**) Northern white shrimp *Litopenaeus setiferus* caught in Tabasco, Mexico February 21th of 2011 (Photograph by A. T. Wakida-Kusunoki).

specimens of the Pacific white shrimp *Litopenaeus vannamei* were collected; six in the Azucena area and one in Sanchez Magallanes. Shrimp in the Azucena area were captured in mangrove channels near shrimp farms. They were caught using cast nets with a mesh size of 12.7 mm. The criteria used to identify the specimens were those described by Pérez-Farfante and Kensley (1997).

## Results and discussion

The Pacific white shrimp measured from 117 to 180 mm in total length, total weight ranged from 11 to 39 g. Two specimens were females and five were males (Figure 2).

Two specimens of both sexes were housed in the Ichthyology and Aquatic Invertebrate Collection of the Centro de Investigación de Ciencias Ambientales of the Universidad Autónoma del Carmen under catalog numbers CI-CICA-UNACAR 0296 and 0297.

Pacific white shrimp have a greenish color, a rostrum armed with 2 ventral teeth and 8 dorsal teeth. The differences between *L. setiferus* and *L. vannamei* are the structures of the sexual organs.

The shoreline vegetation in the Azucena area was primarily red mangrove *Rhizophora mangle*; white mangrove, *Laguncularia racemosa*, and black mangrove *Avicennia germinans* followed by saltwort *Batis maritima*, huano palm *Sabal yapa*, beach spider lily *Hymenocallis littoralis* and common reed *Phragmites australis.* The substrate was mud. Water surface temperature was 21°C and the salinity was 11 PSU. In Sanchez Magallanes, the shoreline is an urban development; the substrate is muddy with oyster shells. Water temperature was 25°C and the salinity 24 PSU.

Shrimp escapes can occur in different ways during the harvest of open ponds, during water exchange and flooding events (Briggs et al. 2004), as well as from hatcheries and during transport. In the case of *L. vannamei,* the escape may be occurred during the harvest of ponds (F. Palma pers. comm.). The harvests in the farms of this zone are carried out twice per year, in April and September generally and the shrimps are harvested when they reach a weight of 12 g. The factors that could indicate that this species can survive in the wild include: the weight differences between harvest size and collected specimens (12 to 39g) and the distance between farming zones and capture area.

The ecological impacts of escaped farmed shrimps could be as follows: spreading alien pathogens, competition with other species for space and food, and interfering with breeding behavior or breeding success of native shrimp species (Briggs 2004; Molnar et al. 2008; Senanan et al. 2009; Panutrakul et al. 2010). In the case of the spreading alien pathogens, there is a concern that shrimp viruses associated with these species have infected native shrimp populations, for example Taura Syndrome Virus (TSV) was detected in *L. setiferus* and *Farfantepenaeus aztecus* in Laguna Madre, Mexico (Guzmán-Sáenz et al. 2009), *L. schmitti* in Maracaibo lagoon, Venezuela (Fajardo et al. 2010) and seven shrimp species in Bangpakong river, Thailand (Senanan et al. 2009).

Some studies made in Thailand concluded that *L. vannamei* could potentially compete with native shrimp species because it approaches food items faster and is more aggressive than the native shrimp (Chavanich et al. 2008; Panutrakul et al. 2010).

It was not possible to find evidence of Pacific white shrimp becoming established in this zone of the Mexican coast of the Gulf of Mexico. The low frequency of *L. vannamei* encounters in the monitoring program of artisanal shrimp fishing in lagoon system and the negative presence of *L. vannamei* in surveys of the commercial shrimp catches of coastal waters near to the mouth of this lagoon indicate the absence of an established population of Pacific white shrimp.

Additional sampling and long term monitoring are required to assess the potential impacts of the presence of *L. vannamei* on the native shrimp species.

## Acknowledgements

We are grateful to the local shrimp fishermen for their help in the sampling of the shrimp specimens, to Fernando T. Wakida for proofreading an early version of this manuscript to Dr Frances Lucy and anonymous referee for their suggestions and recommendations and to Magda Estela Dominguez for providing valuable information. We also acknowledge the National Research and Technology Council of Mexico (CONACYT) and Secretary of Agriculture, Livestock Farming, Rural Development, Food and Fisheries (SAGARPA) for the financial support for project No. 126964.

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