

# An update on the Asian tiger shrimp, (*Penaeus monodon*)

*Peter R. Kingsley-Smith, Ph.D. ... and many others!*

Marine Resources Research Institute (MRRI)

South Carolina Department of Natural Resources (SCDNR)

Charleston SC 29422

[kingsleysmithp@dnr.sc.gov](mailto:kingsleysmithp@dnr.sc.gov)



Photo by M. Sempsrott, FL FWCC

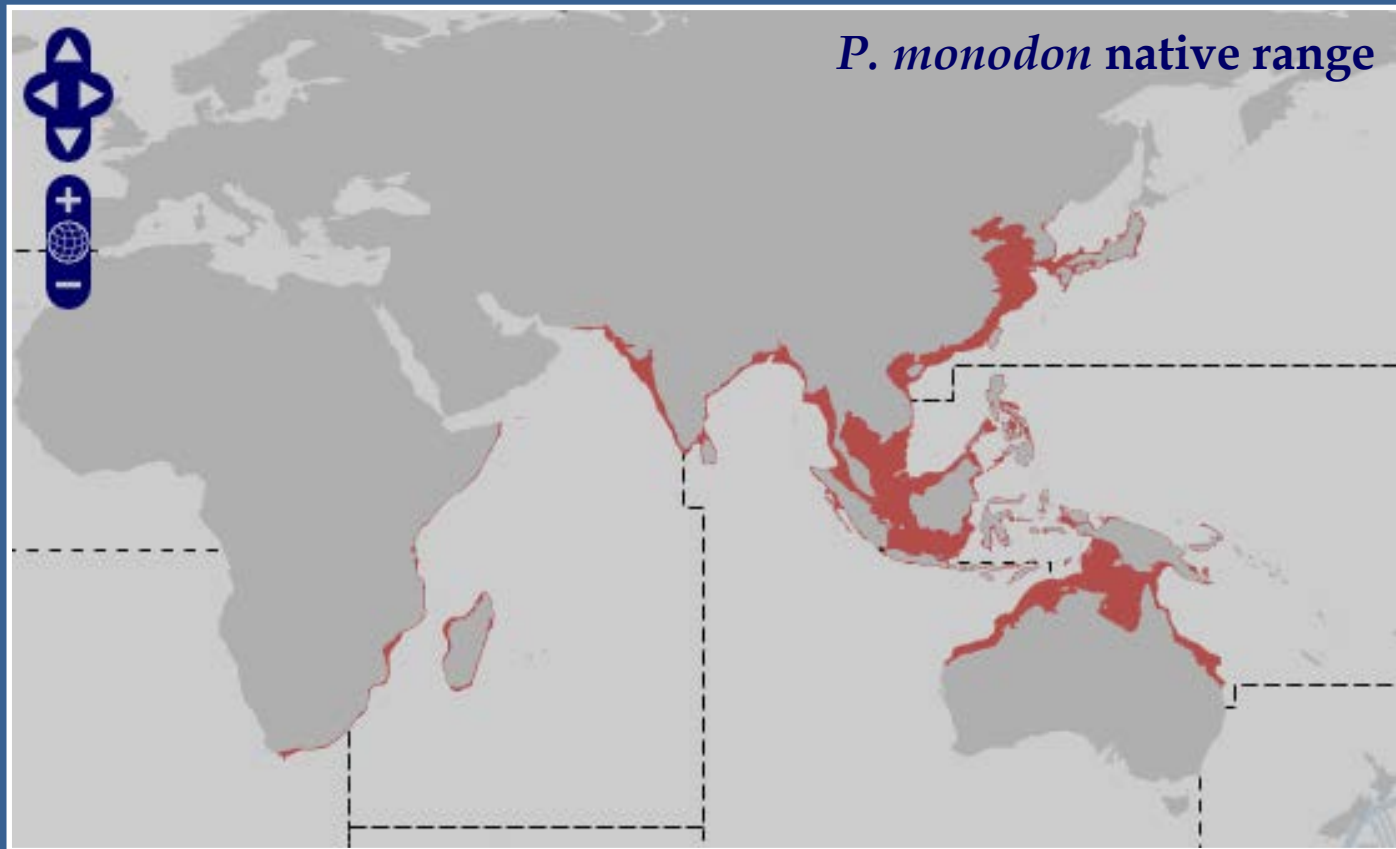
## *Asian tiger shrimp collaborative working group*

Dr. Peter Kingsley-Smith	SC Dept of Natural Resources
David Knott	Poseidon Taxonomic Services
Pam Fuller	USGS (Gainesville, FL)
Amy Benson	USGS (Gainesville, FL)
Dr. Margaret Hunter	USGS (Gainesville, FL)
Dr. Timothy King	USGS (Kearneysville, WV)
Dr. James Morris	NOAA-NMFS, Beaufort, NC
Christine Buckel	NOAA-NMFS, Beaufort, NC
Leslie Hartman	Texas Parks & Wildlife Division

... and many other individuals across the region that have assisted with specimen collections, outreach and education.

# Asian tiger shrimp, *Penaeus monodon*

- Native range: East Africa, Southeast Asia, Japan, China, Korea, Philippines, Australia, Fiji
- First recorded in U.S. coastal waters off Georgia, in 1988 following its accidental release (~3,000 animals) from the SCDNR Waddell Mariculture Center, **however...**
- Not seen in U.S. southeastern waters again after 1988 until 2006.



## ***P. monodon* physiological tolerances:**

- Salinity tolerance > 10 ppt.
- Temperature tolerance approx. 13-33°C.
- Estimates of tolerance are preliminary for juveniles / adults.
- Testing of different life history stages is needed.

## **Native range ecology:**

- Prefer depths from 0 m to 110 m.
- Found in muddy and sandy bottoms.
- Occur in estuaries as juveniles and in marine waters as adults.

## **Reasons for concern surrounding recent reports:**

- Re-appearance of *P. monodon* in South Atlantic Bight was sudden and currently not well understood – ignorance breeds fear
- Based on the biology of *P. monodon* in its native habitat, the potential for its interactions with native penaeid shrimp in the southeast U.S. seems high
- Interactions may be indirect (competition for space, food etc.) or direct (diet of *P. monodon* in native habitat includes shrimp and other crustaceans)
- Potential host of viral diseases; transmission to native species?



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## Monster shrimp: Mysterious Asian tiger shrimp again appearing in Lowcountry waters

By BO PETERSEN  
bpetersen@postandcourier.com  
Thursday, October 27, 2011

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## Giant shrimp raises big concern as it invades the Gulf

### Asian tiger prawn has scientists worried

By MATTHEW TRESAUGUE, HOUSTON CHRONICLE

Updated 09:32 p.m., Saturday, December 24, 2011

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## Invasive black tiger shrimp prove a genuine threat to Gulf shrimp populations

By David Sikes  
Posted December 27, 2011 at 4:34 p.m., updated December 27, 2011 at 7:06 p.m.

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## Tiger Prawns Roar into the Gulf o

JANUARY 6, 2012 | 9:00 AM

BY MOSE BUCHELE

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The Asian Tiger Prawn can grow over a foot long. It's a species from the Western Pacific Ocean that first showed up off the coast of Alabama in 2006, when a single, solitary prawn was reported. If the story ended there, we wouldn't have much to talk about.

But it doesn't.

"The next year in 2007, you had some pop up in Louisiana just one or two, in 2008, three or four, [and in] 2009 a couple," Leslie Hartman, the Matagorda Bay Ecosystem leader with Texas Parks and Wildlife, told StateImpact Texas.

PHOTO COURTESY OF JIM GOI

An Asian Tiger Prawn caught! Little Lake in Larose, LA

**Tiger Prawns Roar into the Gulf**

The Giant Shrimp-Like Creatures Could Spell Trouble for Ecosystem

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But that was just the start.

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## Giant Asian Tiger Prawns May Threaten Gulf Shrimp

Sudden increase sparks fears Asian species is breeding in region.

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## Energy specialist has DISD seeing

DICKINSON — Every time Jeff Pulkinen turns off a light, he measures the energy efficiency of an air conditioning school district officials see green.

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Photo by Tony Reisinger

## Black Tiger shrimp are surfacing in the Gulf

By Mike Gunning

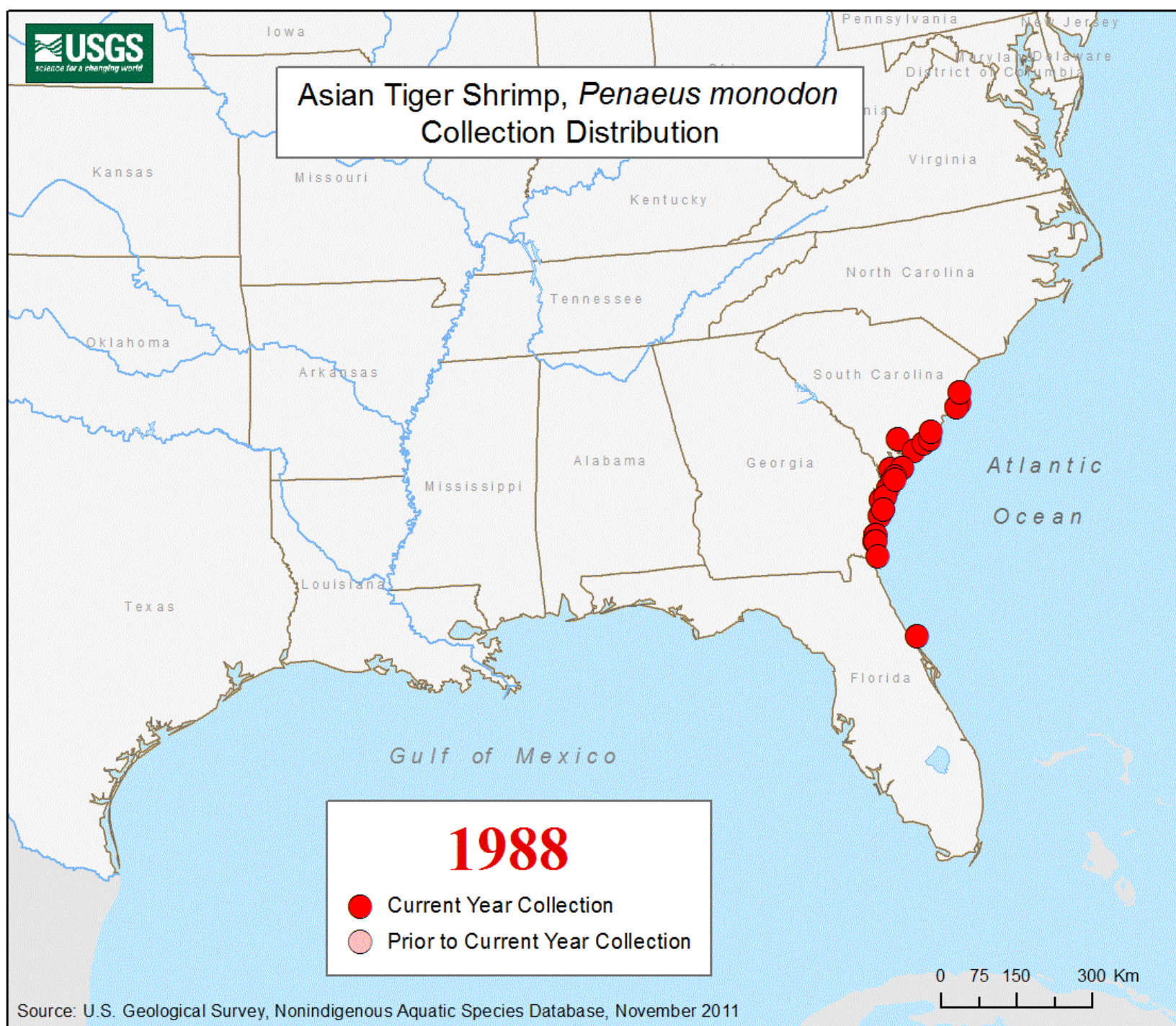
An exotic Black Tiger shrimp, above, taken from the Gulf of Mexico is compared to a very large native Gulf brown shrimp. Both shrimp were caught by Ron Pockrus' 13-vessel shrimp fleet operating out of Brownsville.

**Reported collections of this species have shown an order of magnitude between 2010 and 2011.**

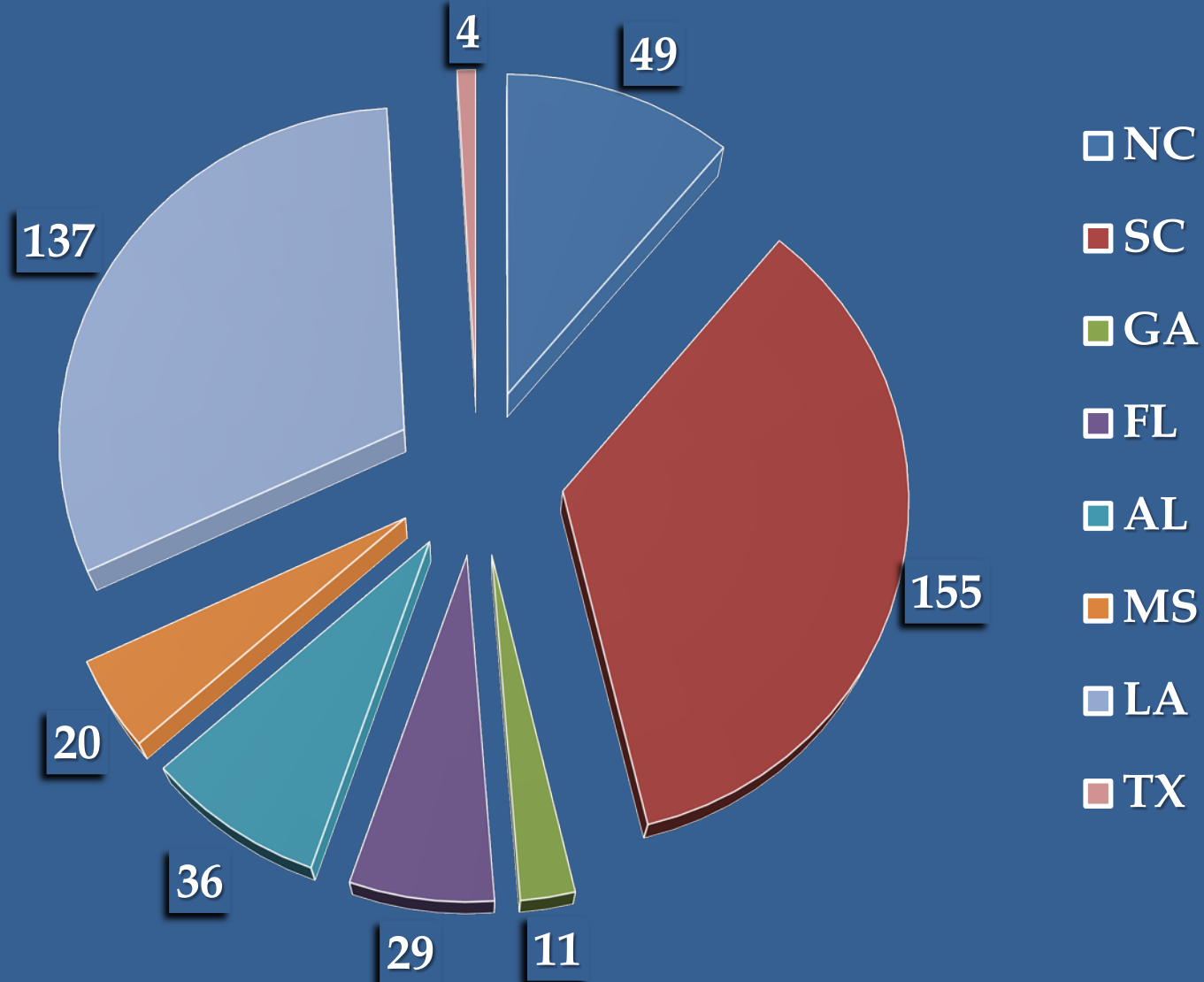
<b>Year</b>	<b>NC</b>	<b>SC</b>	<b>GA</b>	<b>FL</b>	<b>AL</b>	<b>MS</b>	<b>LA</b>	<b>TX</b>	<b>TOTAL</b>
<b>2005</b>	0	0	0	0	0	0	0	0	<b>0</b>
<b>2006</b>	5	0	0	0	0	1	0	0	<b>6</b>
<b>2007</b>	1	1	0	1	0	0	1	0	<b>4</b>
<b>2008</b>	8	6	4	2	1	0	0	0	<b>21</b>
<b>2009</b>	14	15	3	1	5	3	4	0	<b>45</b>
<b>2010</b>	2	20	1	2	0	0	7	0	<b>32</b>
<b>2011</b>	19	113	3	23	28	16	125	4	<b>331</b>
<b>2012</b>	0	0	0	0	2	0	0	0	<b>2</b>
<b>Grand totals to date</b>	<b>49</b>	<b>155</b>	<b>11</b>	<b>29</b>	<b>36</b>	<b>20</b>	<b>137</b>	<b>4</b>	<b>441</b>



## Asian Tiger Shrimp, *Penaeus monodon* Collection Distribution



# Contribution to *P. monodon* catches by state (through January 14<sup>th</sup> 2012).





Size-frequency distribution of *P. monodon* collected and measured between July 2009 and January 2012 (n = 219).

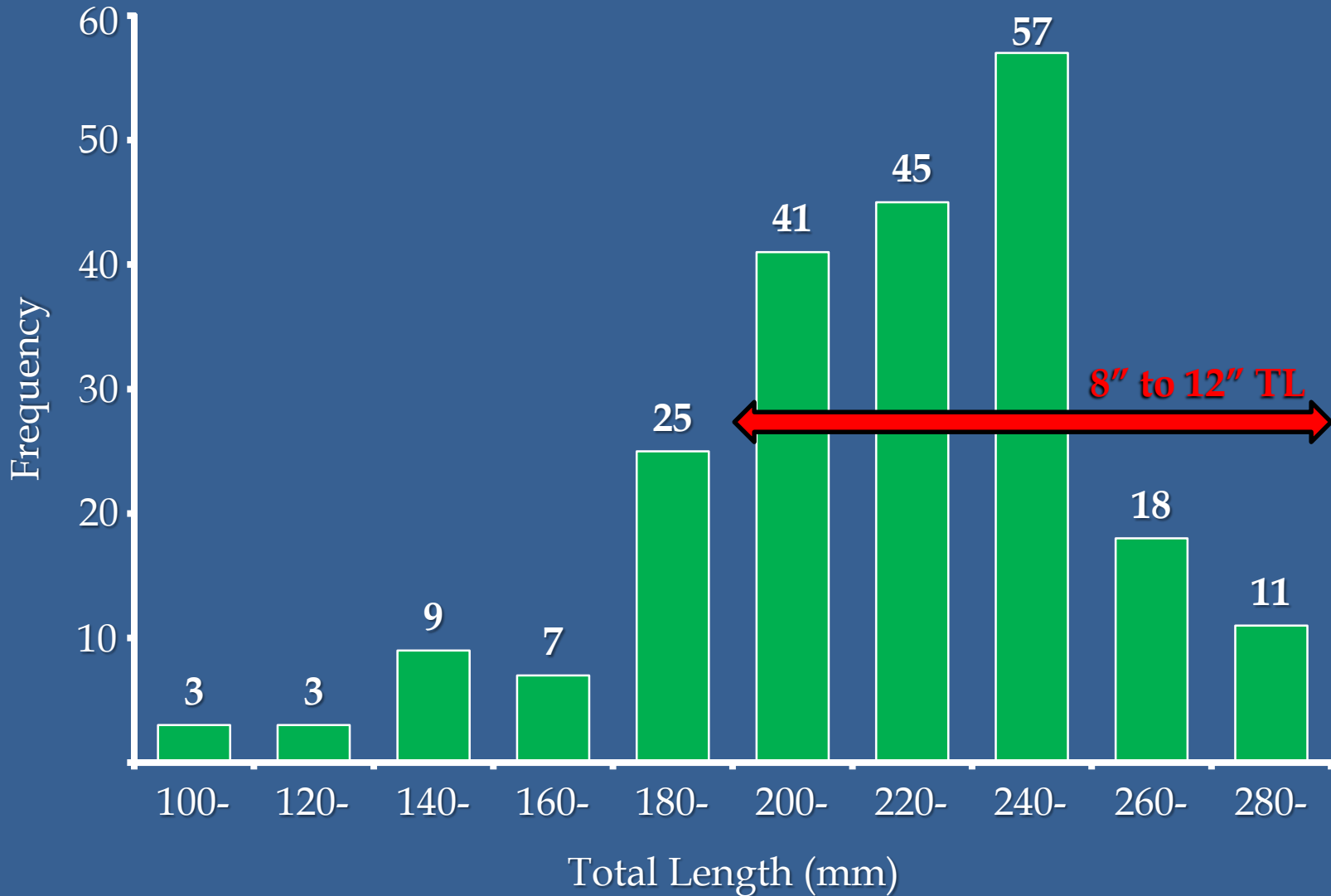




Photo by Dr. Dayne Buddo - University of the West Indies  
Discovery Bay Marine Laboratory (March 2012)

Recent confirmation of the collection of *P. monodon* from seagrass bed in Jamaica.

<http://nas.er.usgs.gov>

**Additional thanks to Matt Cannister and Matt Nielson from USGS  
for their efforts to add new reports of *Penaeus monodon*  
(and many other invasive species) to the USGS NAS database!**

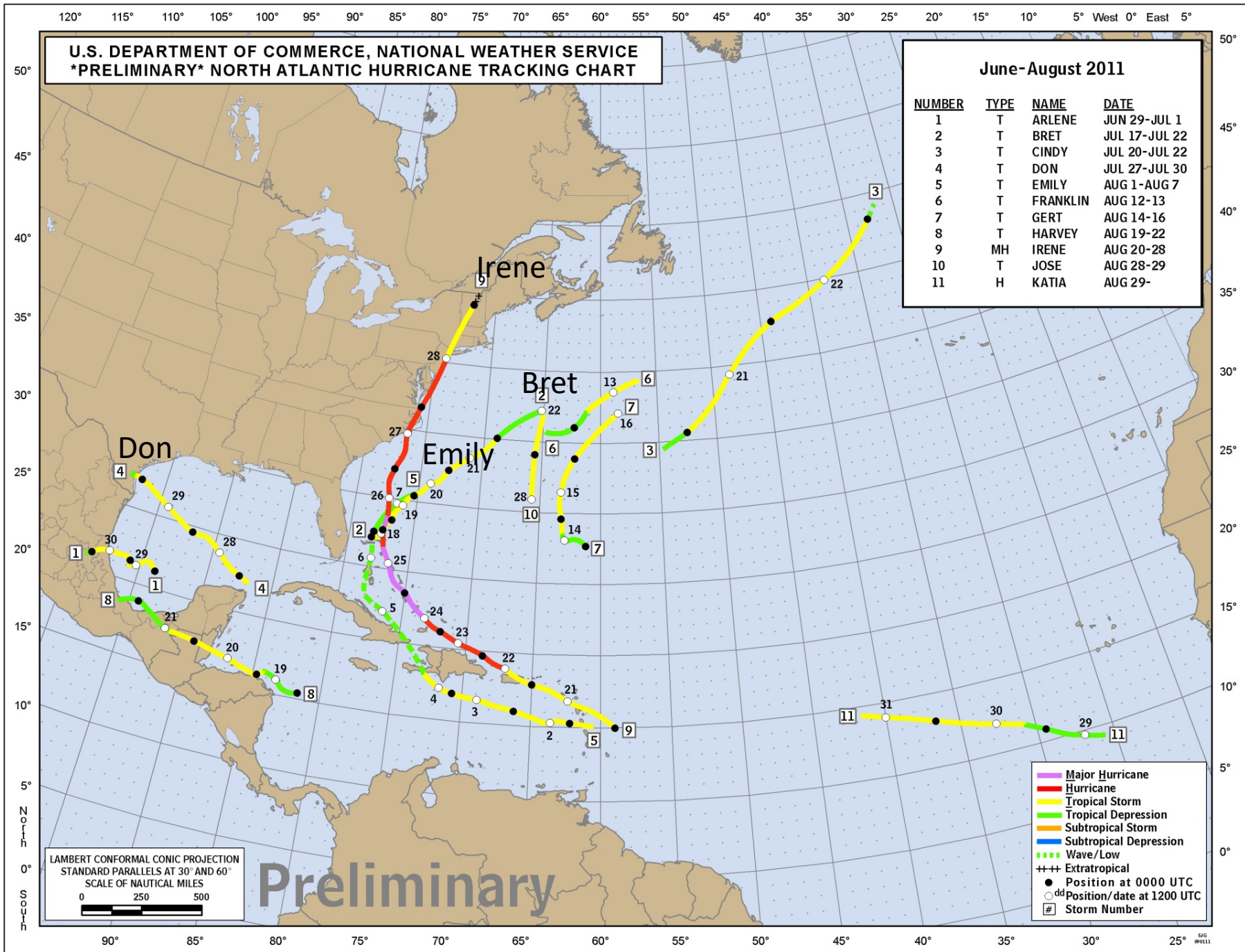




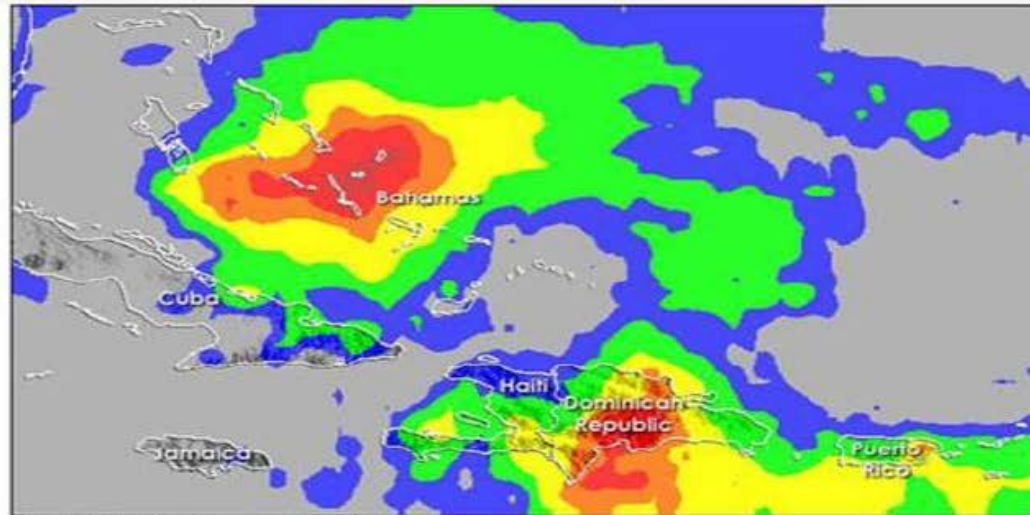
# Potential sources of *P. monodon* in the U.S.

*- continuous ballast transport and delivery?*









October 26 - November 1, 2007

Rainfall Totals (mm)

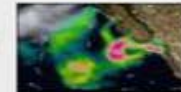
50 100 200 300 400 500 600

## Rain from Tropical Storm Noel

November 3, 2007

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Tropical Storm Noel dropped 15-20" of rain on the southern coastal town of Baharona in November 2007.

# Tropical Storm Noel 2007

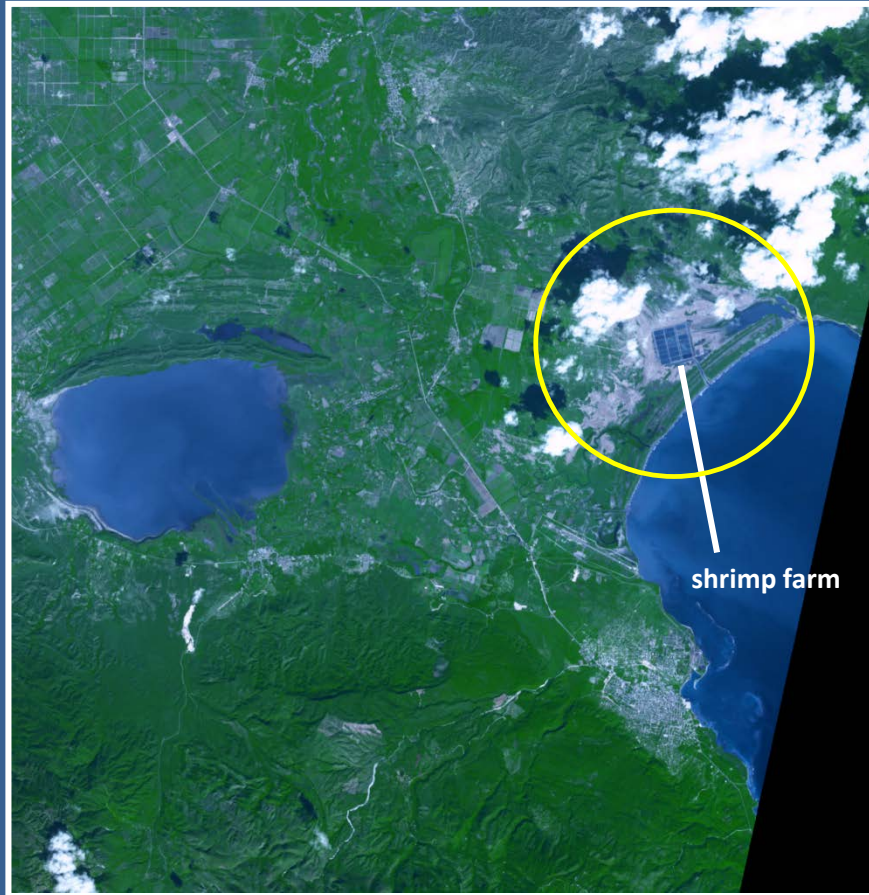




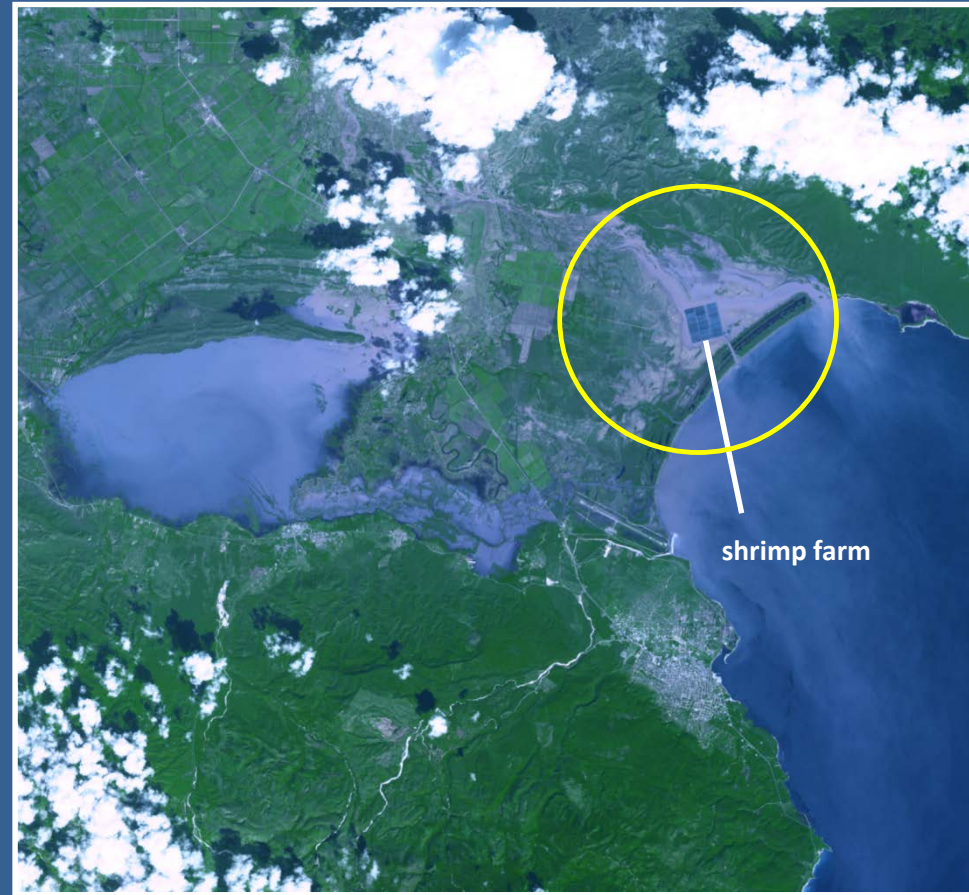
# Potential sources of *P. monodon* in the U.S.

- escapement from Caribbean aquaculture operations?

2006, one year before TS Noel



2007, one week after TS Noel



# Baharona, Dominican Republic, 2002





# Baharona, Dominican Republic, 2010



Image NASA  
Image © 2011 GeoEye

© 2011 Google

Imagery Date: 1/23/2010

lat 18.308050° lon -71.087681° elev 5m



# Baharona, Dominican Republic, 2010



La Canea

Bombita

© 2011 Europa Technologies  
Image © 2011 TerraMetrics

Imagery Date: 1/23/2010

lat 18.313300° lon -71.103193° elev 5 m

Google

Eye alt 4.02 km

*Penaeus monodon* collected by Dominican Republic trawler in 2006  
and sent to Al Stokes, SCDNR Waddell Mariculture Center.



**Potential sources of *P. monodon* in the U.S.**  
*- migration from wild Caribbean or African populations?*

***Exploring Economic Opportunities in Sustainable Shrimp Farming  
in West Africa: Focus on South-South Cooperation***

**Regional Roundtable**

**Conakry (Guinea), 6 - 8 June 2006**

**Sahel and West Africa Club/OECD**

**Development Perspectives Unit**

Shrimp seed: Shrimp farming requires a reliable supply of quality disease free hatchery seed. *Penaeus monodon*, is a non-indigenous species widely found in Asia, but has localized and is now found wild along the west coast of Africa, probably the result of an earlier introduction. This resource provides the potential for the development of a *P. monodon* hatchery system based on local resources, avoiding the need to introduce shrimp from other regions, and risks of importing disease. The advantage of *P. monodon* is that hatchery technology is readily available in Asia and eastern Africa and sufficiently well-understood and thus, it is amenable to adaptation for aquaculture in West Africa. Two hatcheries already exist in West Africa, although only the hatchery currently functioning is The Gambian farm “West African Aquaculture”.

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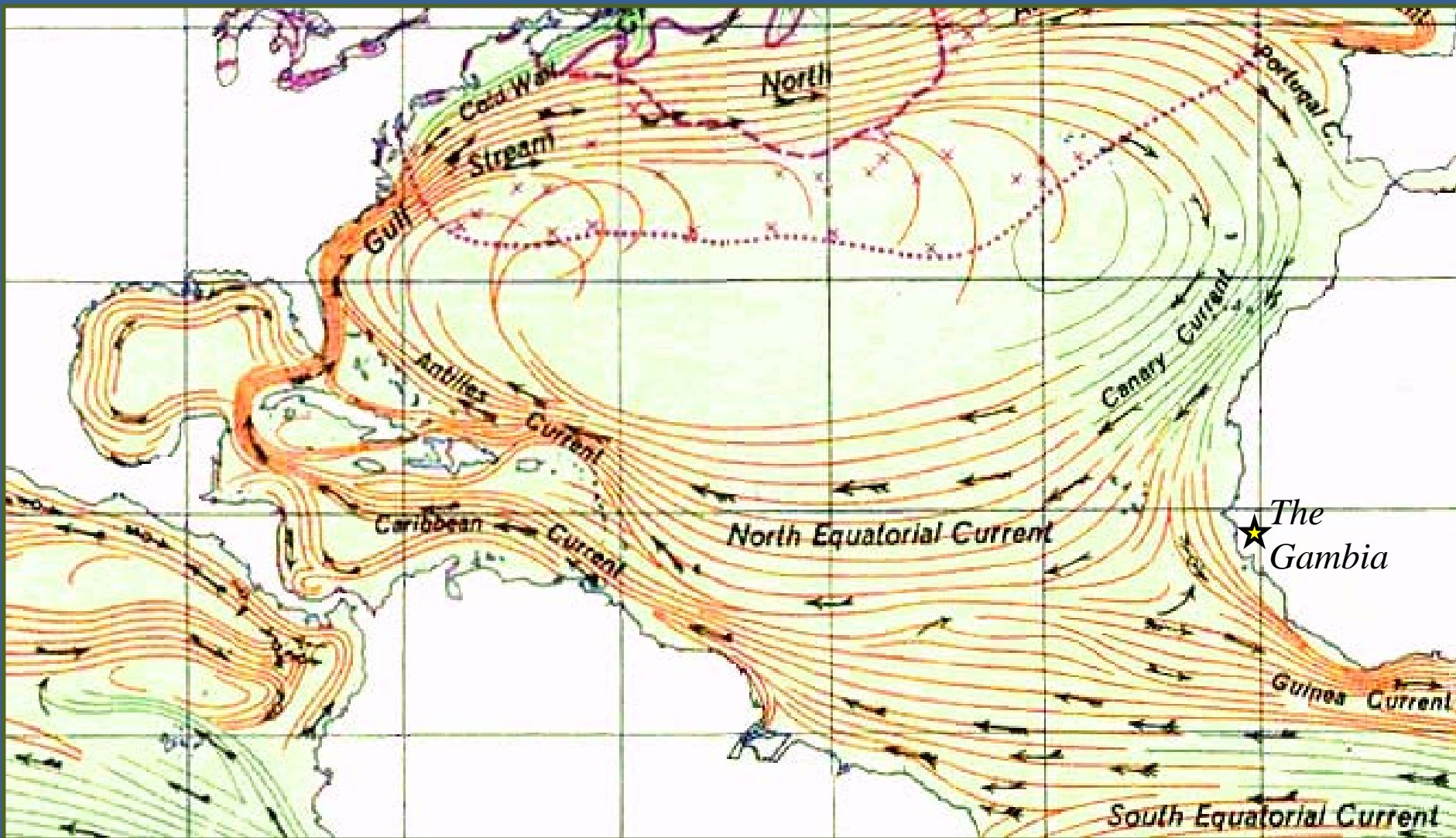
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Hypothetical mechanism for transport of *P. monodon* to U.S. East Coast.

- Entrainment of individuals from established populations in The Gambia in trans-Atlantic (North Equatorial) currents.
- Consistent with reports of *P. monodon* in southeastern region since 2006.

## Potential sources of *P. monodon* in the U.S.

- continuous ballast water transport and delivery?
- tropical storm events redistributing *P. monodon*?
- escapement from U.S. aquaculture operations?
- escapement from Caribbean aquaculture operations?
- migration from wild Caribbean or African populations?
- *\$ million question: Is there now an established breeding population of *P. monodon* somewhere along the southeastern U.S. coast?*
- Answer will require more specimens and further genetic analyses... and so to our current activities:



Potential sources of *P. monodon* in the U.S.

- *An established breeding population somewhere along the southeastern U.S. coast?*

Current efforts and future needs:

- recognition flyer to docks

# Have You Caught Any Tiger Shrimp?



## DNR Needs Your Help

Researchers at the South Carolina Department of Natural Resources are asking recreational and commercial shrimpers who catch tiger shrimp to photograph and freeze specimens. The date and location of collection should also be documented.

Tiger shrimp, *Penaeus monodon*, native to the Western Pacific, is an invasive species in South Carolina and its impacts on our native fauna are uncertain. Scientists are eager to collect more information on tiger shrimp in order to address the source of these animals and methods of introduction.

Collections by commercial fishermen can be reported to their usual contacts at DNR, while incidental and recreational collections, along with additional information should be directed to: [tigershrimp@dnr.sc.gov](mailto:tigershrimp@dnr.sc.gov).

# Attention Shrimpers



Please be on the lookout for a non-native species of shrimp called the black tiger shrimp, *Penaeus monodon*. This species has been captured by shrimpers fishing in portions of Pamlico Sound and near shore ocean waters of North Carolina. This shrimp is native to the Western Pacific and could pose a threat to our native shrimp species. The black tiger shrimp has distinct dark and white stripes along its back. If you capture a black tiger shrimp, please freeze it, record the date and location where the shrimp was taken, and contact Trish Murphey at the NC Division of Marine Fisheries at (800) 682-2632 or [Trish.Murphey@ncmail.net](mailto:Trish.Murphey@ncmail.net).

Please contact NCDMF at (800) 682-2632

# WANTED

## Tiger Shrimp (*Penaeus monodon*)



Photo above of Captain Benjamin Lopez, F/V Lady Mexico, by Tony Reisinger.



Photos above courtesy Lawrence Evans, © Ecolao Enterprises

Look for their distinct dark and light stripes.

Smaller juveniles are also wanted. They may occur in the bays and near the shore.

If you catch any tiger shrimp in your nets, please:

1. Write down the trawl information
  - Captain's Name and/or Vessel Name
  - Date and Time
  - Location (Latitude/Longitude)
  - Water Depth
2. Put each shrimp (with head on) in a separate Ziploc® bag with the trawl information and freeze it.
3. Call \_\_\_\_\_  
at \_\_\_\_\_.

He or she will arrange to pick up the shrimp so that Texas Parks and Wildlife Department can send it away for genetic testing to find the source of these shrimp.

## Texas Sea Grant flyer

Also available in Spanish and Vietnamese.

Not suitable for small children (rated R ☺)

Hard copies available from  
DeWayne Hollin

Digital versions available  
from Cindie Powell  
([cpowell@neo.tamu.edu](mailto:cpowell@neo.tamu.edu))





Potential sources of *P. monodon* in the U.S.

- *An established breeding population somewhere along the southeastern U.S. coast?*

Current efforts and future needs:

- **recognition flyer to docks**
- more systematic data collection and reporting; Tiger Shrimp Tissue Repository, NOAA-NMFS, Beaufort, NC; NOAA integrated assessment in 2012
- size/weight/sex /condition data for specimens
- standardized data recording cards to biologists

**TIGER SHRIMP DATA CARD**

Reporter Name:
Date of Report:
Captain/Fisherman Name:
Vessel Name:
Dock Location/Sfd Company:
Date of Capture:
Location of Capture (detailed description-GPS)  _____
N ____ ° ____ ' W ____ ° ____ ' _____
Depth Range of Capture: <input type="checkbox"/> Feet <input type="checkbox"/> Meters
Number caught at this location (all tows):

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Depth Range of Capture: <input type="checkbox"/> Feet <input type="checkbox"/> Meters
Number caught at this location (all tows):

Sp #	TL		Weight		Sex		
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2					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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10					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Sp #	TL		Weight		Sex		
	<input type="checkbox"/> mm	<input type="checkbox"/> inches	<input type="checkbox"/> grams	<input type="checkbox"/> ounces	Male	Female	Undet
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9					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10					<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

# Tiger Shrimp Data Card



Organization of indiv. reporting collection:

State & County of collection:

Date of capture (mm/dd/yy): \_\_\_\_ / \_\_\_\_ / \_\_\_\_ # days of trip \_\_\_\_  
(or mid day of multi-day trip)

Site name or capture location description:

GPS Location

N \_\_\_\_ ' \_\_\_\_ "  
degree min. sec.

W \_\_\_\_ ' \_\_\_\_ "  
degree min. sec.

Depth of capture: Circle one: Feet Meters

Number caught at this location (or over multi-day trip):

Gear used to collect:

Associated habitat (if known):





# Tiger Shrimp Database

Questions or comments: email [Christine.Addison@noaa.gov](mailto:Christine.Addison@noaa.gov)

- ☐ Add/Update collection
- ☐ Update individual data
- ☐ Summaries and Queries

## Potential sources of *P. monodon* in the U.S.

- *An established breeding population somewhere along the southeastern U.S. coast?*

### Current efforts and future needs:

- recognition flyer to docks
- more systematic data collection and reporting; Tiger Shrimp Tissue Repository & associated database in NOAA-NMFS laboratory in Beaufort, NC
- size/weight/sex/condition data for specimens
- standardized data recording cards to biologists
- tissue collection, DNA sequencing and analysis

1<sup>st</sup> pair of pleopods  
from male *Penaeus  
monodon*.



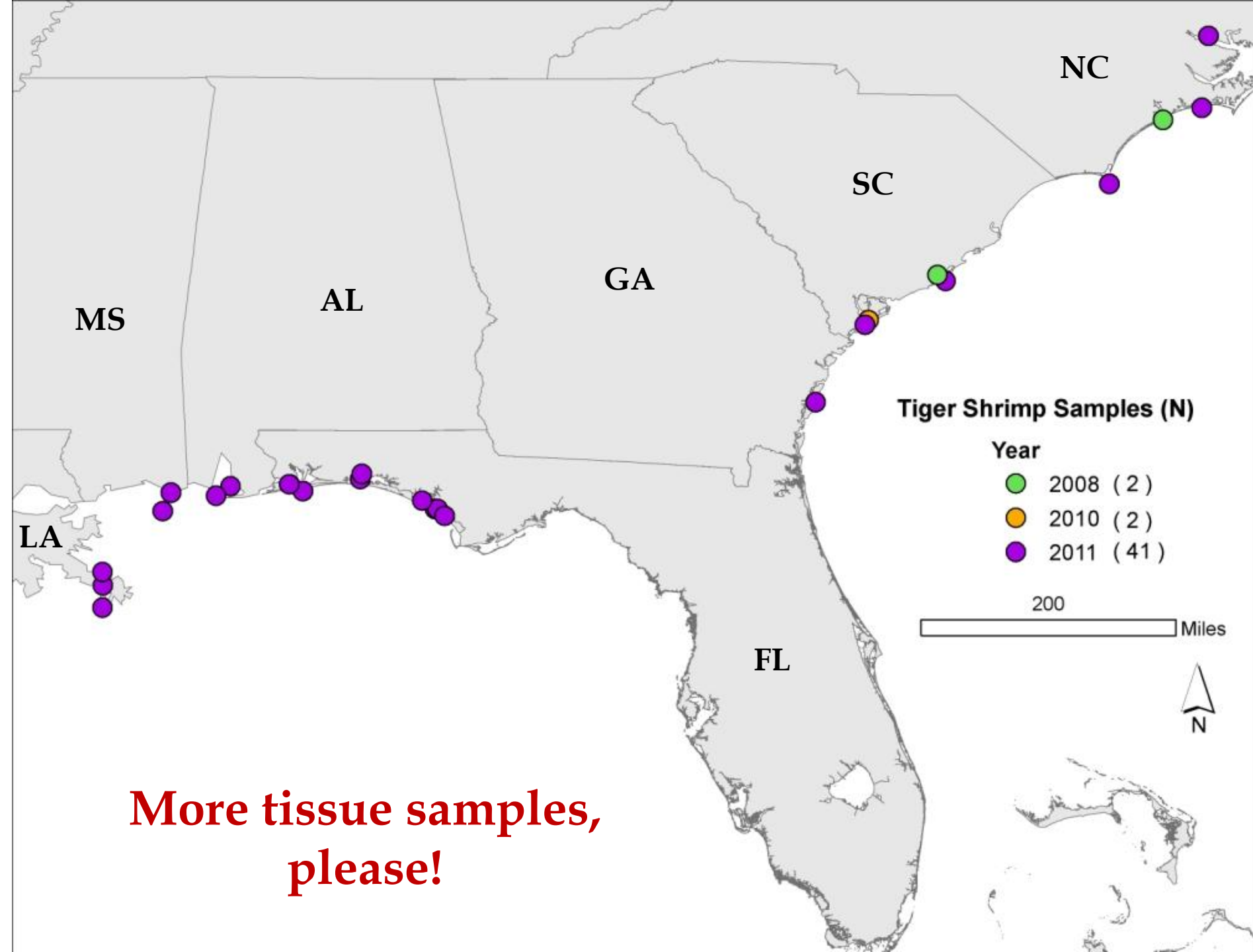
Potential sources of *P. monodon* in the U.S.

- *An established breeding population somewhere along the southeastern U.S. coast?*

Current efforts and future needs:

- recognition flyer to docks
- more systematic data collection and reporting; Tiger Shrimp Tissue Repository & associated database in NOAA-NMFS laboratory in Beaufort, NC
- size/weight/sex/condition data for specimens
- data recording cards to biologists
- tissue collection, DNA sequencing and analysis
- microsatellites and single nucleotide polymorphisms provide sufficient markers for assessing phylogeographic and population genetic structuring among *P. monodon* collections from the SE U.S.





**More tissue samples,  
please!**

*Questions?*



Photograph courtesy of the Southeast Regional Taxonomic Center, SCDNR

