IMPACTS OF RECENT HURRICANE ACTIVITY ON HISTORICAL SHIPWRECKS IN THE GULF OF MEXICO OUTER CONTINENTAL SHELF

Contract No. M07PC13010

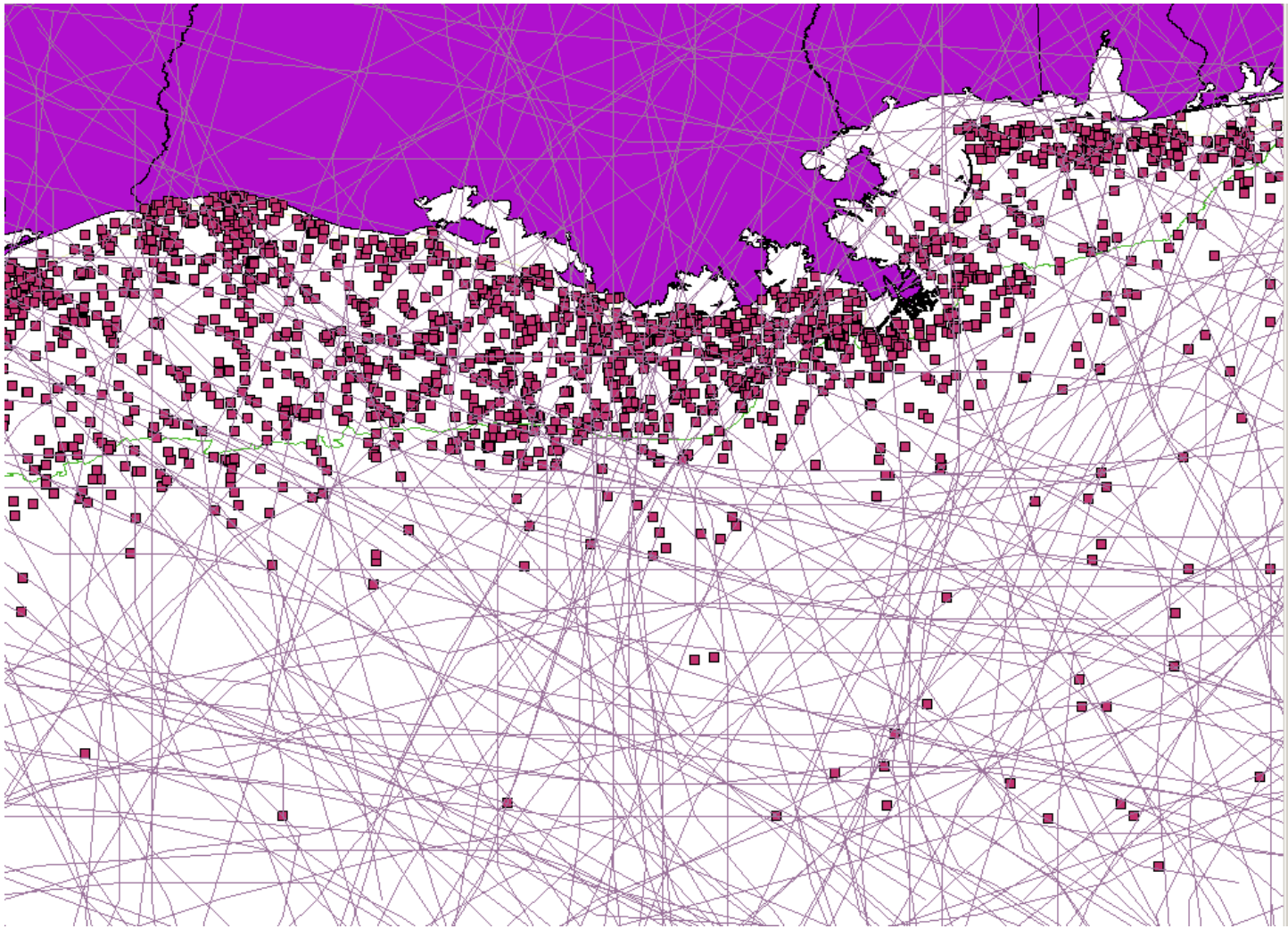
Robert Gearhart

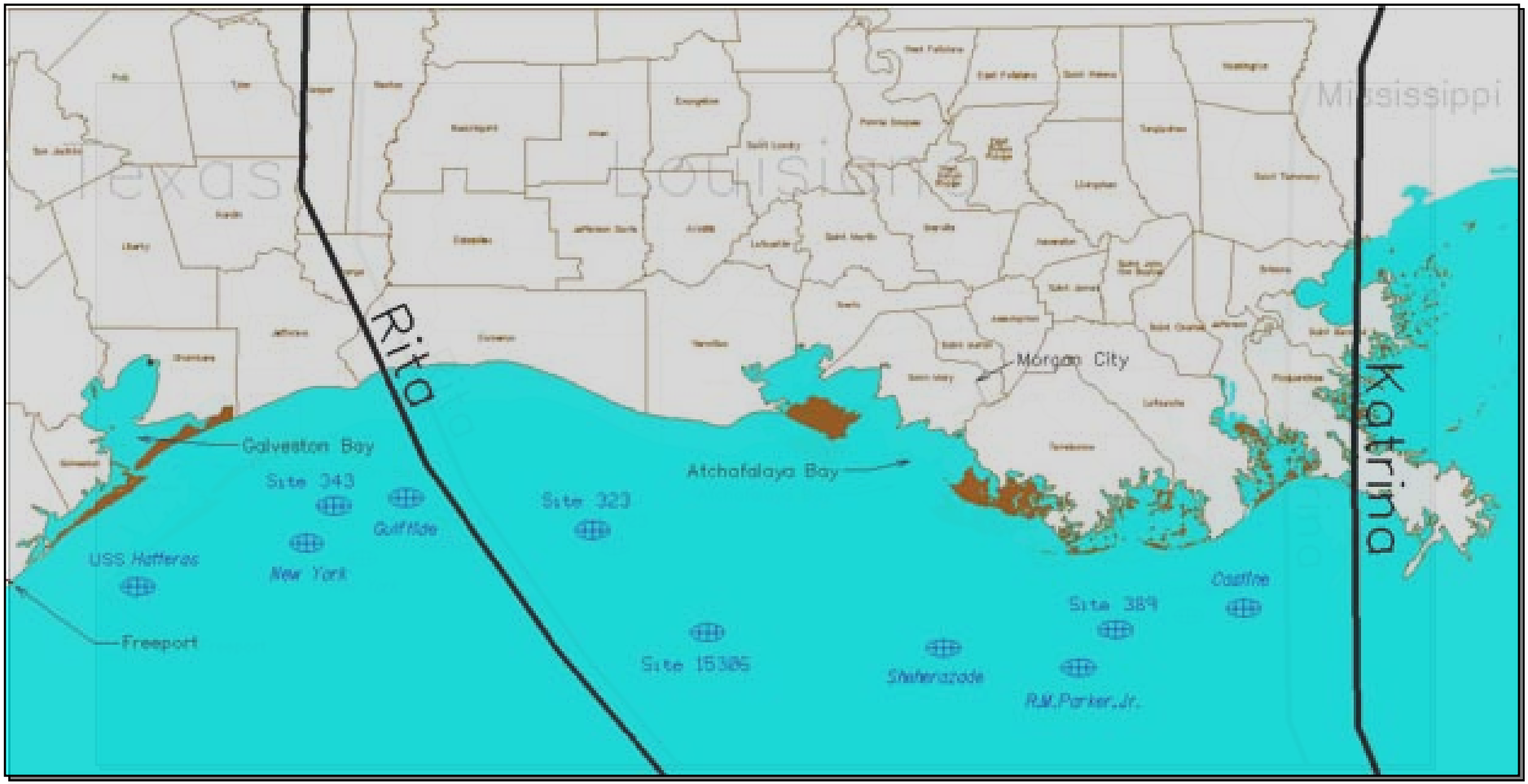
PBS&J

PBSJ

MMS

HURRICANE TRACKS & SHIPWRECKS




Texas
Louisiana
Mississippi
Rita
Katrina
Galveston Bay
Site 343
Gulfdale
New York
USS Hatteras
Freeport
Site 323
Atchafalaya Bay
Morgan City
Site 15385
Sheherazade
Site 384
R.W.Parker Jr.
Castine

Impacts of Recent Hurricane Activity on Shipwrecks in the Gulf of Mexico

Study Objectives:

(1) conduct remote sensing surveys in order to document the macro-scale post-storm condition of the sites;

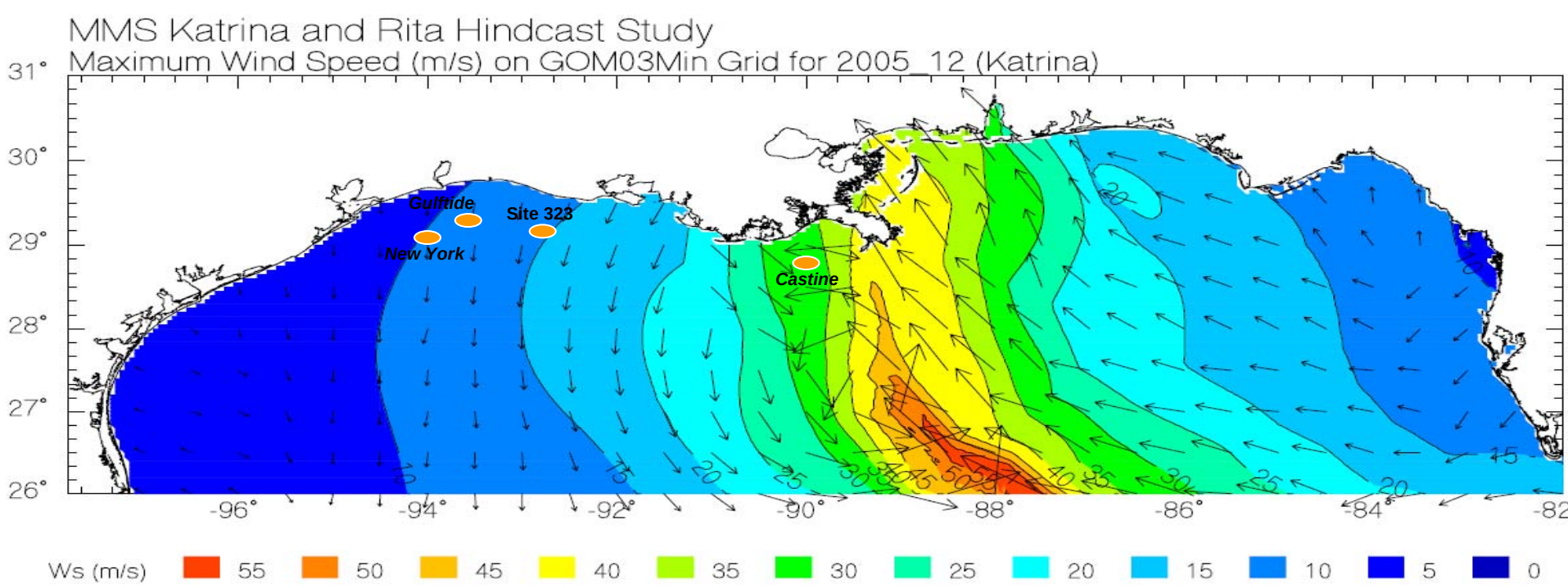
(2) compare and contrast pre- and post-storm remote-sensing data from each site;

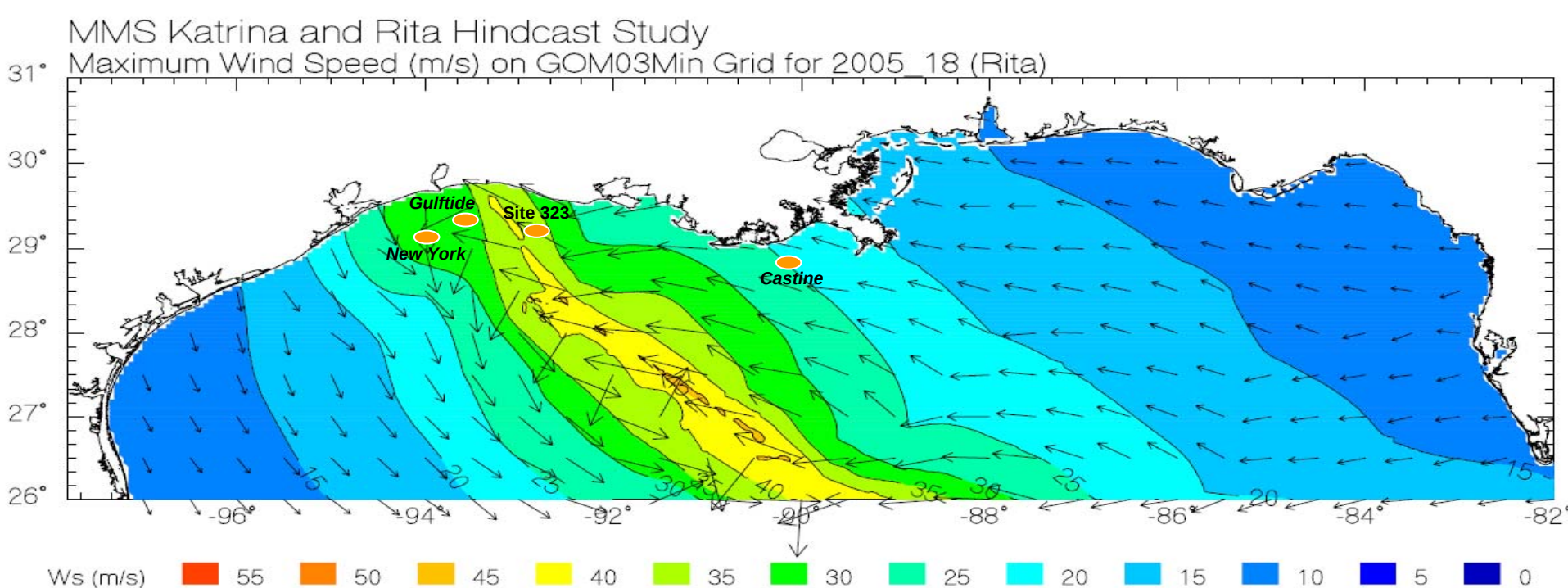
(3) carry out diver investigations of selected sites to document areas, which had changed during the period between pre- and post-storm surveys;

(4) collect sedimentary samples in order to characterize the substrate;

(5) estimate peak storm conditions on the seafloor at each site based on wave-current interaction models;

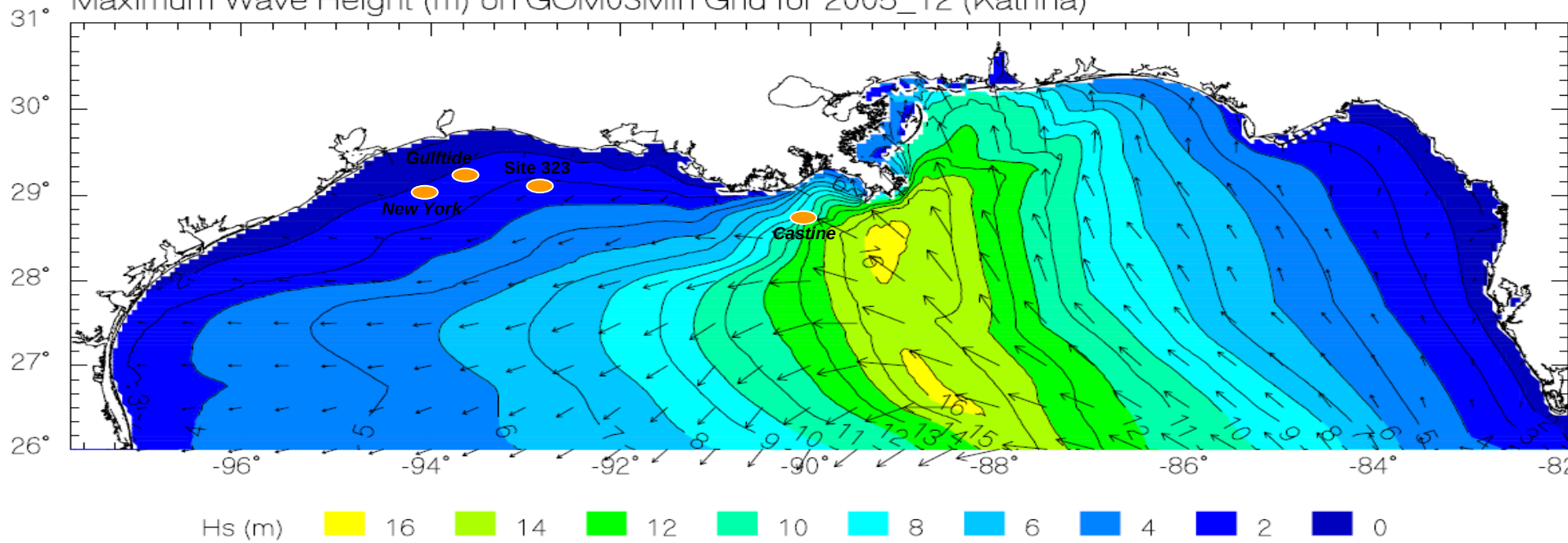
(6) conduct archival and historical research on each of the primary study sites in order to fill gaps in their histories.


MMS Katrina and Rita Hindcast Study
Maximum Wind Speed (m/s) on GOM03Min Grid for 2005_12 (Katrina)
Gulftide
Site 323
New York
Castine
31°
30°
29°
28°
27°
26°
-96°
-94°
-92°
-90°
-88°
-86°
-84°
-82
Ws (m/s)
55
50
45
40
35
30
25
20
15
10
5
0


MMS Katrina and Rita Hindcast Study
Maximum Wind Speed (m/s) on GOM03Min Grid for 2005_18 (Rita)
Gulftide
Site 323
New York
Castine
31°
30°
29°
28°
27°
26°
-96°
-94°
-92°
-90°
-88°
-86°
-84°
-82°
Ws (m/s)
55
50
45
40
35
30
25
20
15
10
5
0

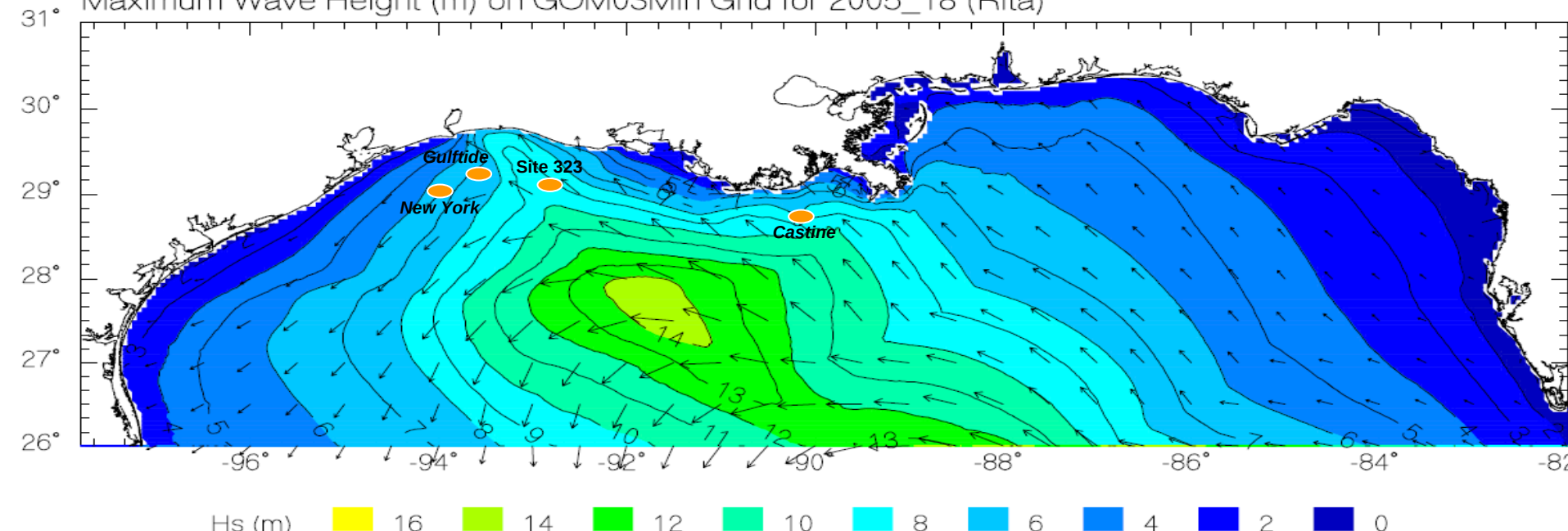
MMS Katrina and Rita Hindcast Study

Maximum Wave Height (m) on GOM03Min Grid for 2005_12 (Katrina)

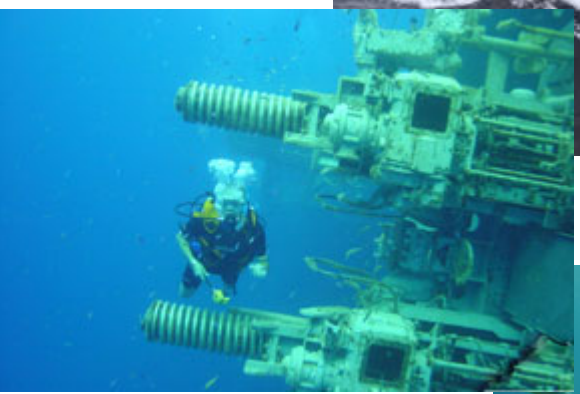


MMS Katrina and Rita Hindcast Study

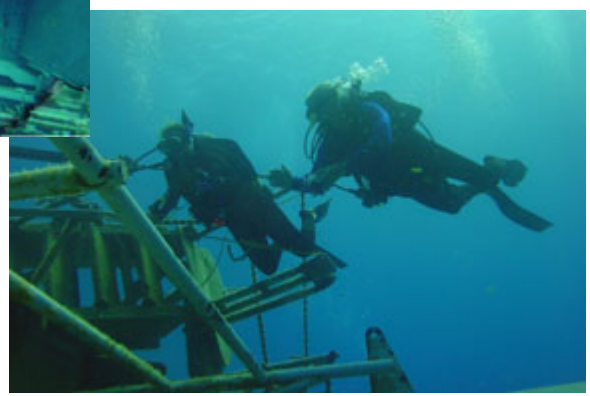
Maximum Wave Height (m) on GOM03Min Grid for 2005_18 (Rita)



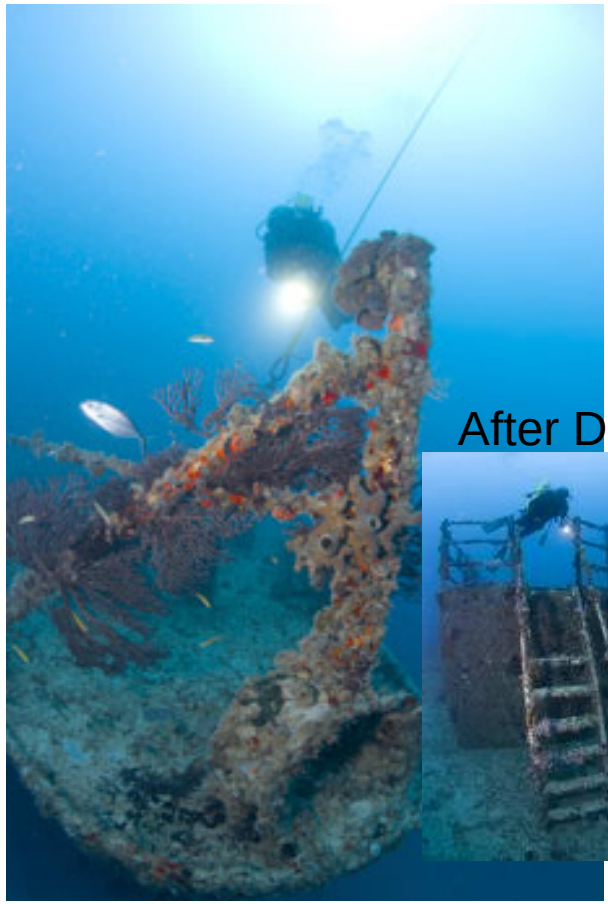
On 9 July 2005 Hurricane Dennis turned the 510-foot *Spiegel Grove* upright from its position on its starboard side in 130 feet of water.



Before Dennis

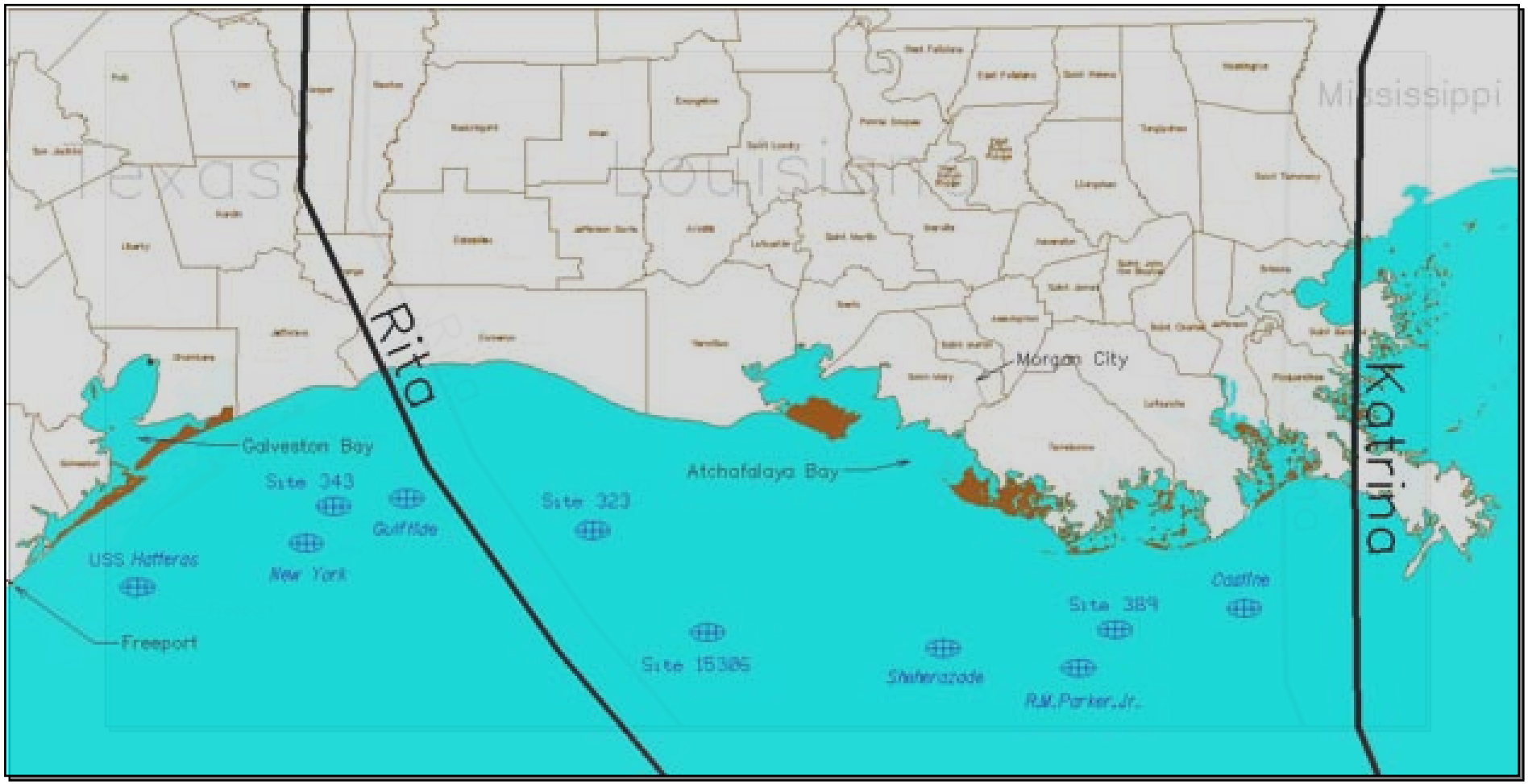


http://www.southernindianascuba.com/spiegel/day2.html



After Dennis

http://www.fla-keys.com/spiegelgrove/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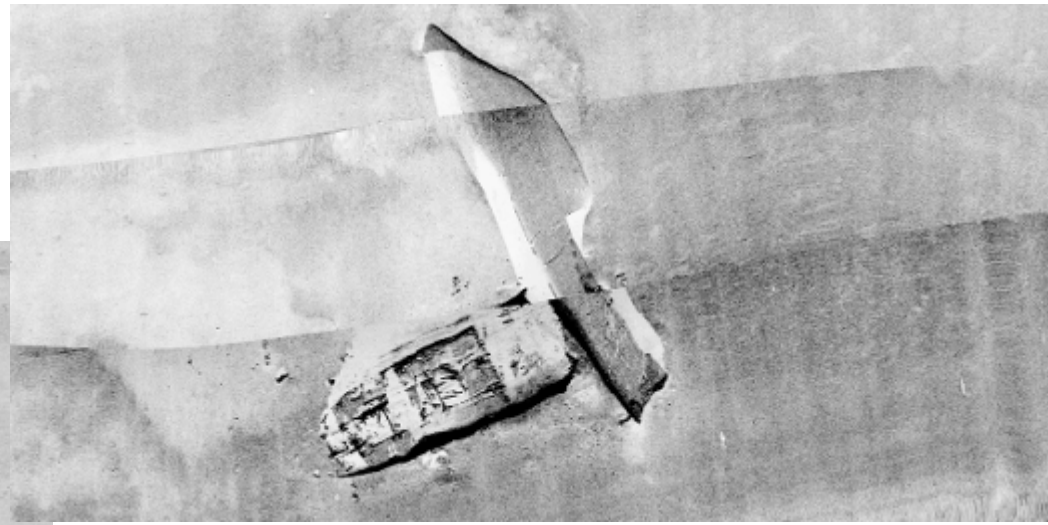
Atchafalaya Bay
Morgan City
Site 15386
Site 389
Castine
Shaherazade
R.M.Parker Jr.

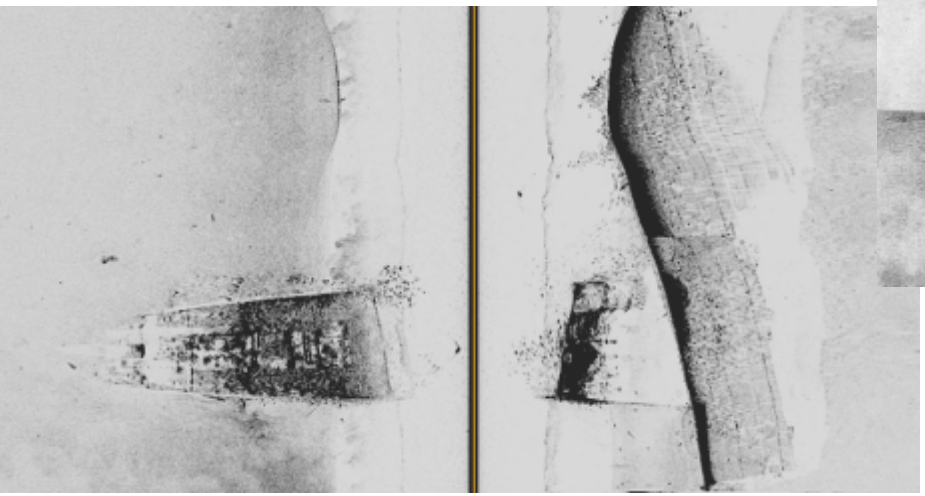
DAMAGE ASSESSMENT & RECOMMENDATIONS

NAME	HURRICANE PROXIMITY	DAMAGE	RECOMMENDATIONS
New York	**29.9 nm west of Rita**	**Increased exposure; reports of salvage activity**	**Diving to document extent of salvage and storm damage**
Gulf Tide	**7.3 nm west of Rita**	**Possibly increased exposure but earlier sonar imagery of poor quality**	**Diving to document extent of storm damage**
Site 323	**24.8 nm east of Rita**	**Broken near stern**	**Diving to document extent of storm damage**
Castine	**26.4 nm west of Katrina**	**No apparent change**	**Diving is recommended because this is the closest wreck to Katrina**
****R.M. Parker Jr.***	**60.5 nm west of Katrina**	**No apparent change**	**No further investigation**
****Sheherazade***	**71.8 nm east of Rita**	**No apparent change**	**No further investigation**
****Site 15306***	**32.6 nm east of Rita**	**No apparent change**	**No further investigation**
*****Site 389***	**55.0 nm west of Katrina**	**No apparent change**	**No further investigation**
*****Site 343***	**20.3 nm west of Rita**	**Change undeterminable**	**No further investigation**
****USS *Hatteras***	**67.5 nm west of Rita**	**No apparent change**	**No further investigation**

Site 432 – *R.M. Parker Jr*

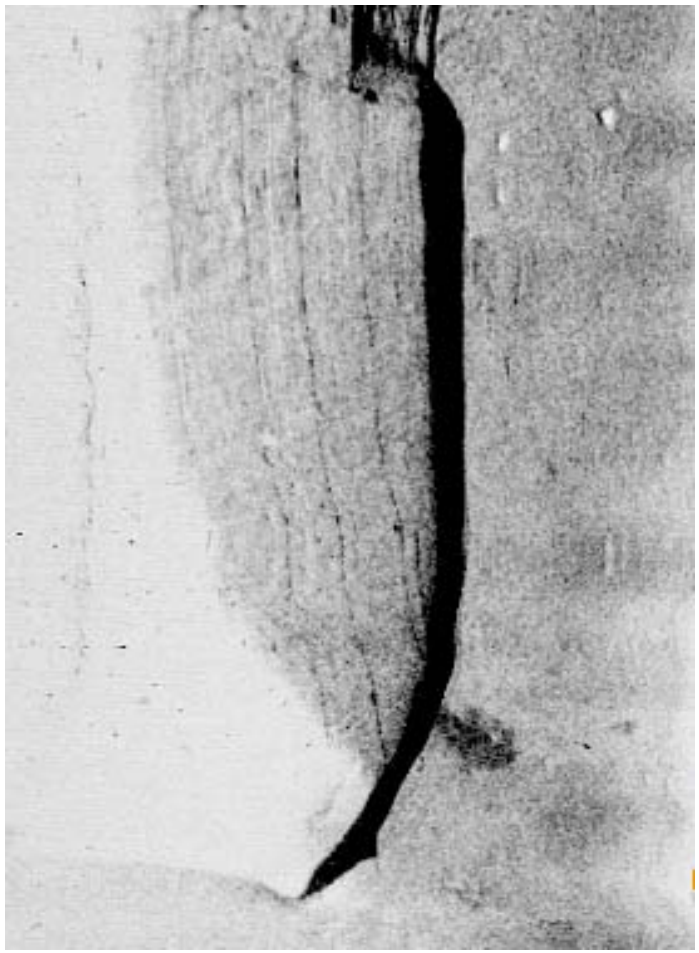


2004

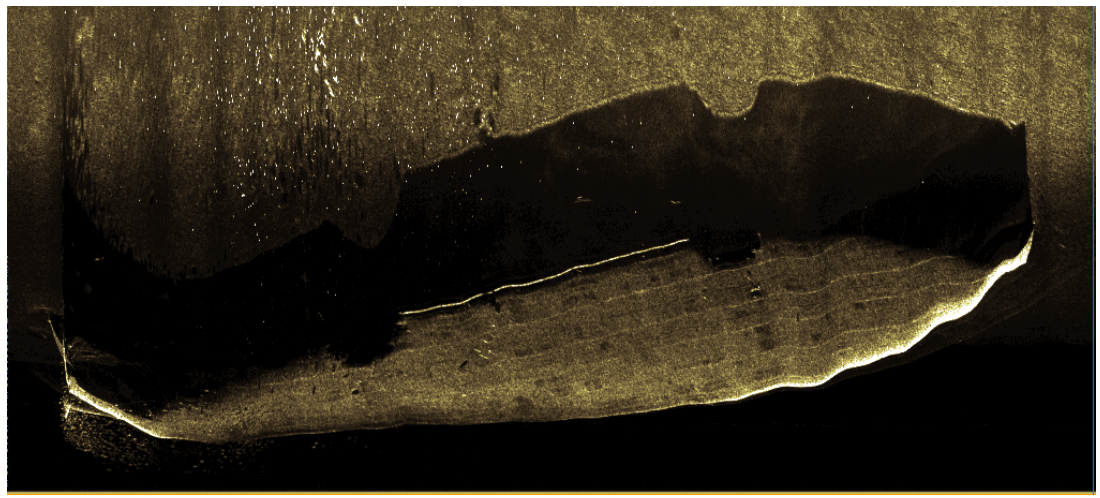


2007

Site 328 – *Sheherazade*



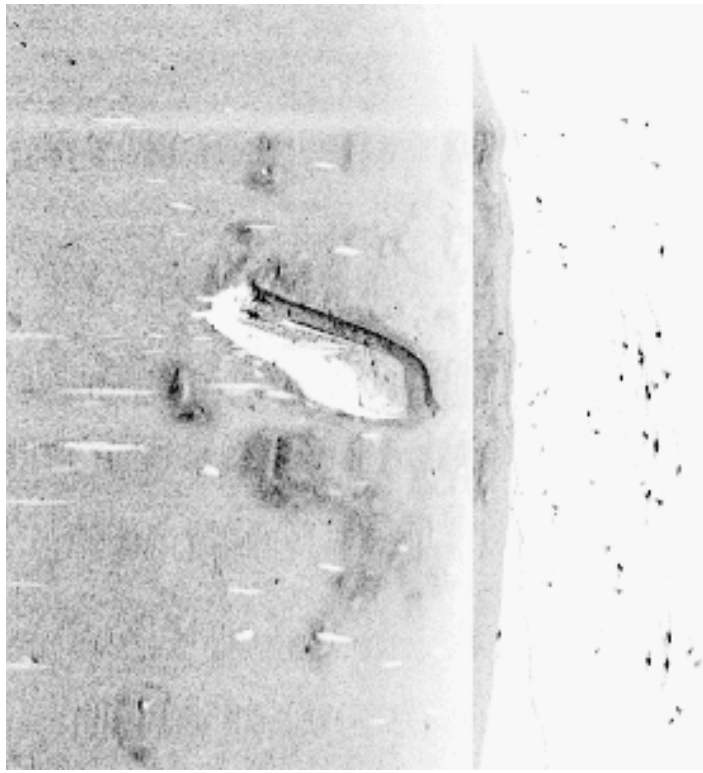
2007



2004

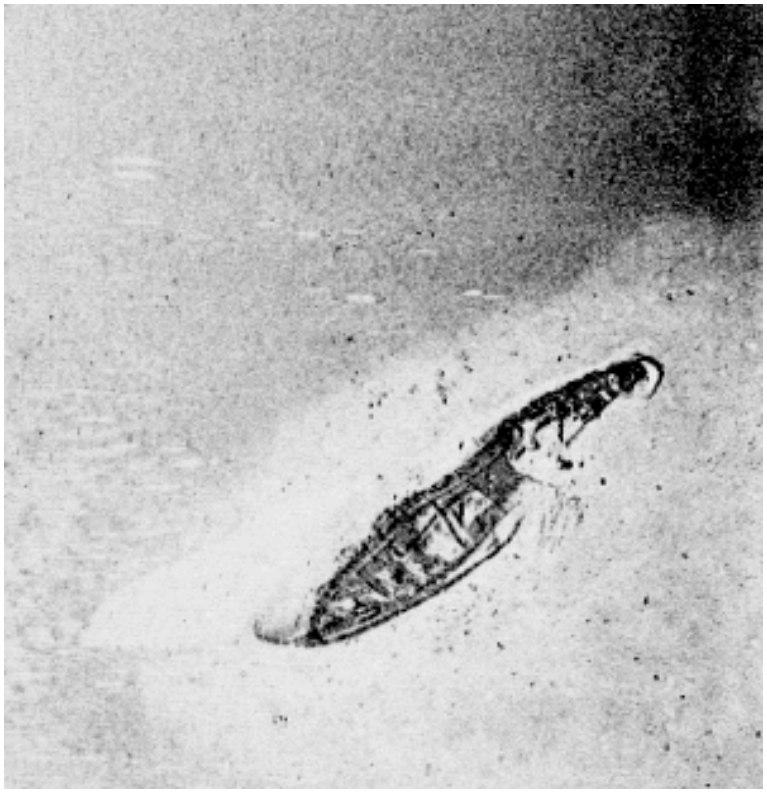
Site 15306

2007

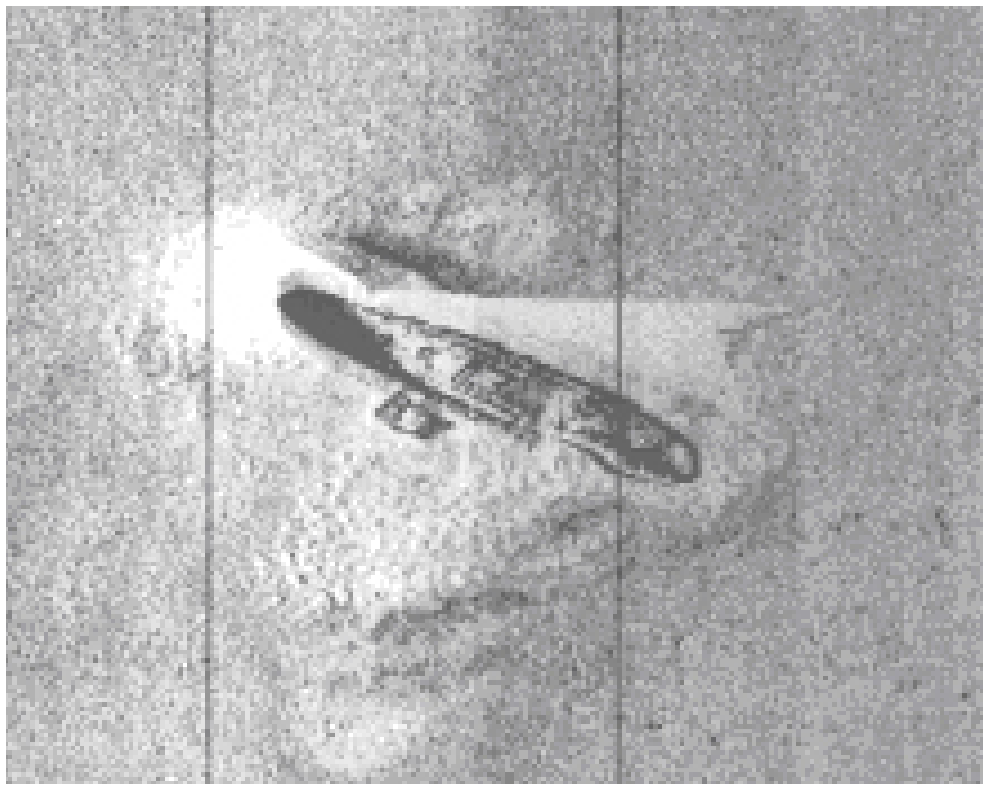


2004

Site 389 – Suspected *J.A. Bisso*



2007



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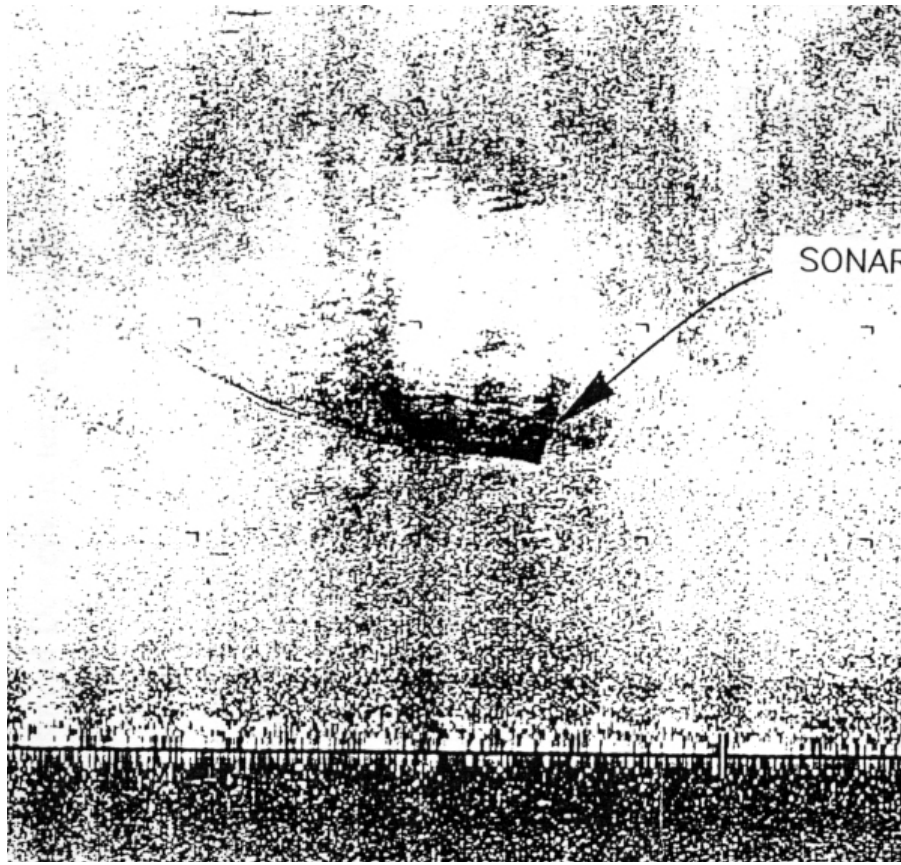
Site 343

2007



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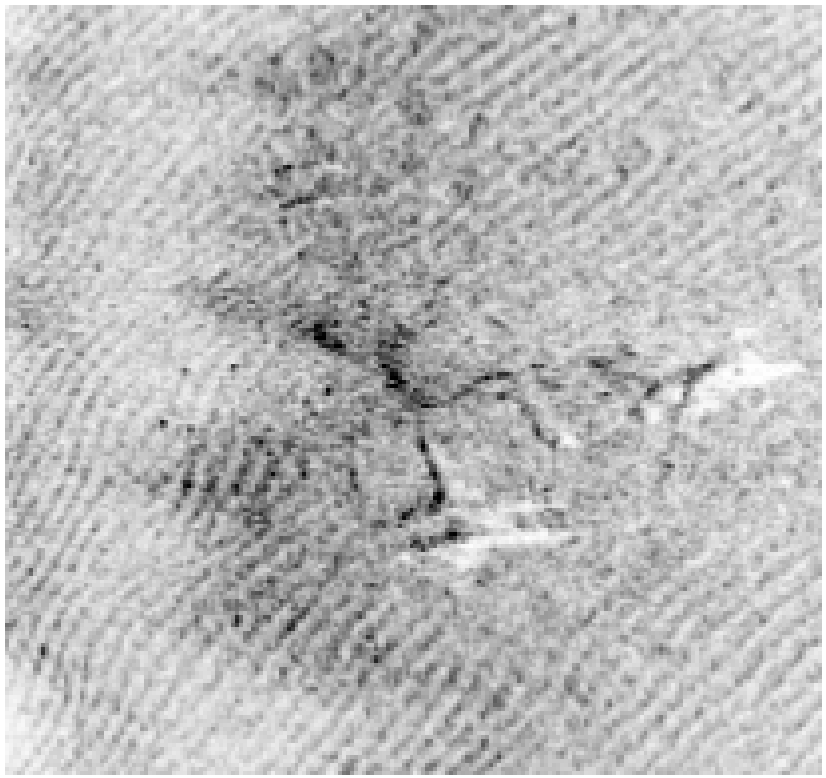
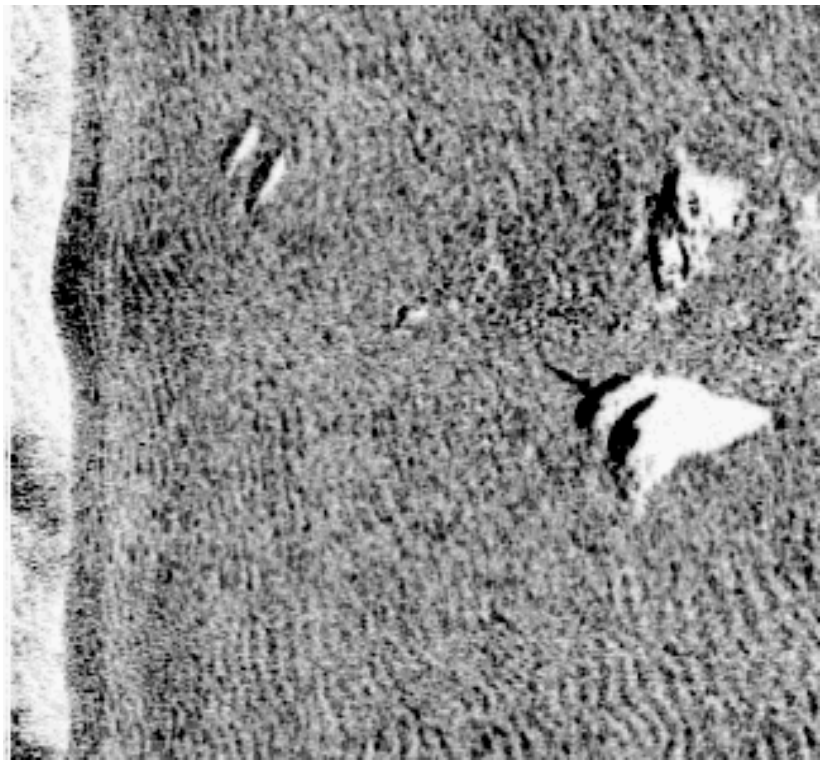
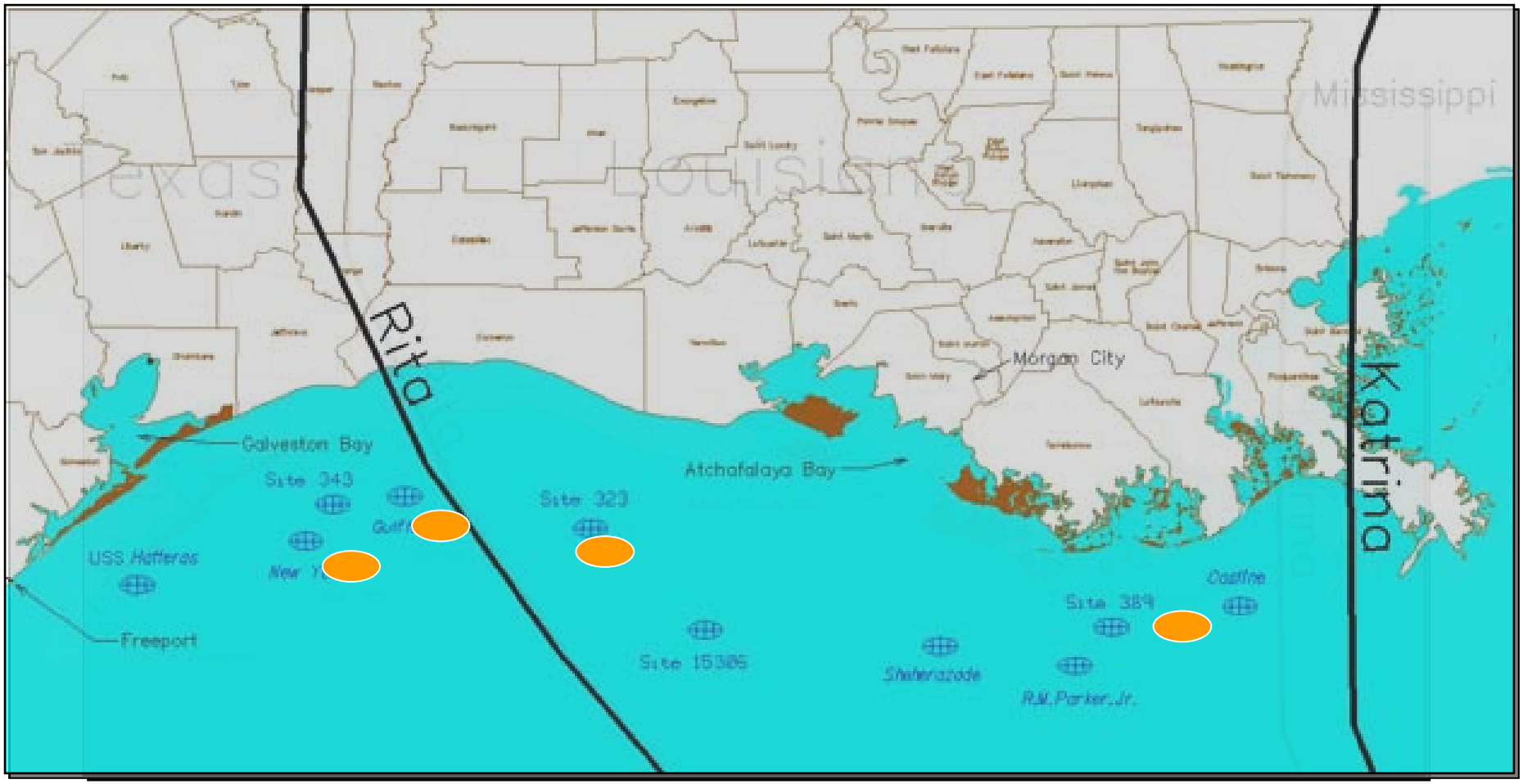
Site 236 – USS *Hatteras*



2007



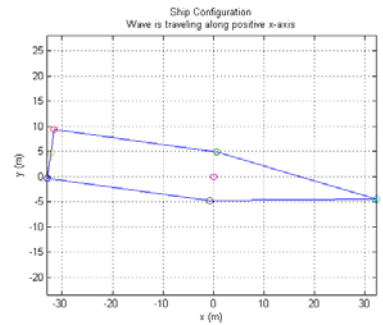
2004

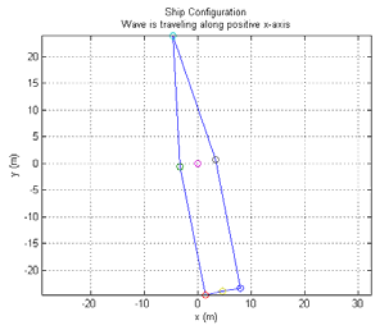

Rita
Katrina
Galveston Bay
Site 343
Site 323
Atchafalaya Bay
Morgan City
USS Hatteras
Freeport
Site 15385
Site 389
Castfire
Shaherazade
R.W. Parker, Jr.

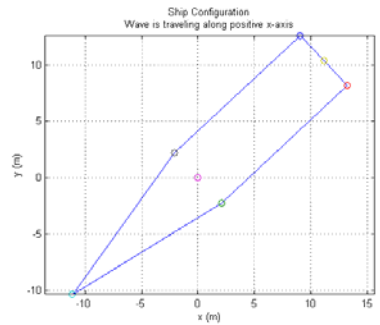
Summary of Wave Model Results

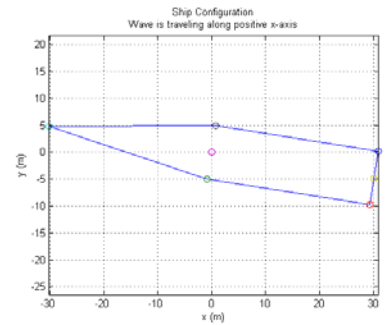
Wreck	USS *Castine*	*New York*	*Gulftide*	Site 323
Distance from Eye (nm)	26 W of Katrina	30 W of Rita	7 W of Rita	25 E of Rita
Water Depth (ft)	115	64	60	75
Length (ft)	214	160	100	200
Beam (ft)	32	22	20	33
Height (ft)	6	0	7	6.5
Hull Orientation (deg)	316	170	69	200
Wave Height (ft)	32	18	23	31
Wave Period (s)	16.4	15.5	14	16
Maximum velocity (knots)	5.1	4.9	5.6	6.6
Minimum velocity (knots)	-2.5	-1.4	-1.7	-2.3
Ship-wave orientation (approx.)	parallel	perpendicular	45°	parallel
Bow-stern phase difference (s)	4	1	2	4

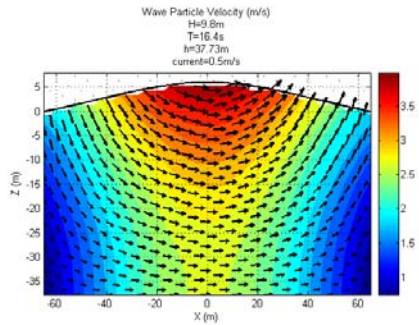
Castine – New York – Gulftide – Site 323

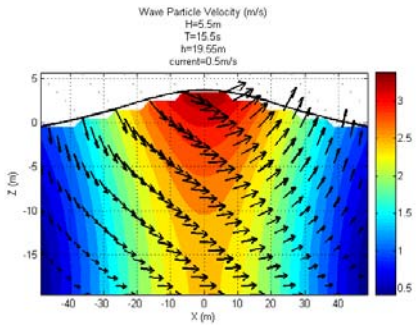


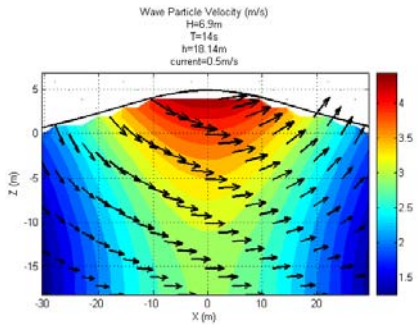


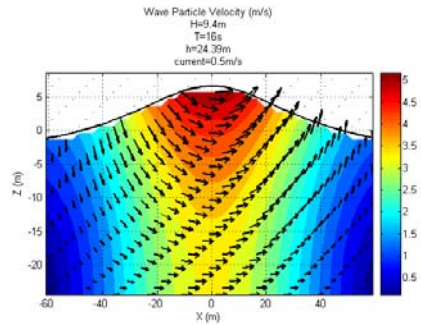


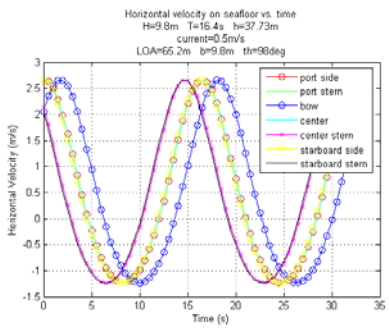


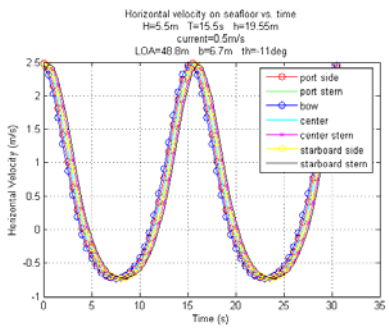


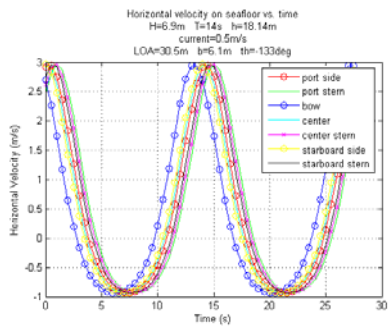


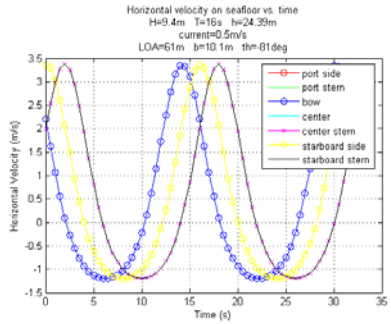




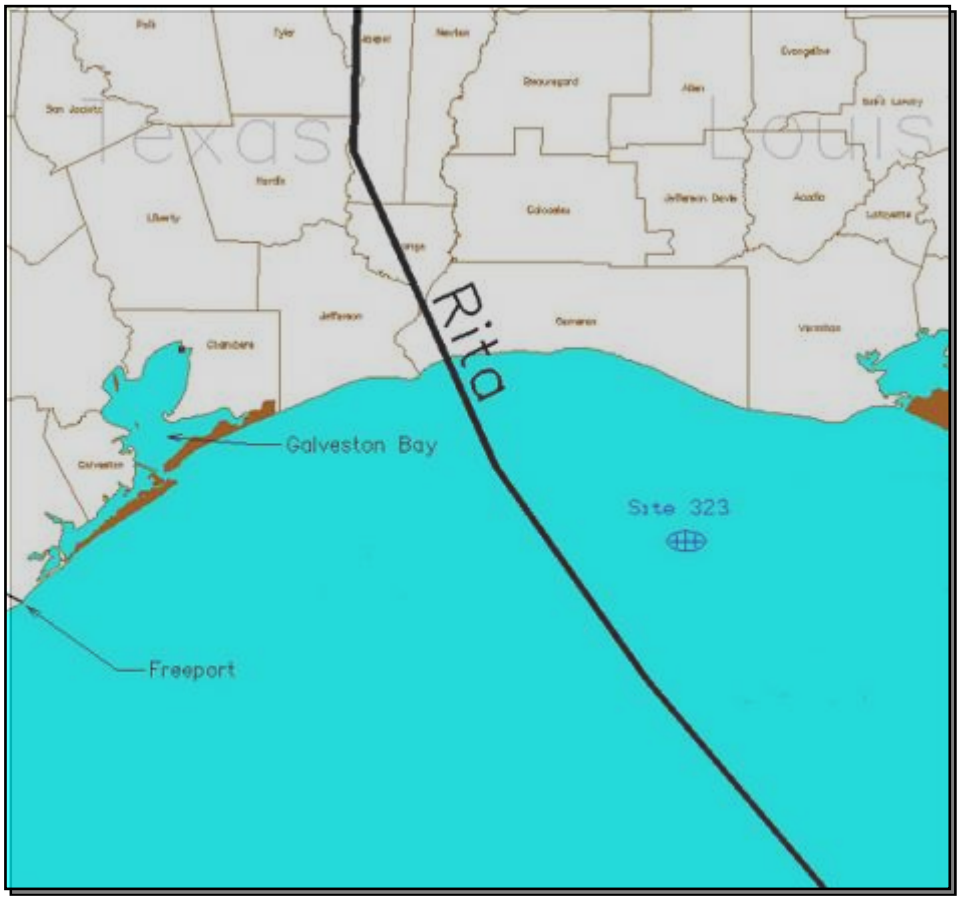








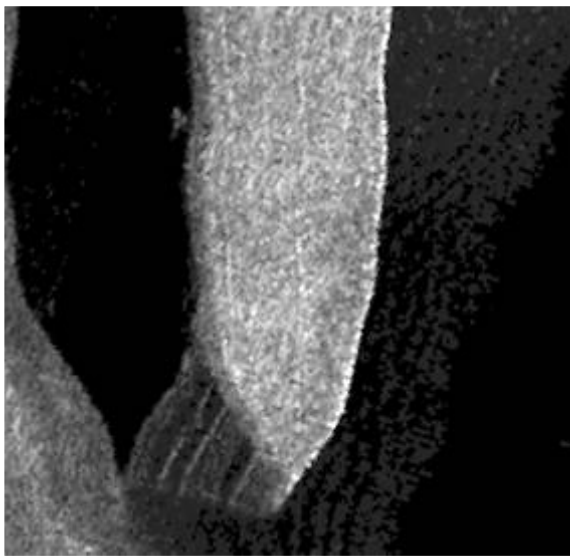
Site 323



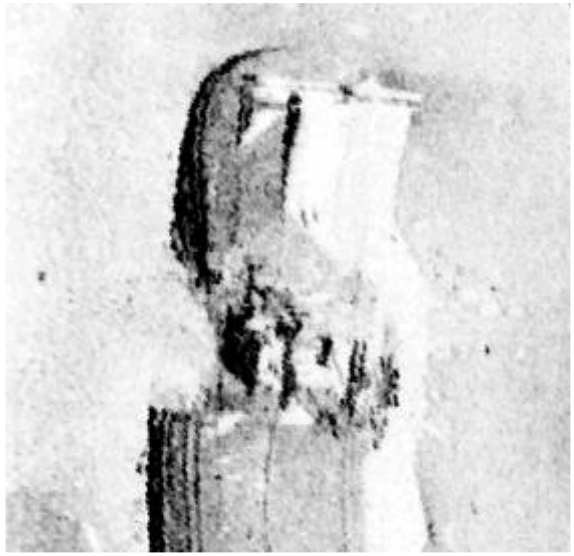
Hindcast Data

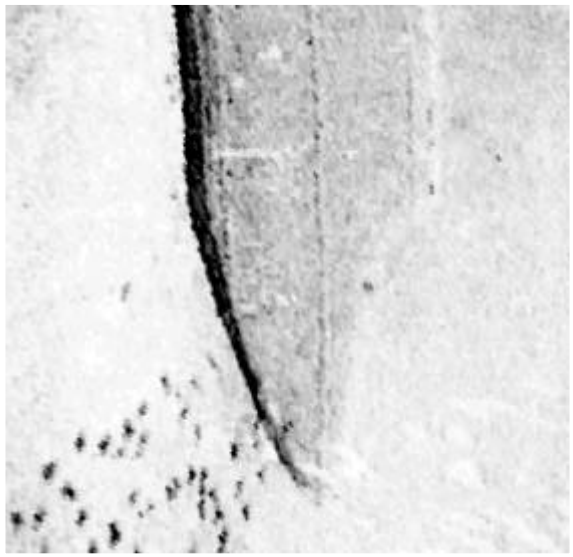
25 nautical miles east of eye
85.7 mph – peak sustained wind
30.8 ft – maximum significant wave height

2004

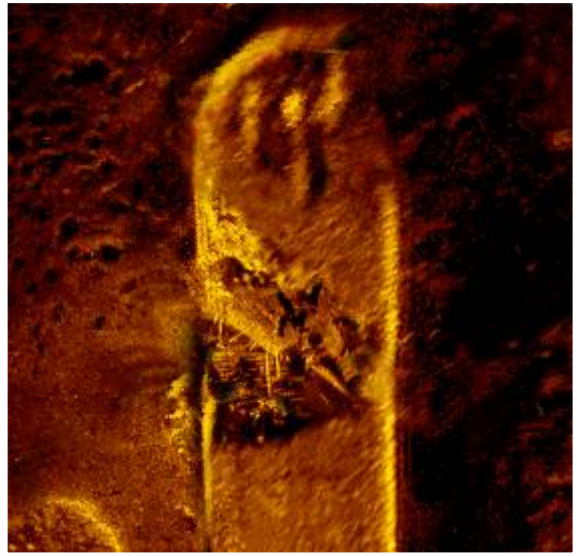


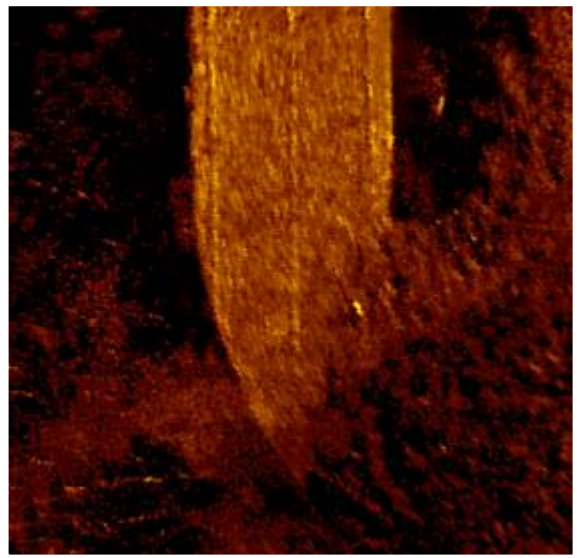
2007



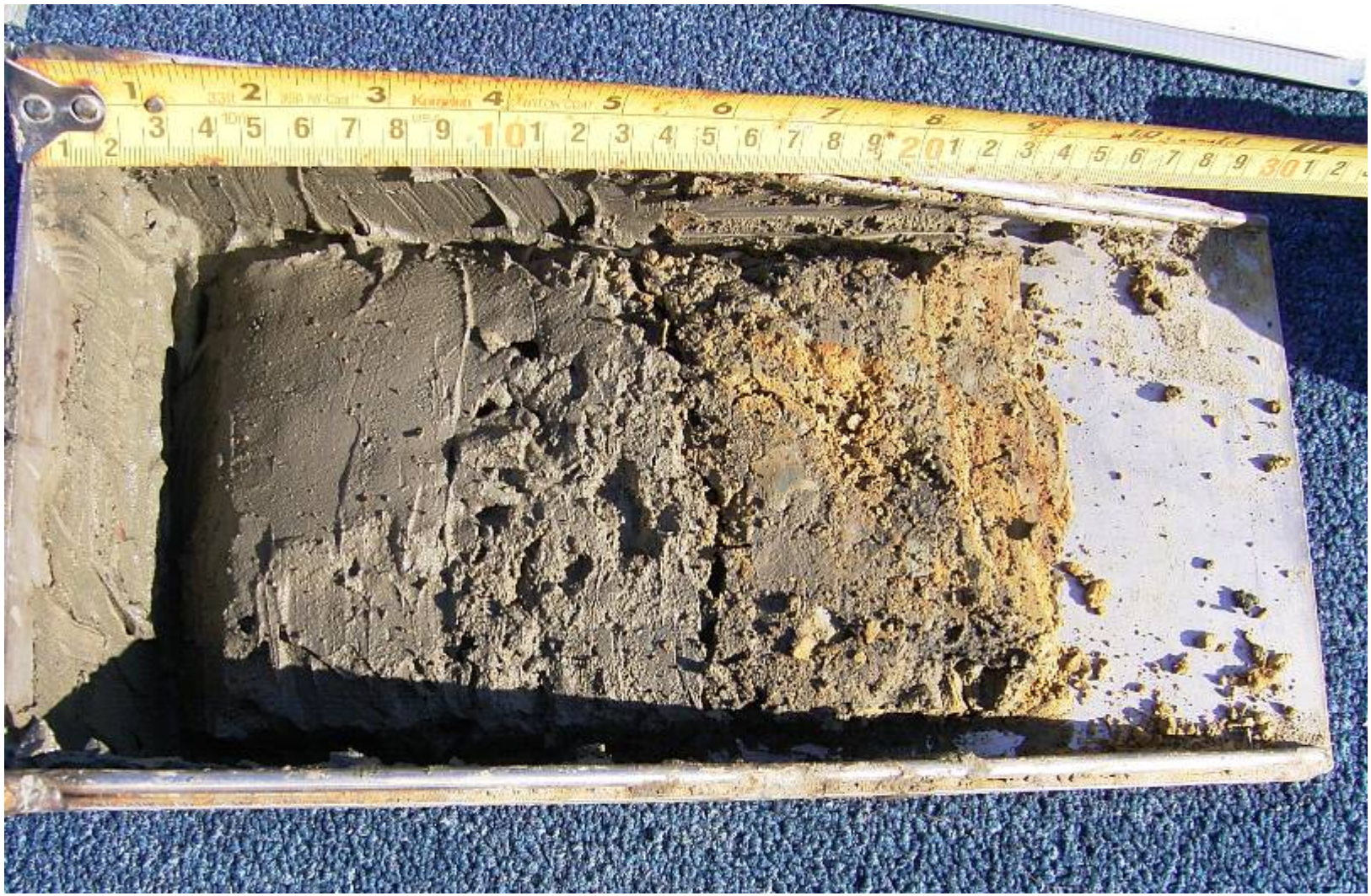


2007

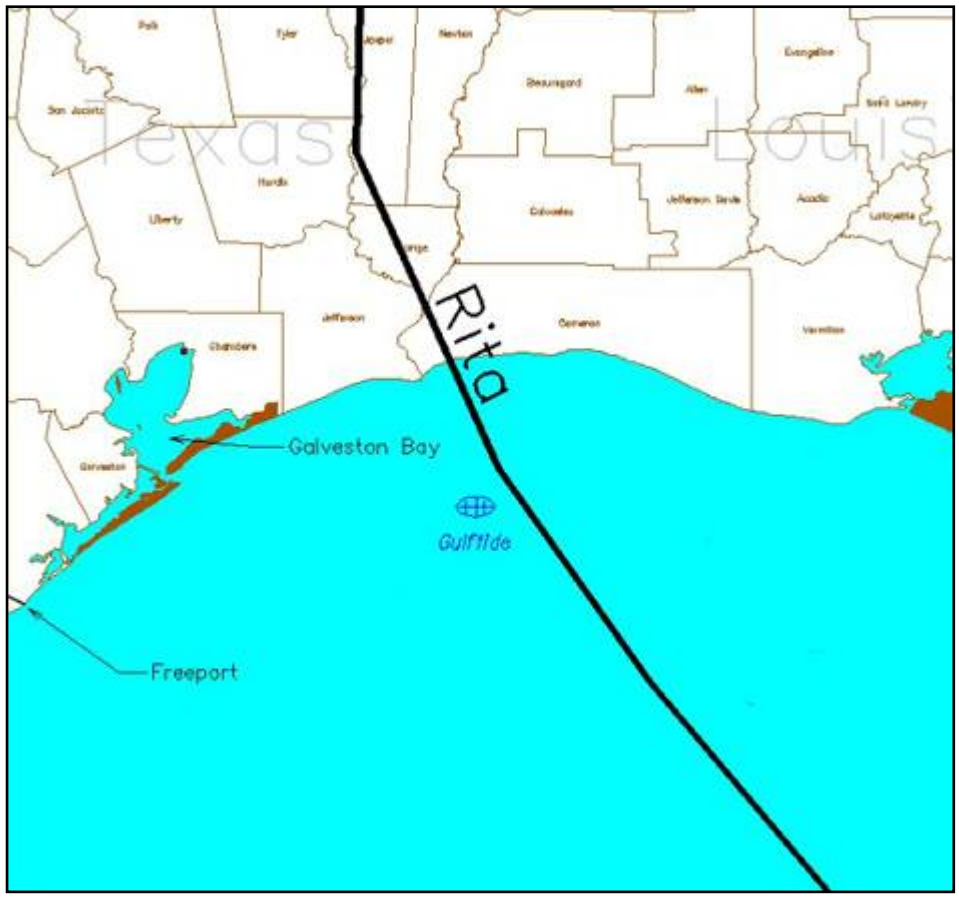




Beaumont Clay in Box Core from Site 323



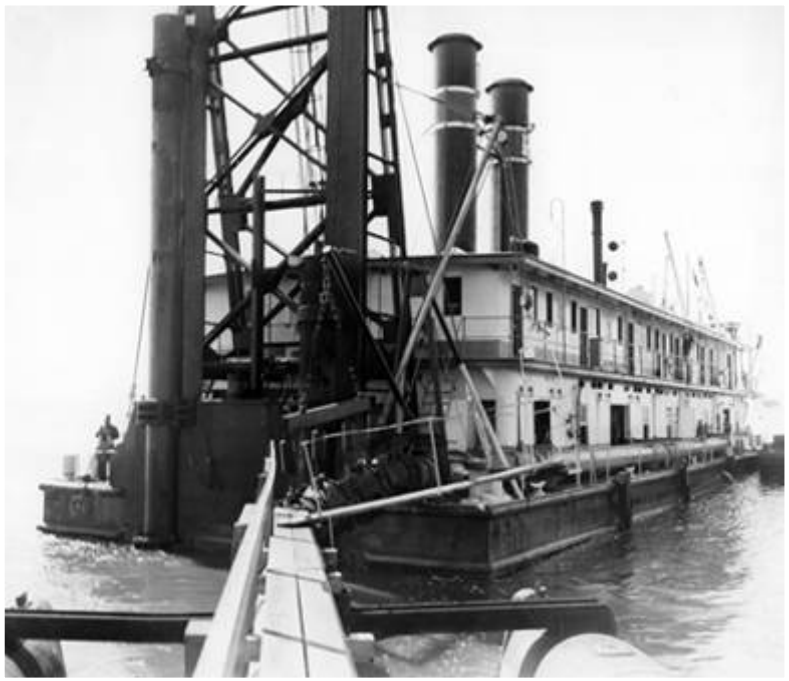
Gulf Tide

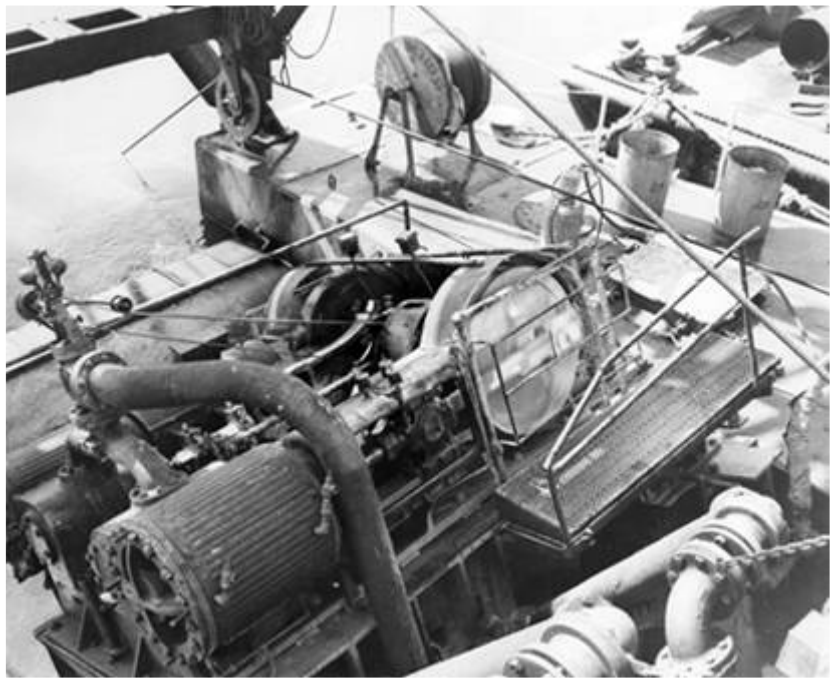


Hindcast Data

7.3 nautical miles west of eye
79 mph – peak sustained wind
23 ft – maximum significant wave height

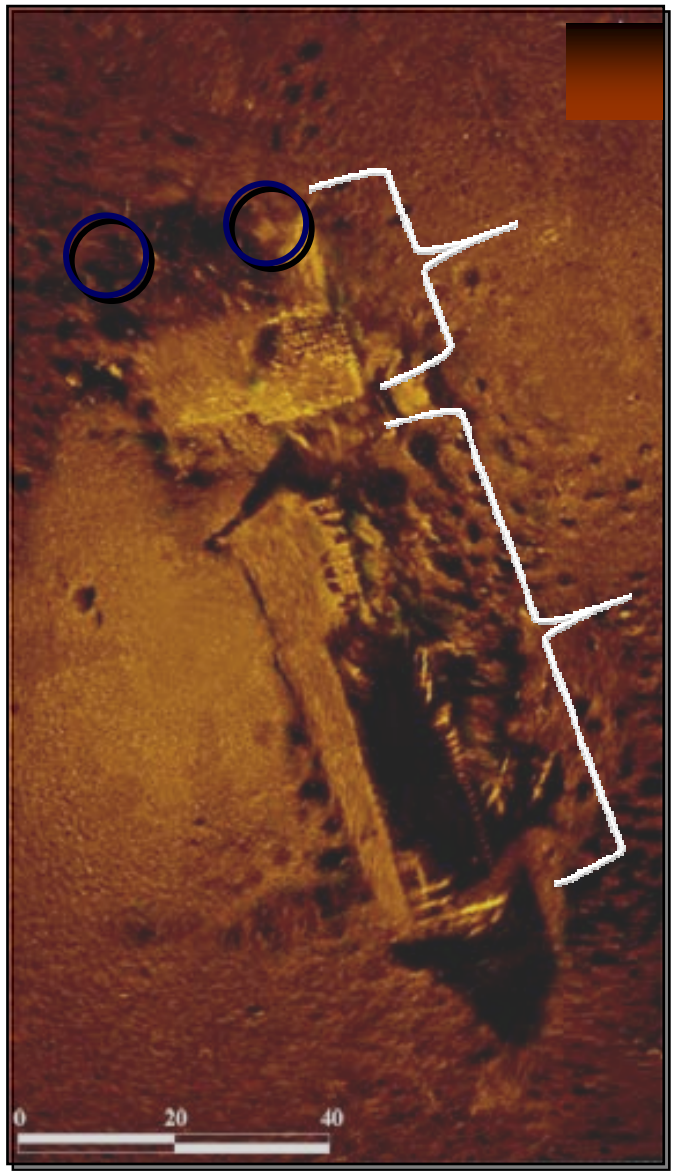
Henry Bacon
160 x 41 x 9 ft
Built in 1931



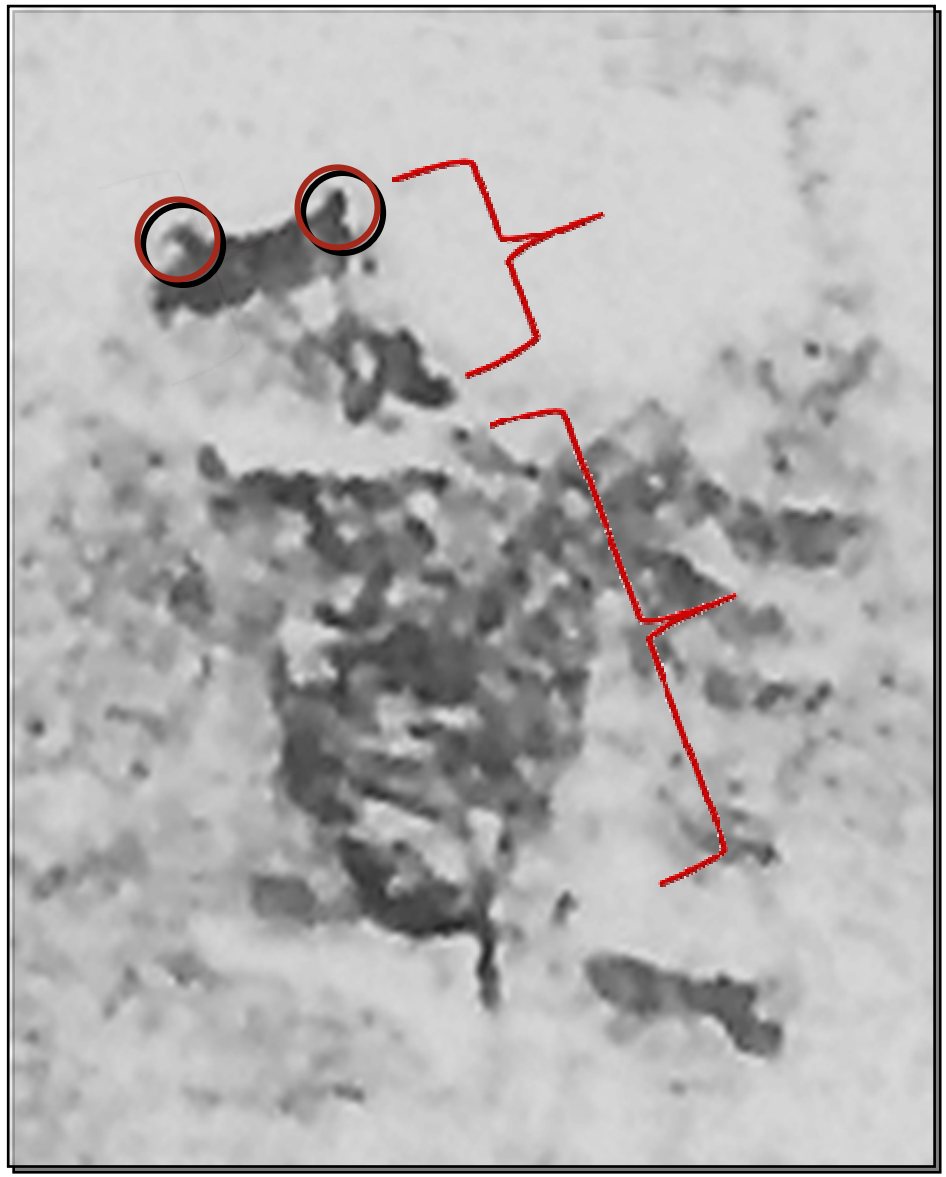


Sonar Image 2007

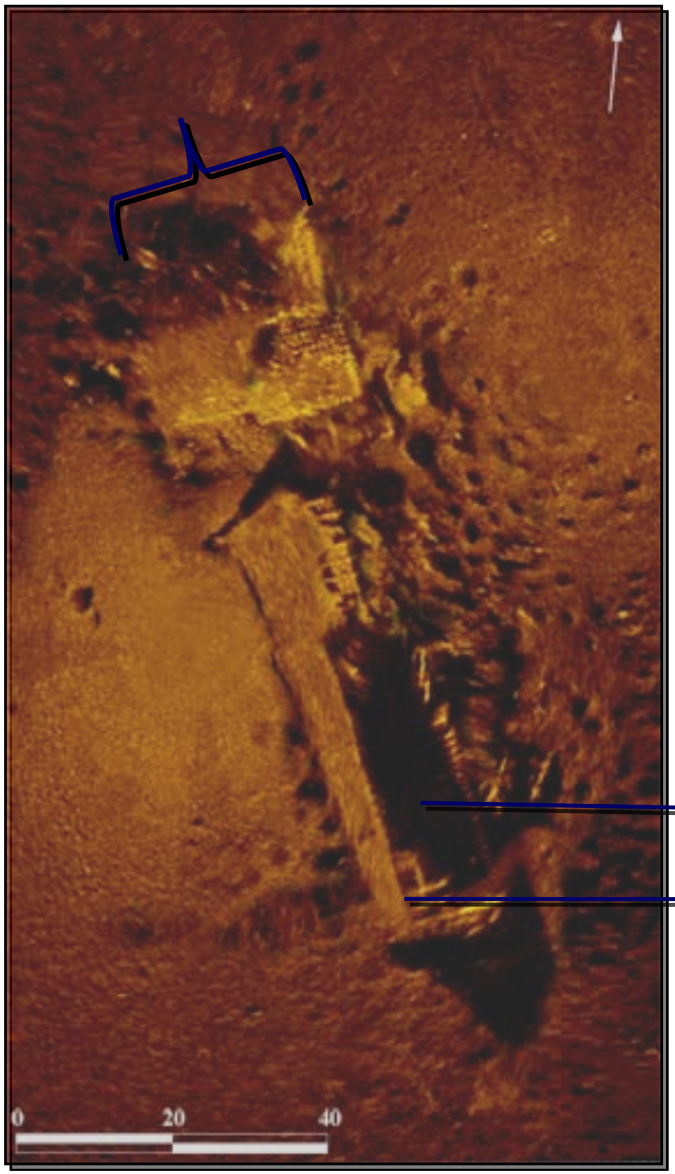
Sonar Image 1997

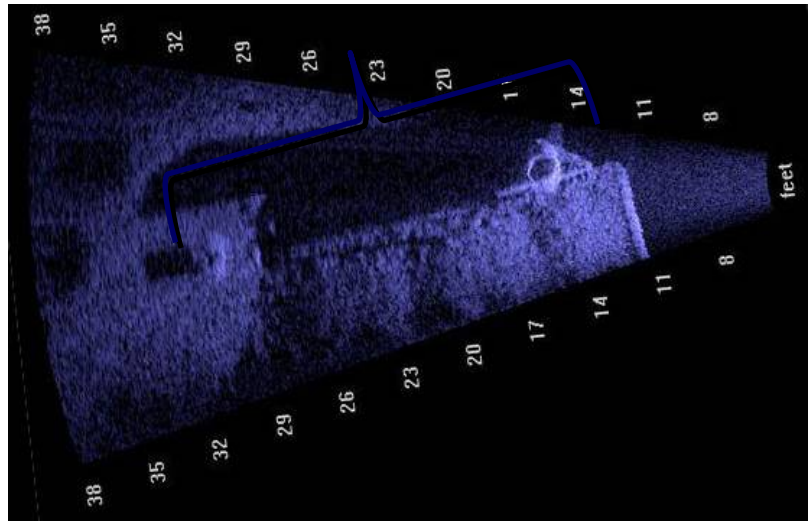


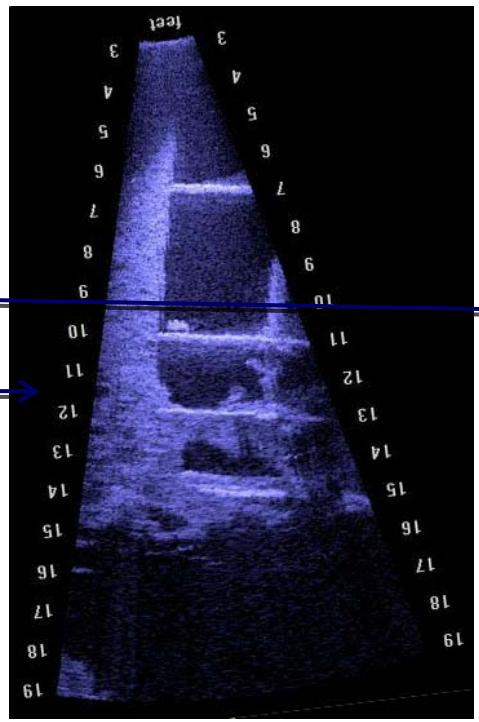
Sector-Scan 2007

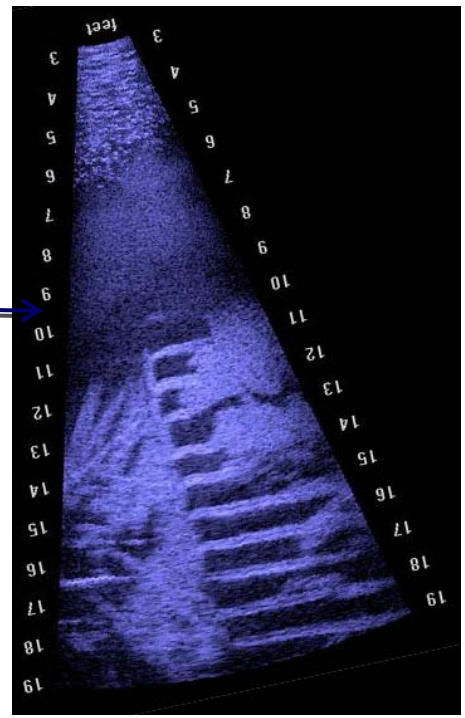


Sonar Image 1997

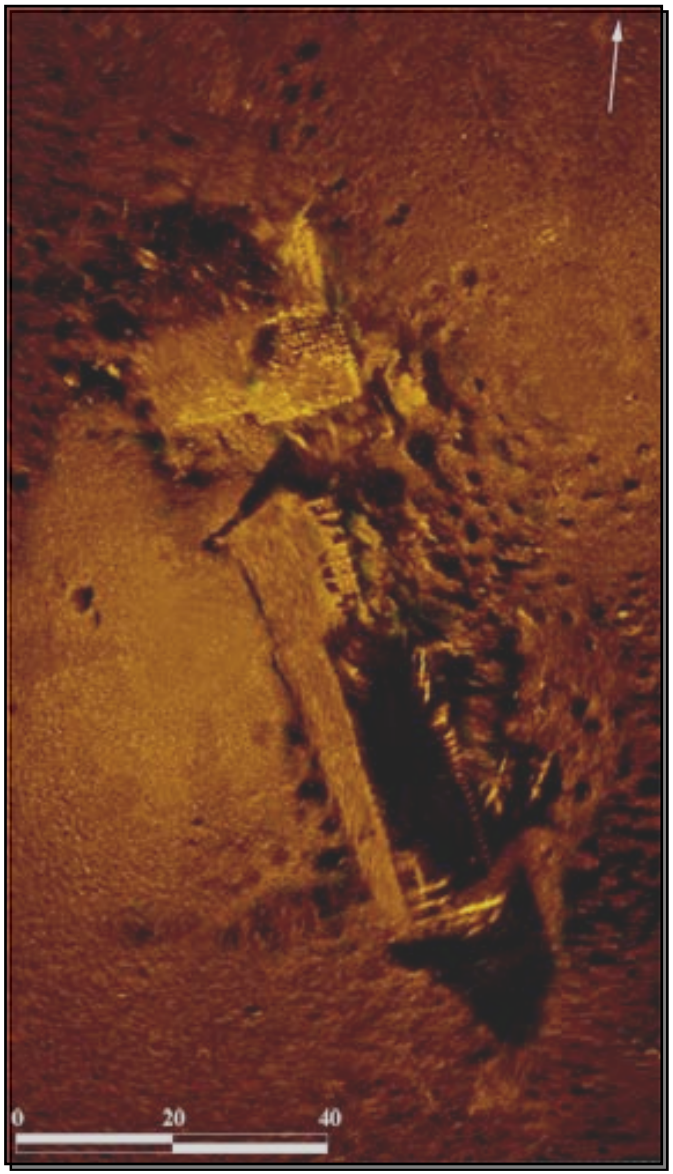








Sector-Scan 2007



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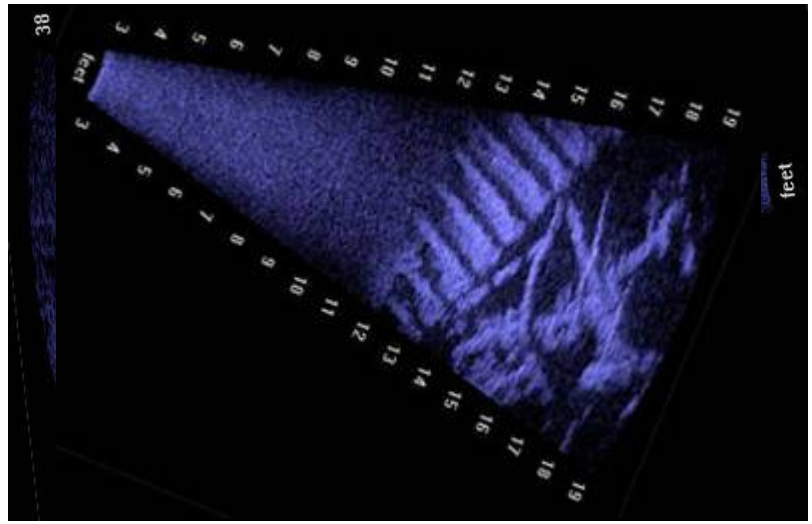
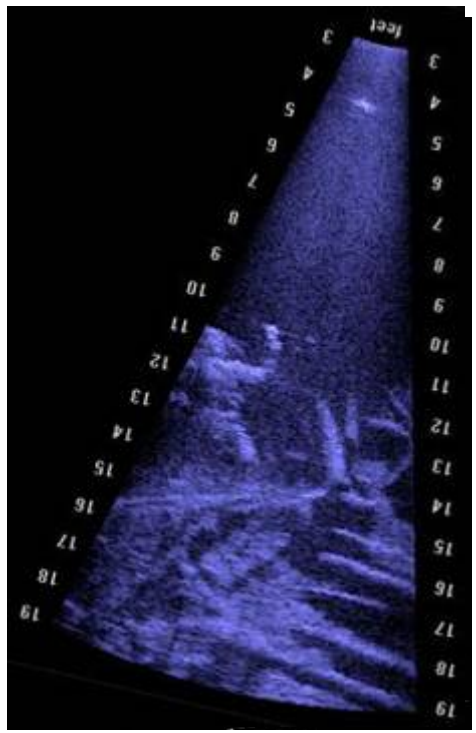
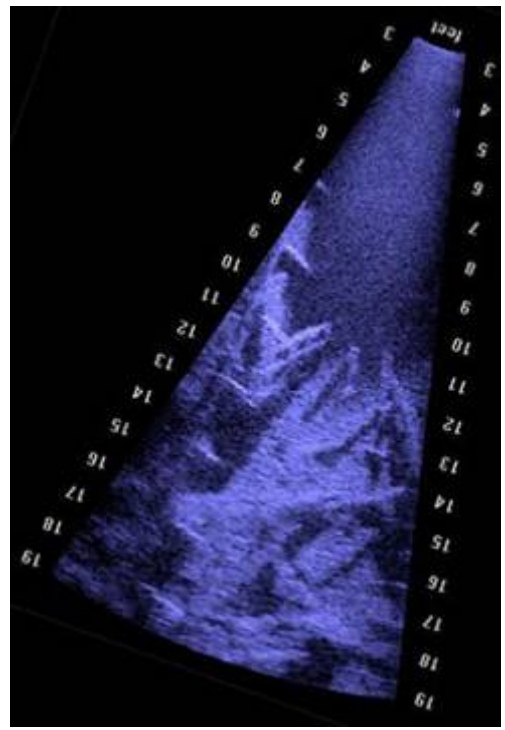
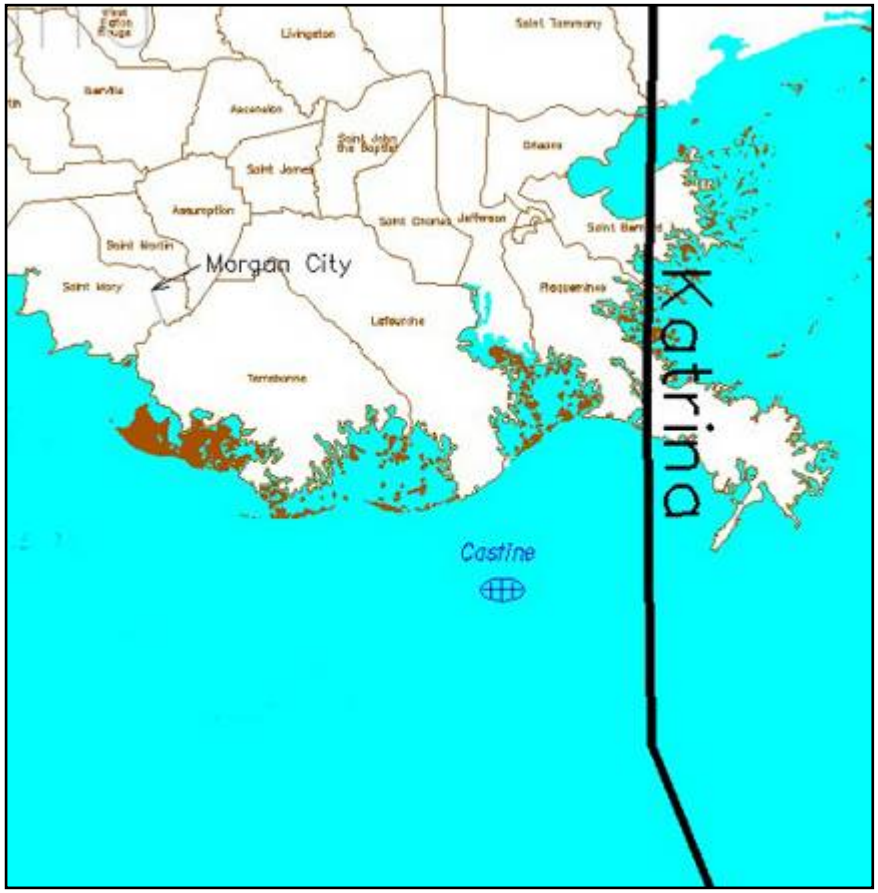






Castine

1892–1924

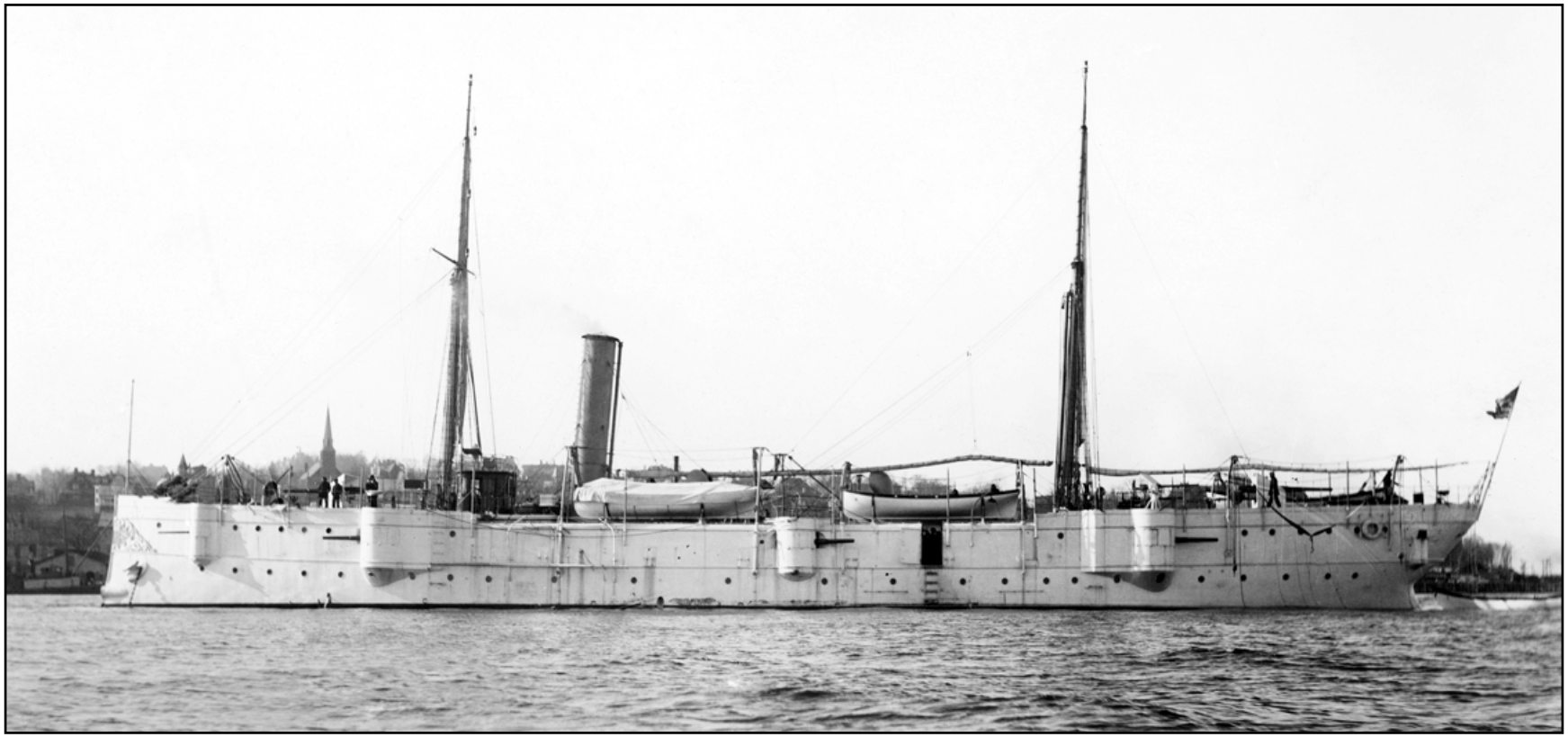


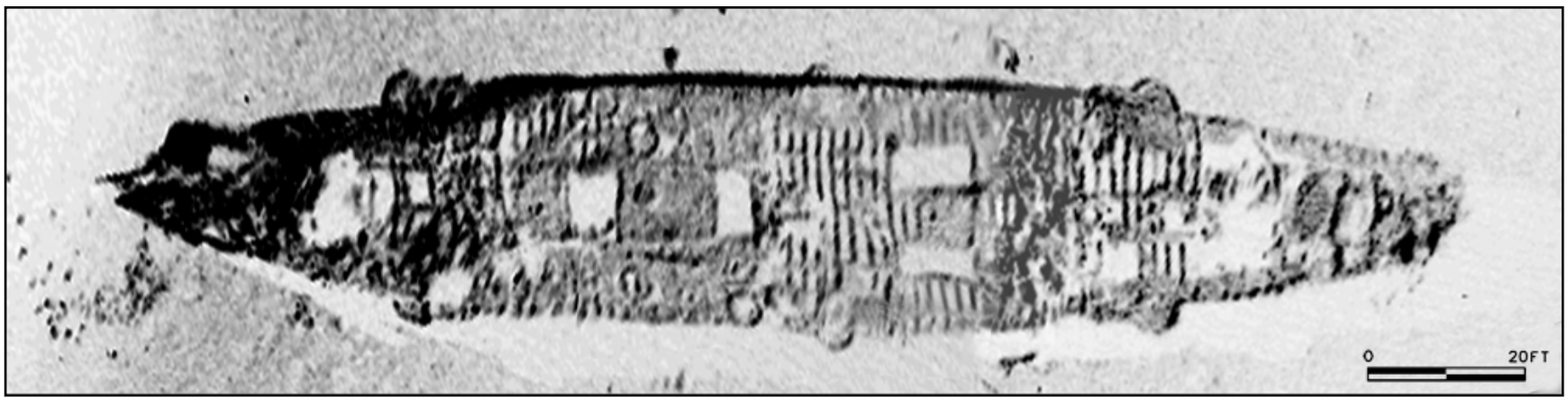
Hindcast Data

26 nautical miles west of path
74 mph – peak sustained wind
32 ft – maximum significant wave height

Castine

1892–1924

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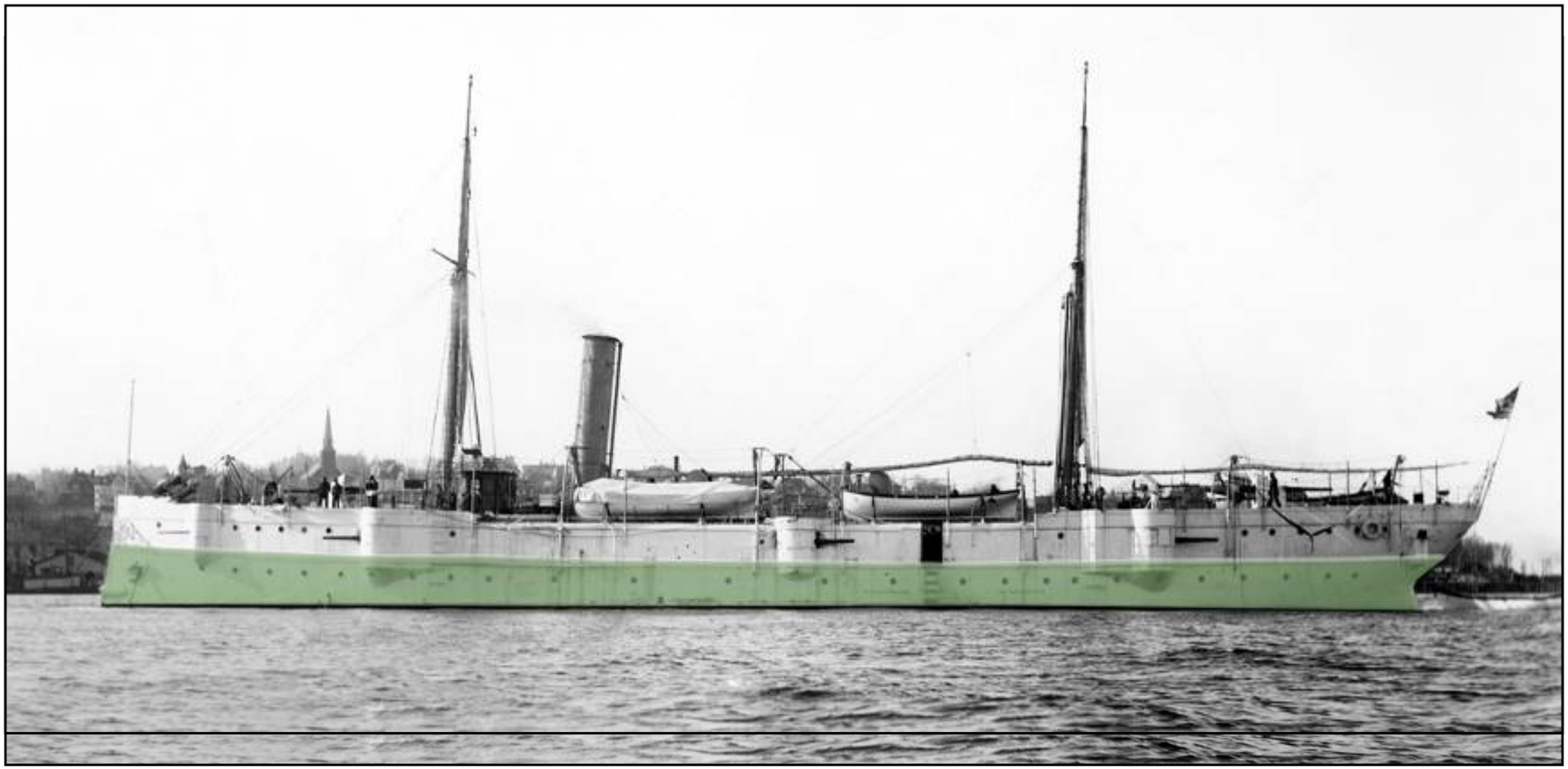

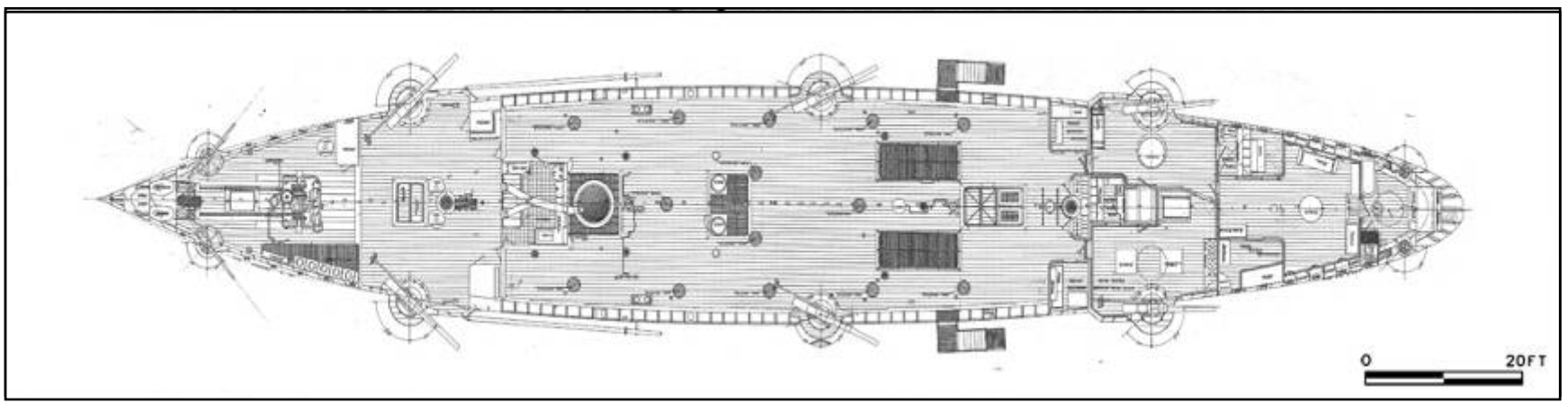
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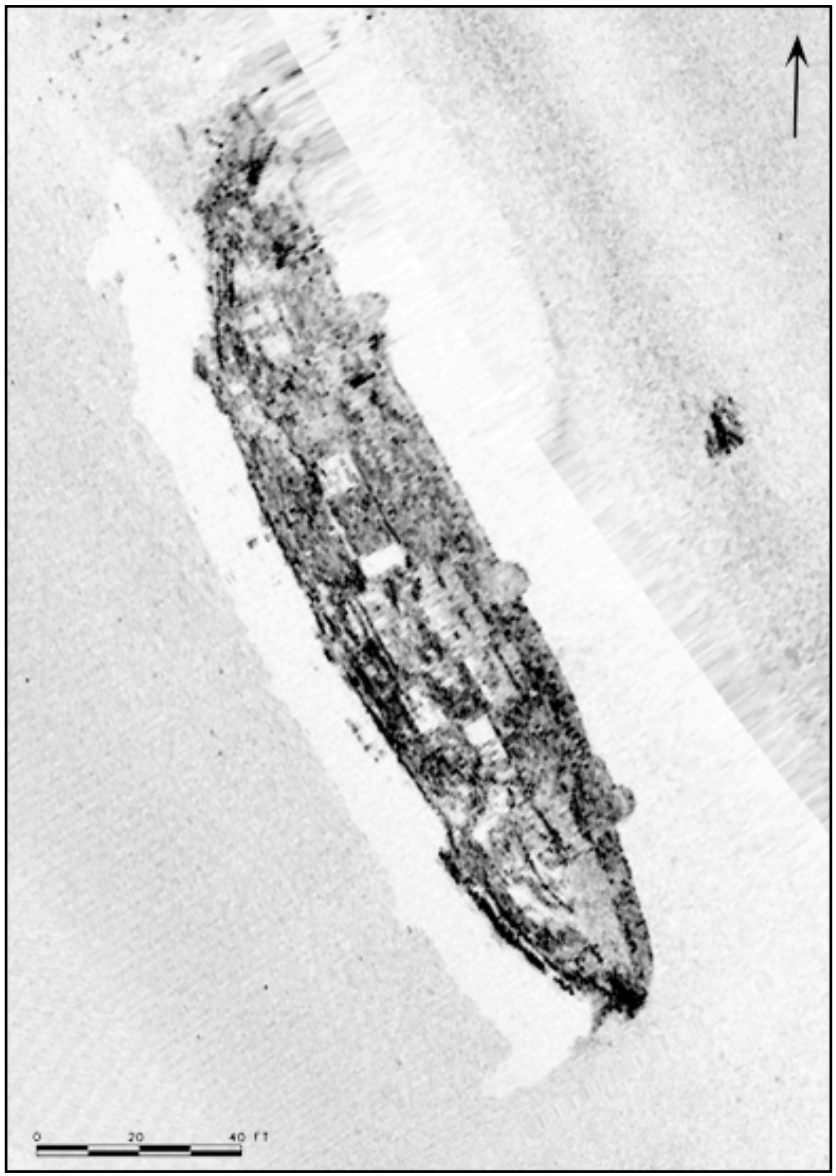
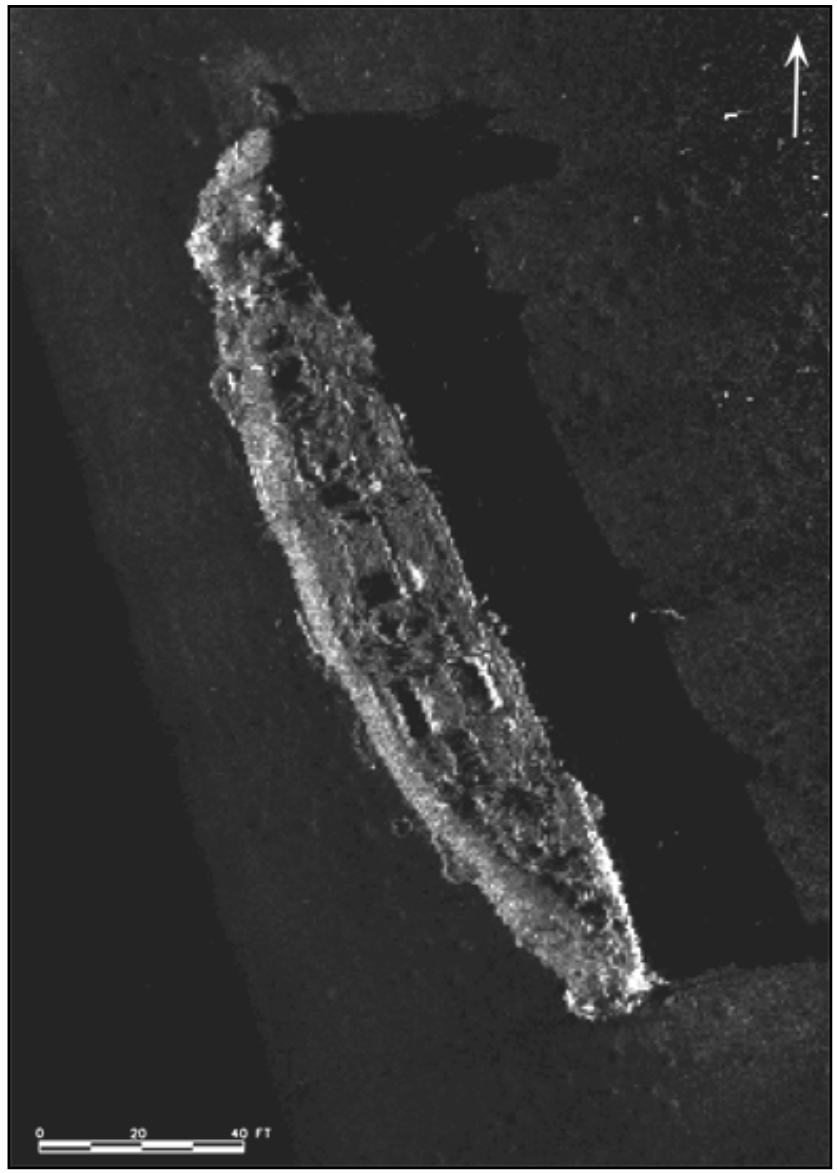


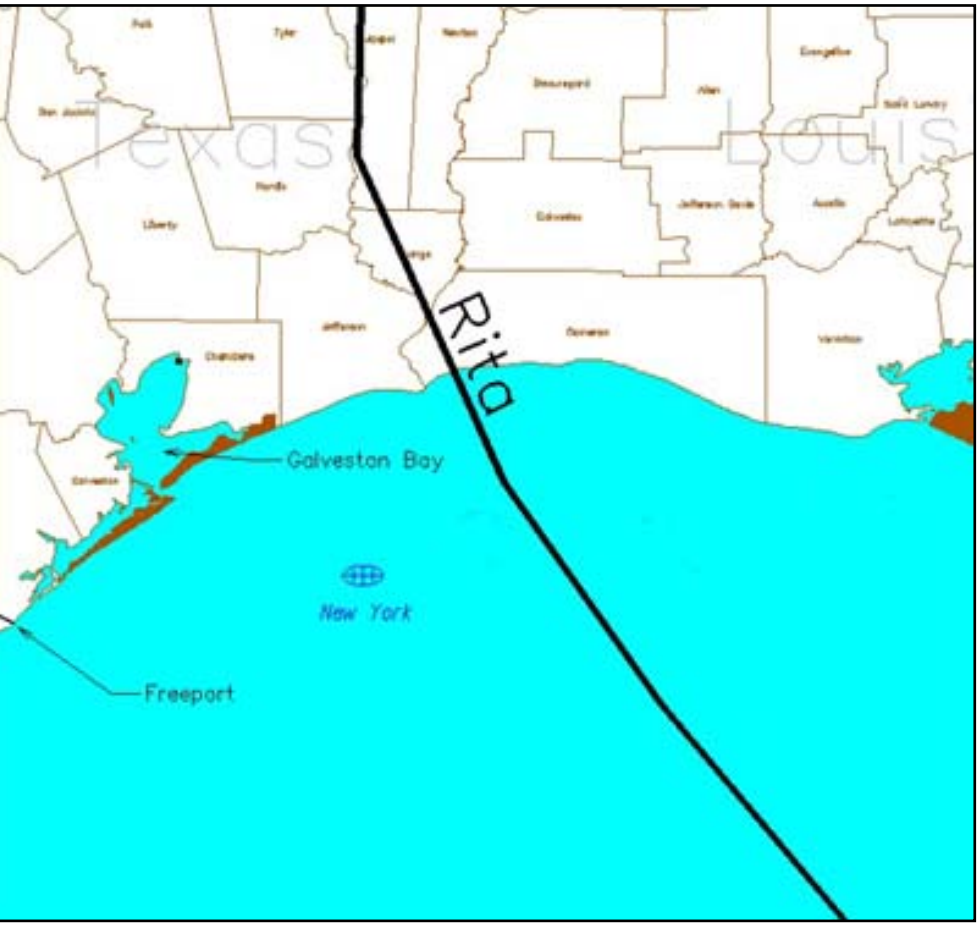
Sector-Scan 2007



Sector-Scan 2004

SS *New York*

1837–1846



Hindcast Data

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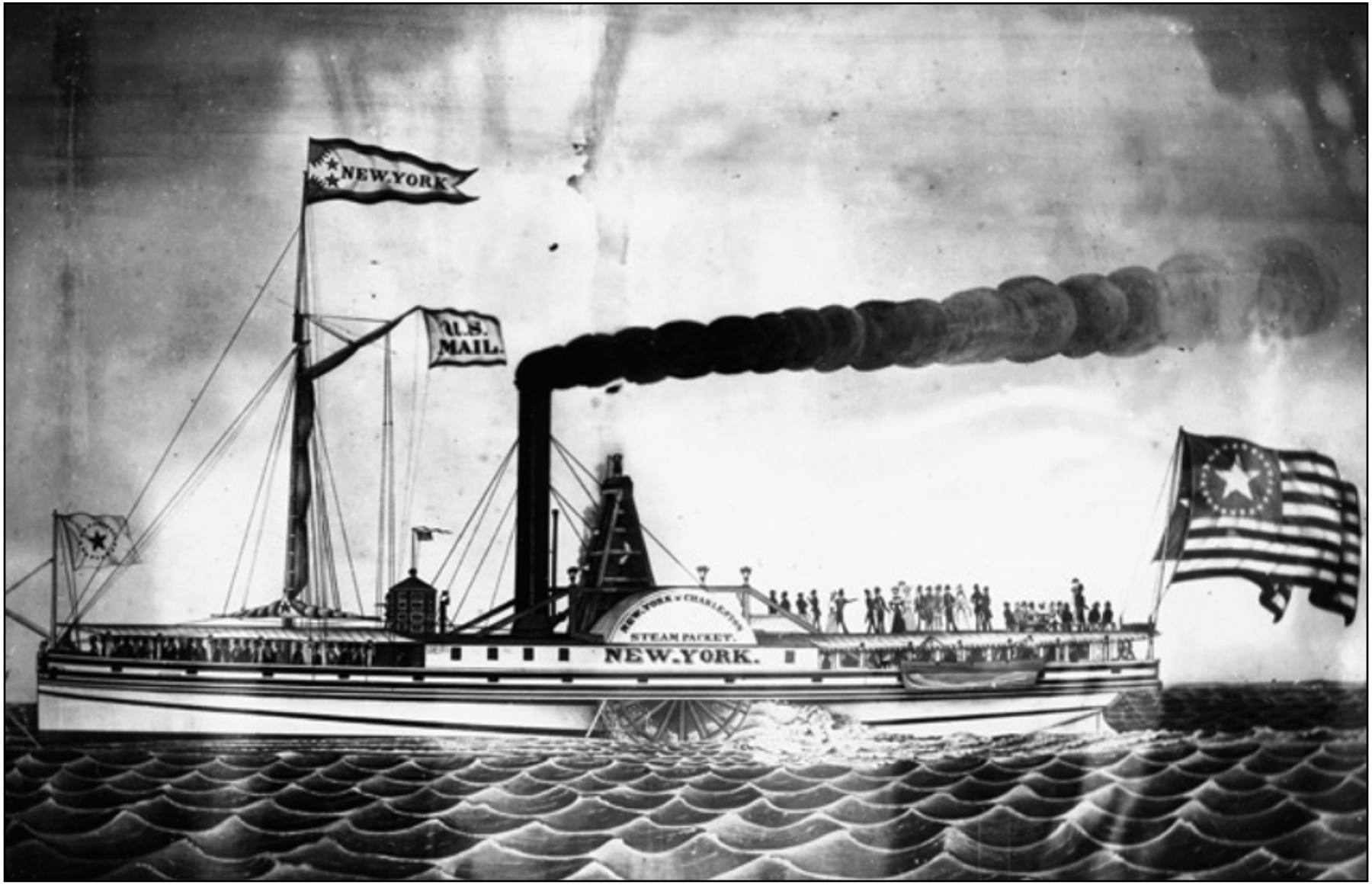
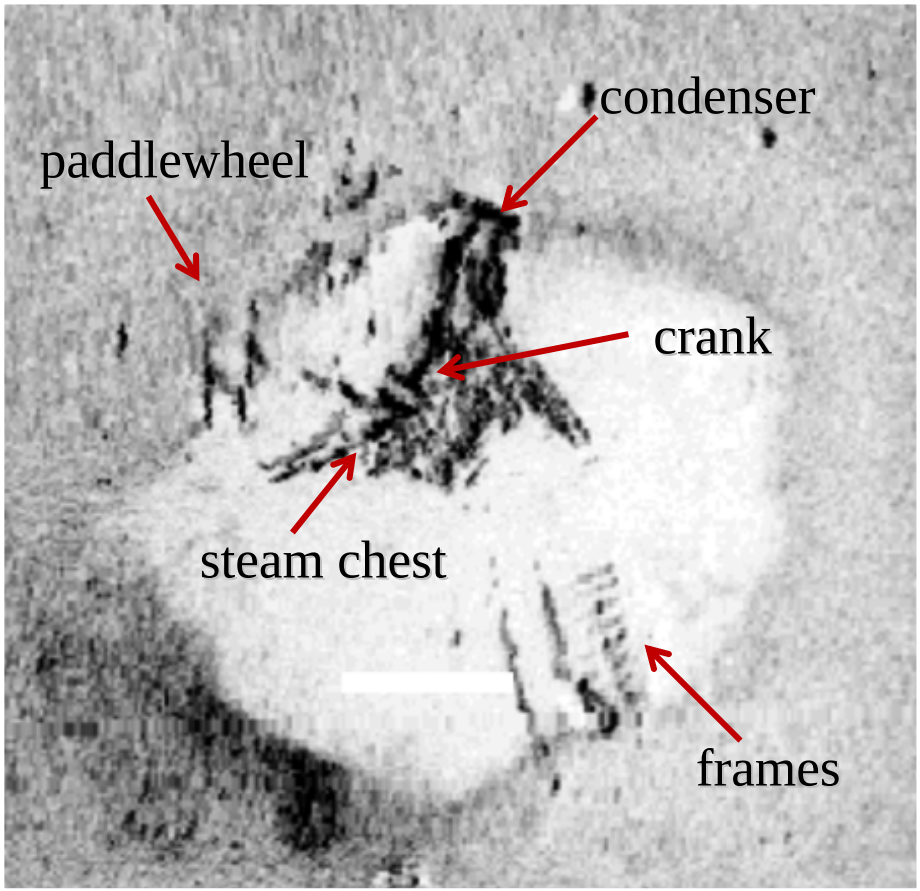
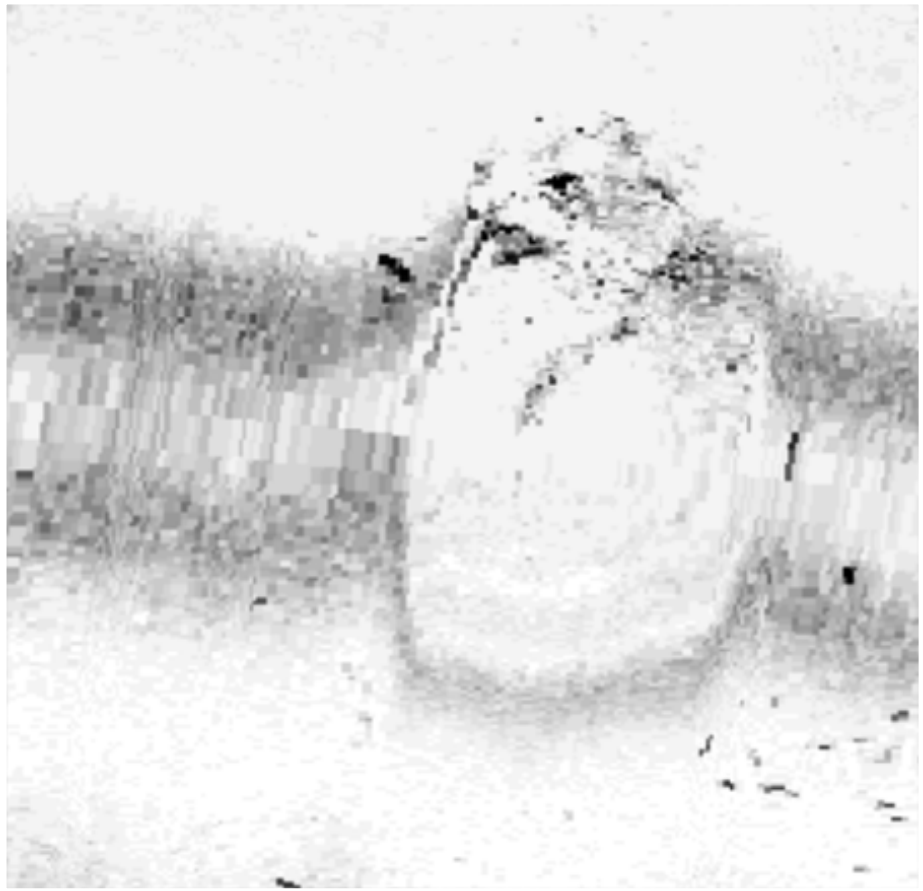

NEW YORK
U.S. MAIL
STEAM PACKET
NEW YORK.

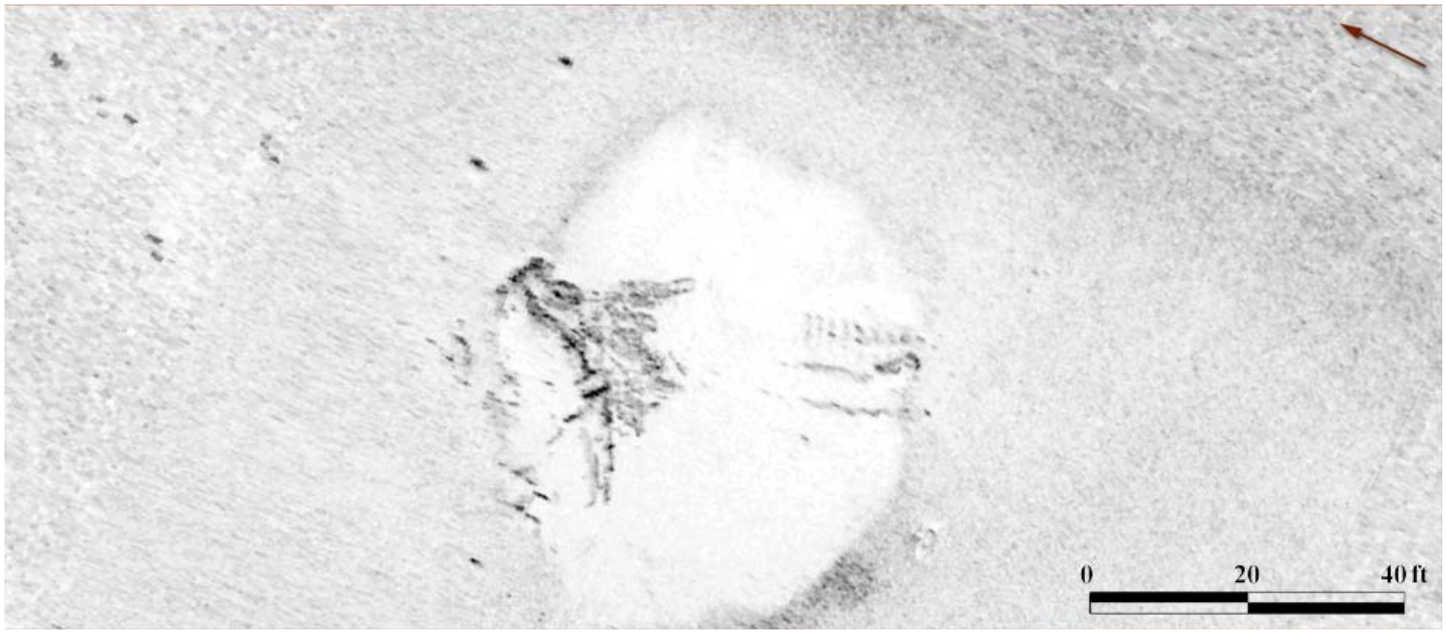


Sonar Image 2007



Sonar Image 1997

Sonar Image
May 2007



Sector Scan
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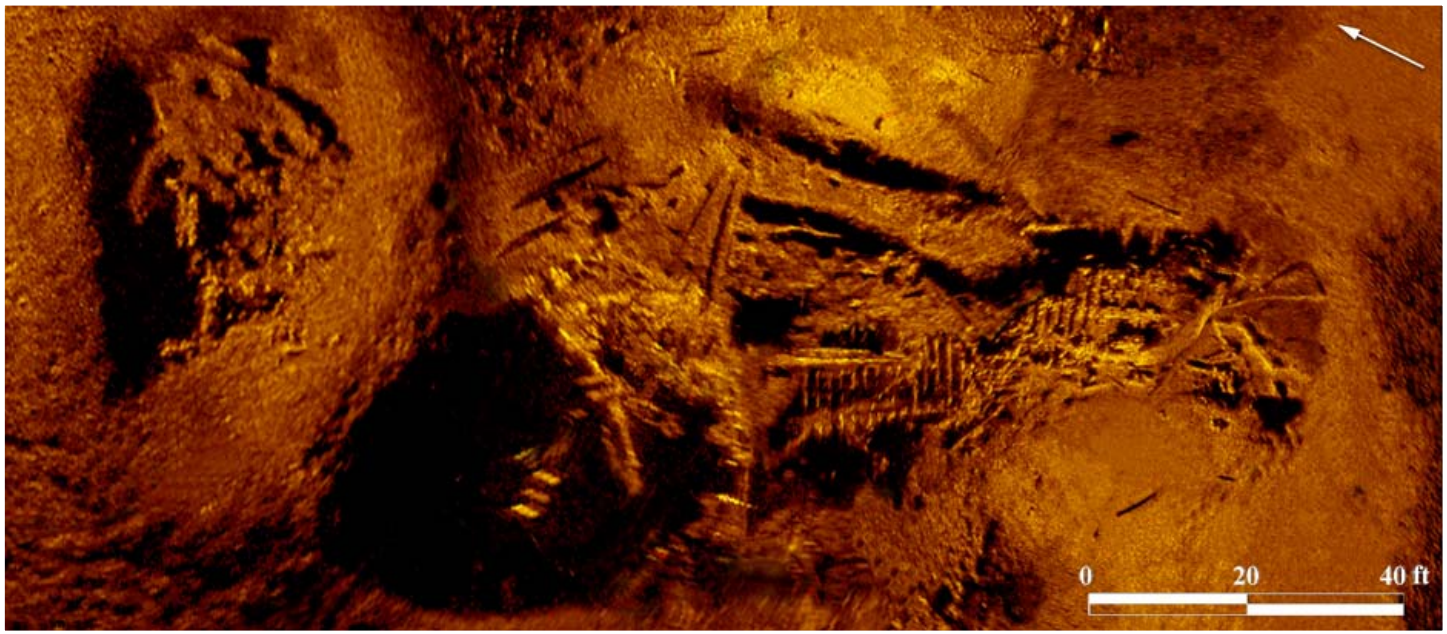
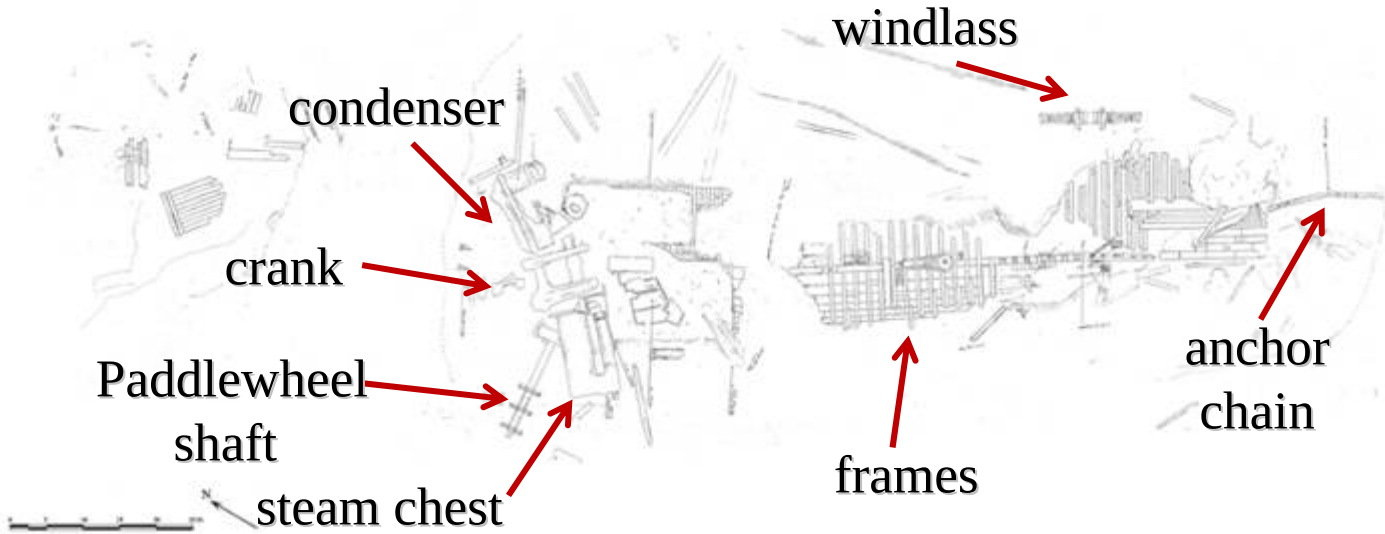
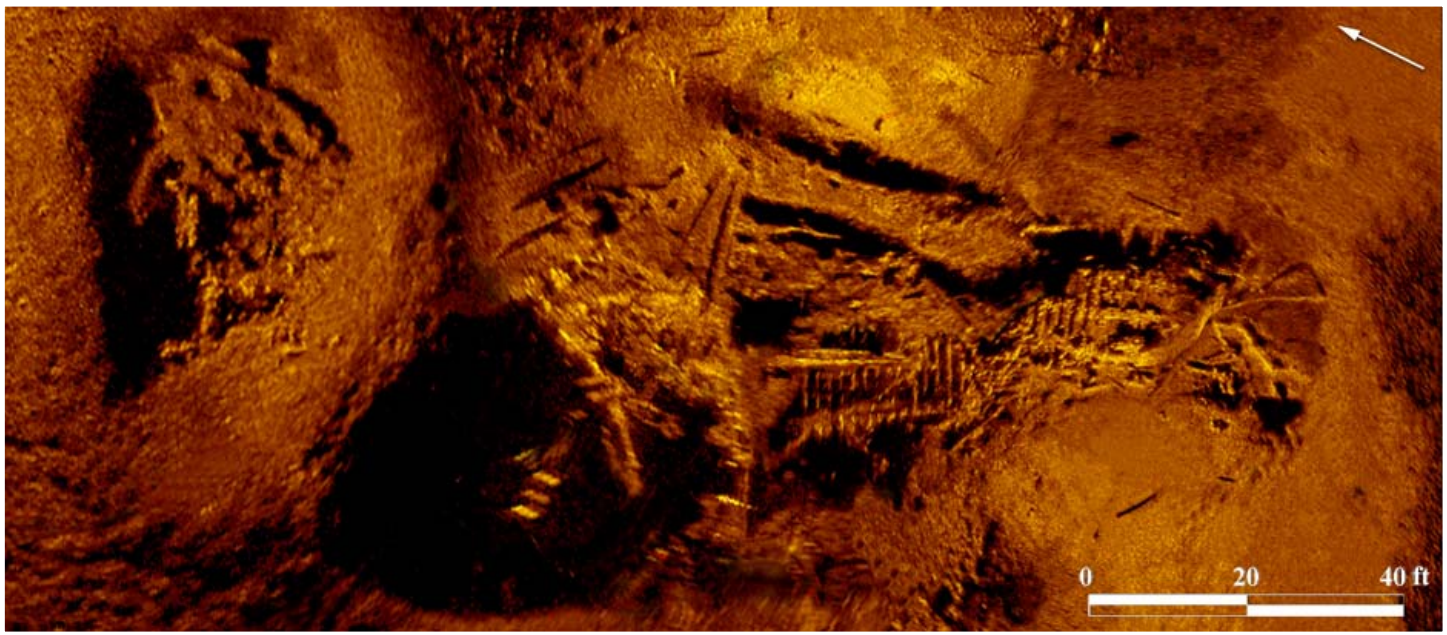
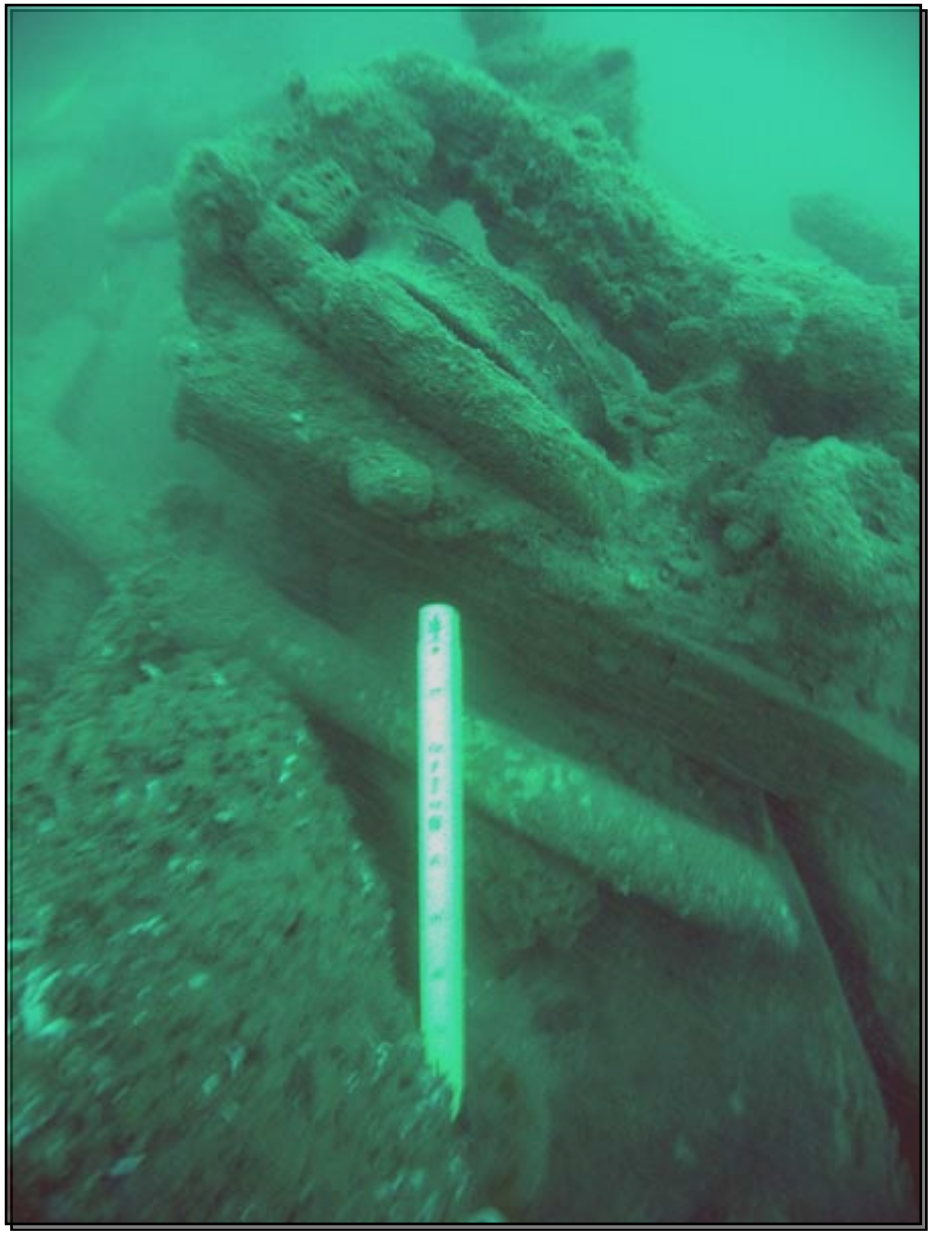


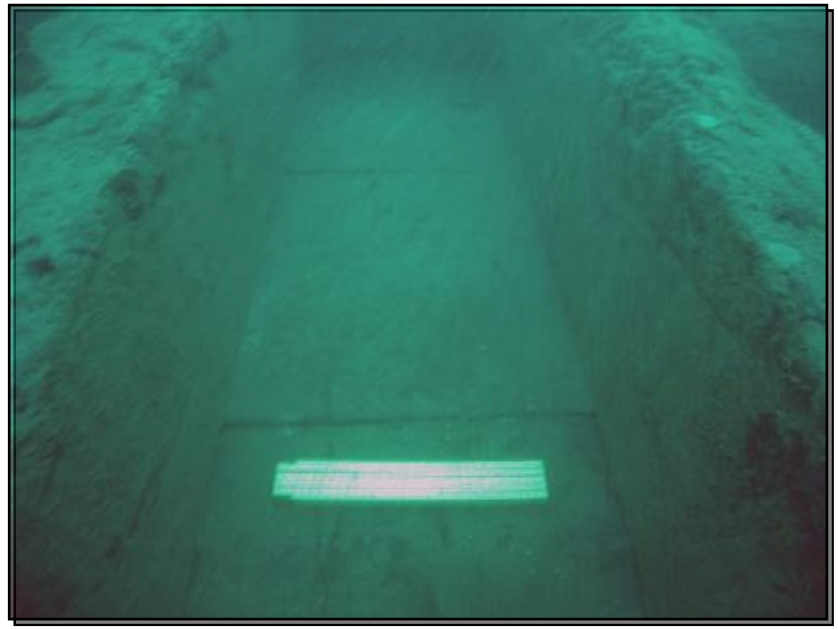
PBS&J Draft Site Plan

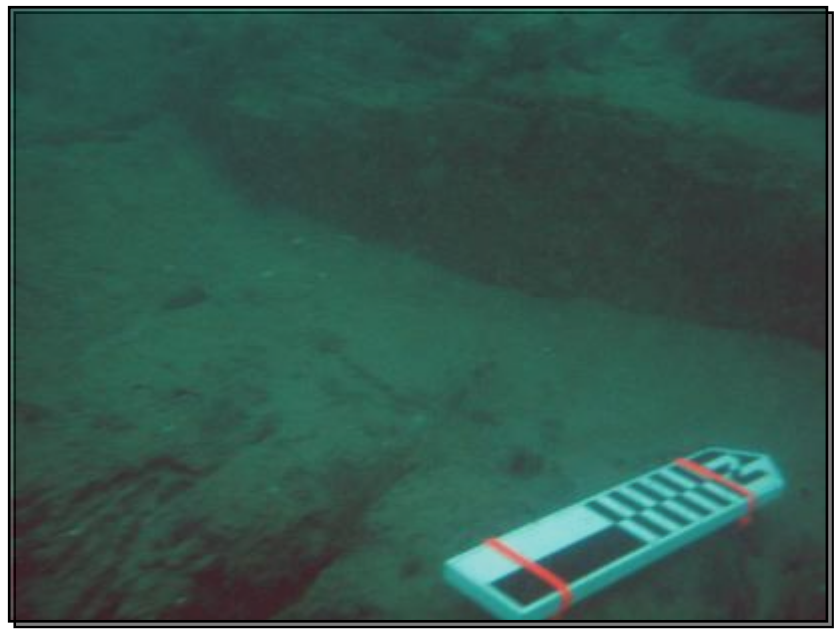


Sector Scan October 2007



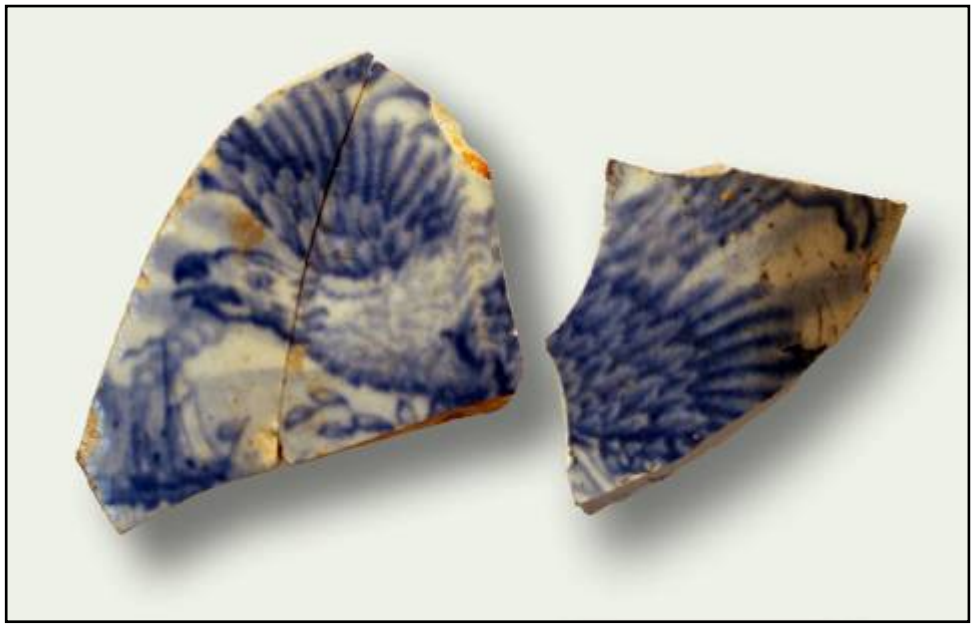


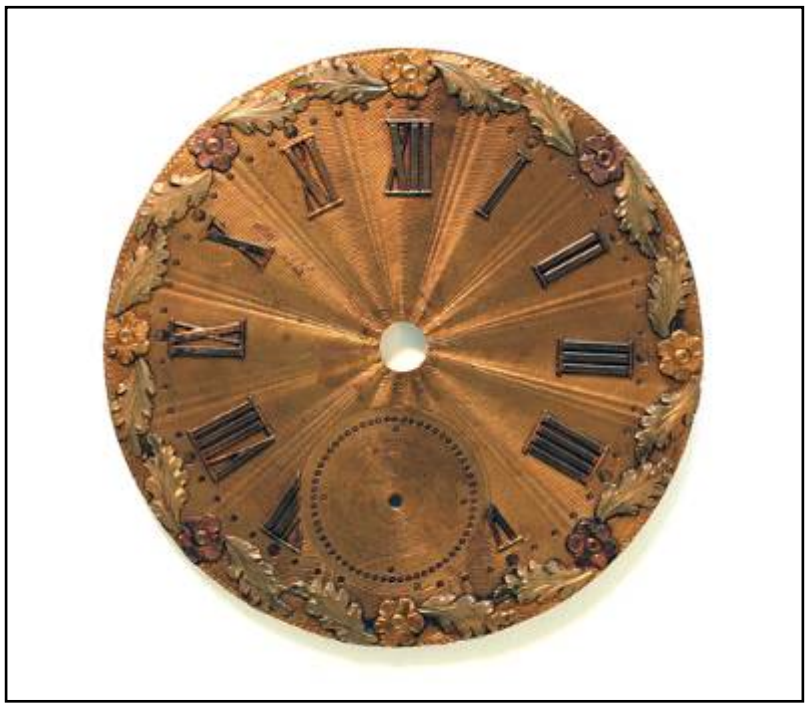




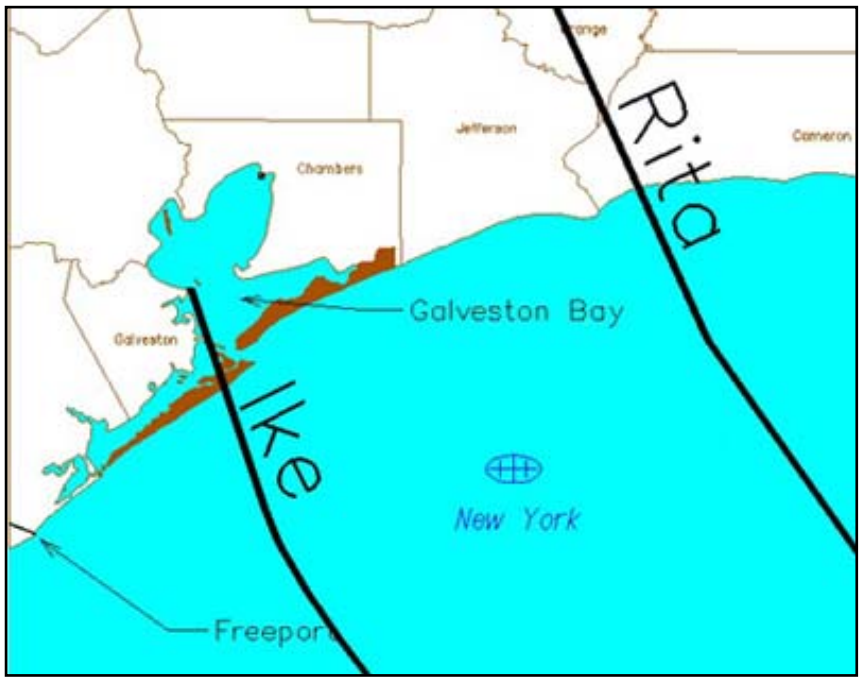

Steam Packet
New York

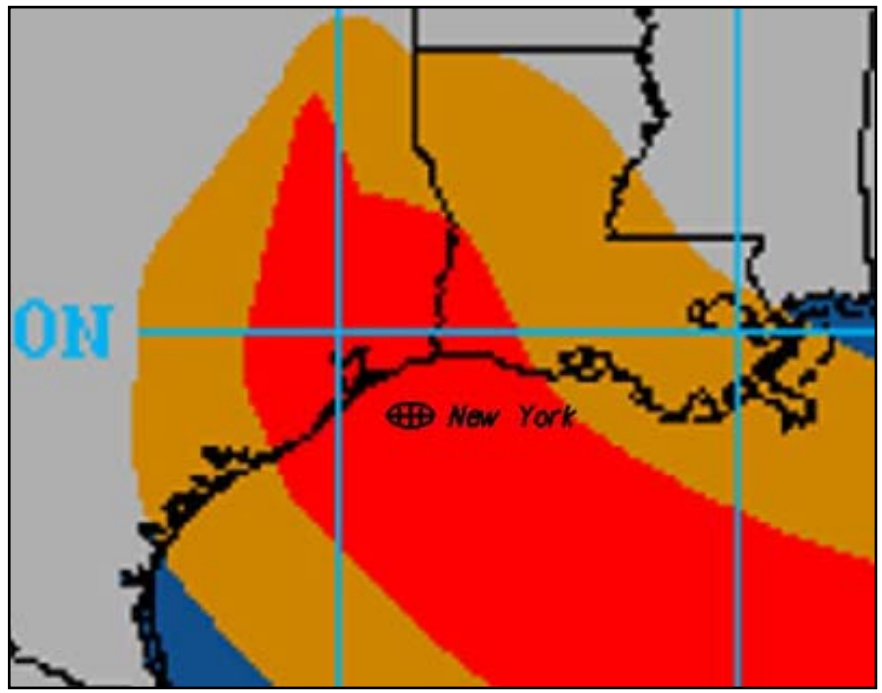

Steam Packet New York





Hurricane Ike Path





Preliminary Conclusions

- Hurricanes may severely damage vessels of any construction recently placed as artificial reefs.
- Hurricanes Katrina and Rita did comparatively little damage to ten vessels studied by PBS&J in depths similar to those of artificial reefs damaged by hurricanes.
- The degree of structural damage caused by hurricanes may be closely tied to hull orientation (whether upright or not) and to the firmness of substrate material.
- Buried portions of wooden hulls may survive repeated severe storms with little deterioration subsequent to burial.
- Exposed articulated wooden hull remains may survive direct hurricane strikes relatively unscathed, provided there is sufficient sediment available for burial.

Hypothesis: Shipwrecks achieve a degree of equilibrium with their environment relatively quickly