

Seasonal Movements and Home Range of Sperm Whales in the Gulf of Mexico

Bruce Mate and Joel Ortega-Ortiz

Oregon State University

Hatfield Marine Science Center

Fisheries and Wildlife, COMES

Newport, Oregon





Whales Tagged

Year	Number	% w/data
2001	4	25
2002	18	100
2003	15	100
2004	8	75
2005	12	100

33 females, 6 males, and 18 unknown



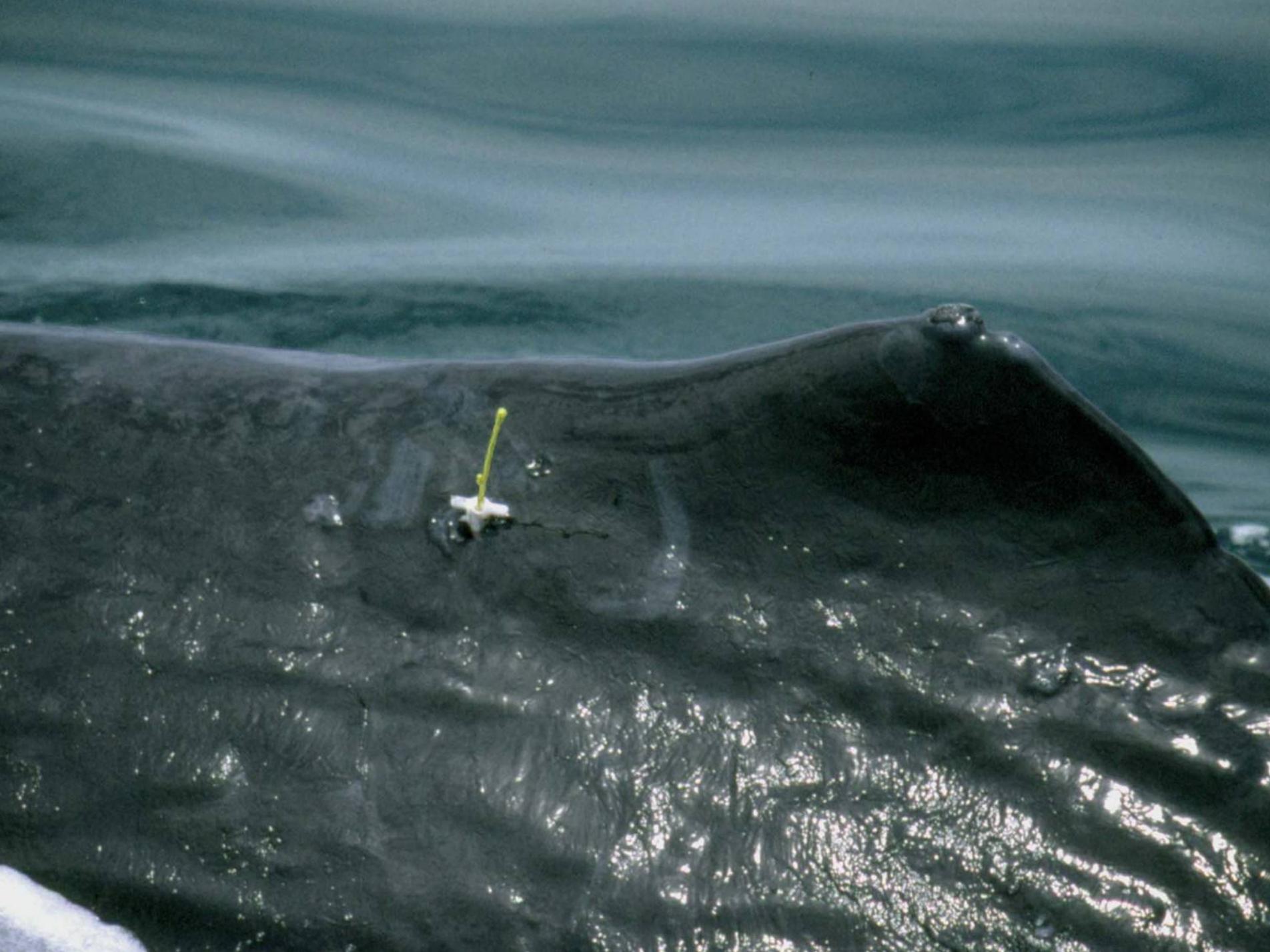


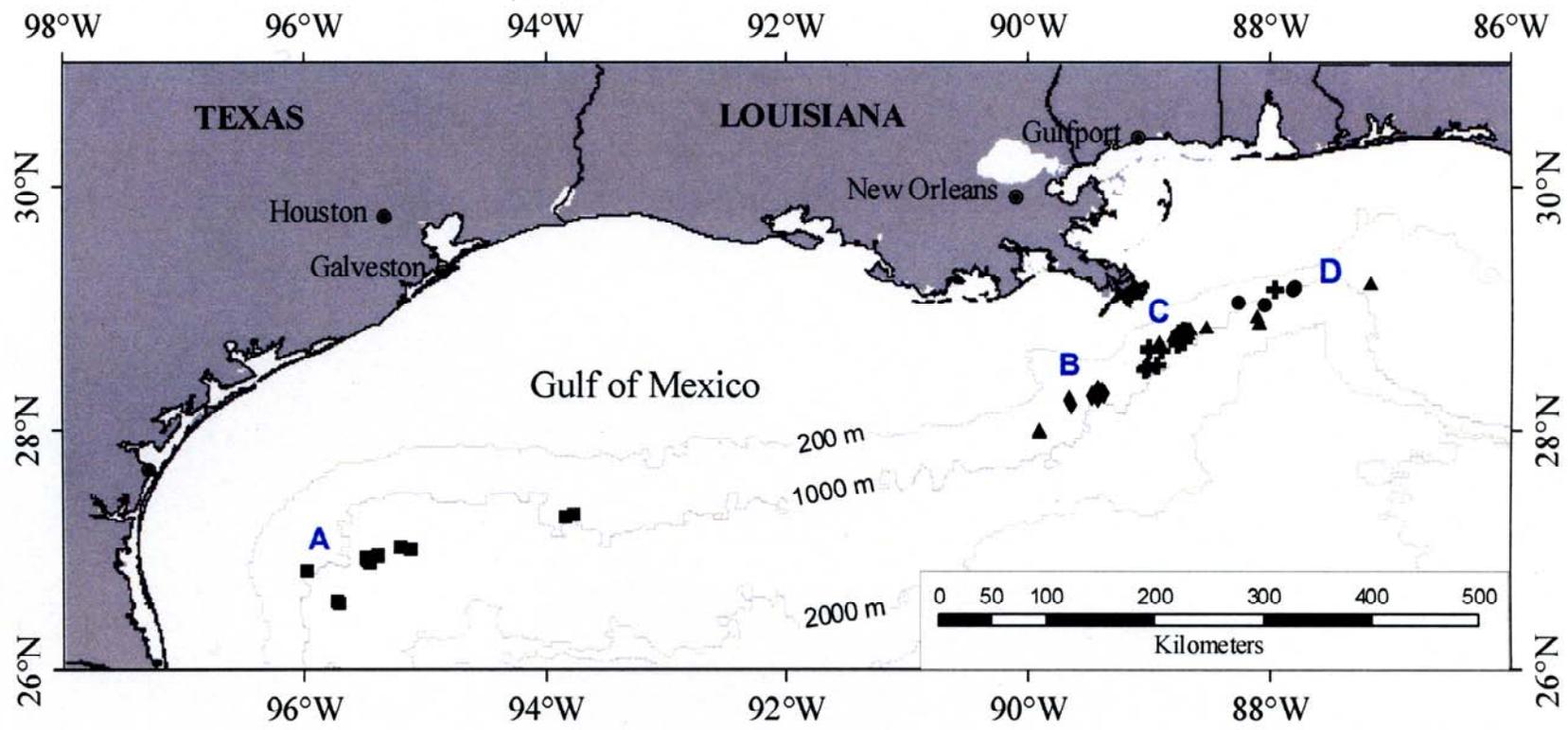


[Click to see video.](#)



[Click to see video.](#)





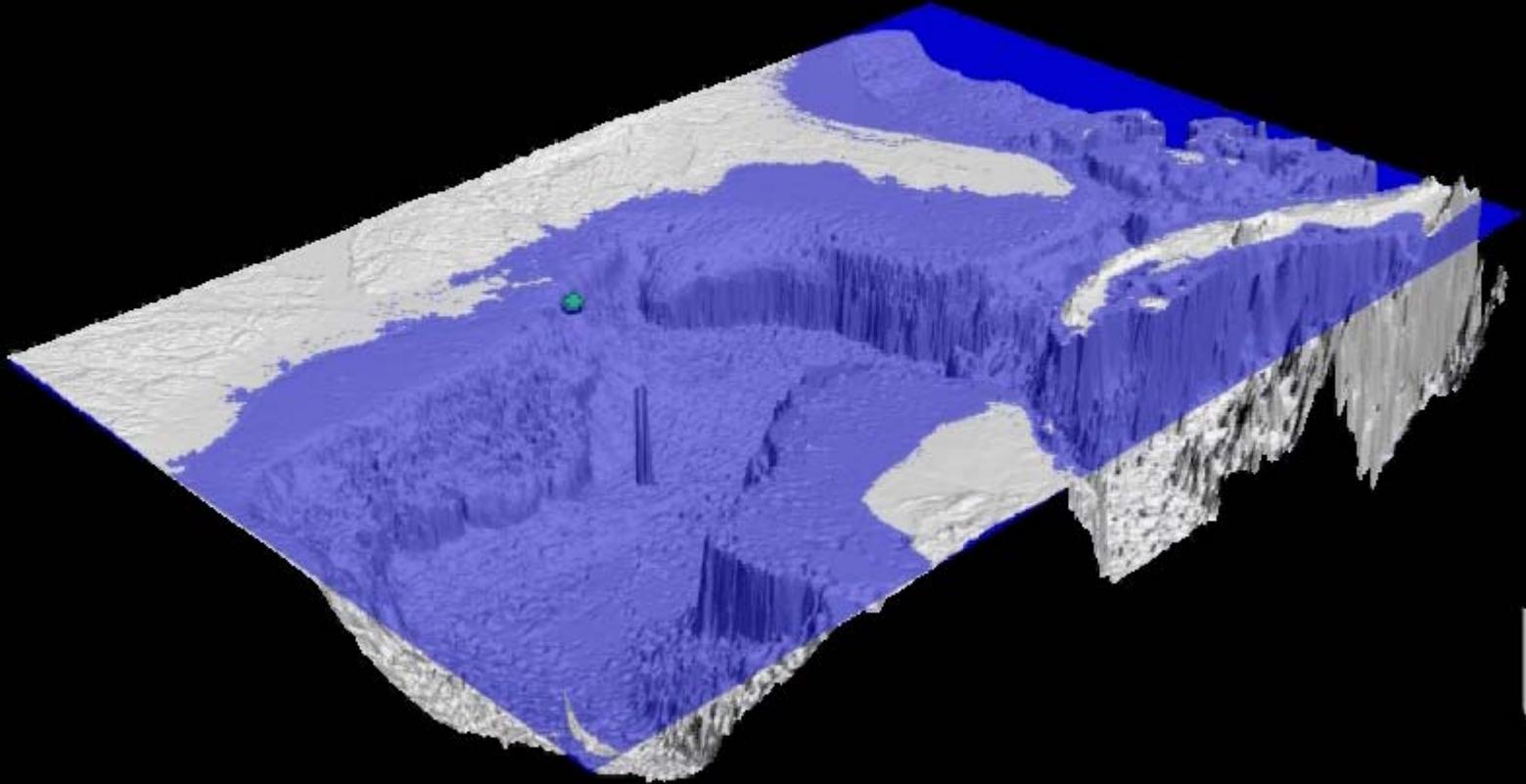
Sizes, Speed, and Location Quality

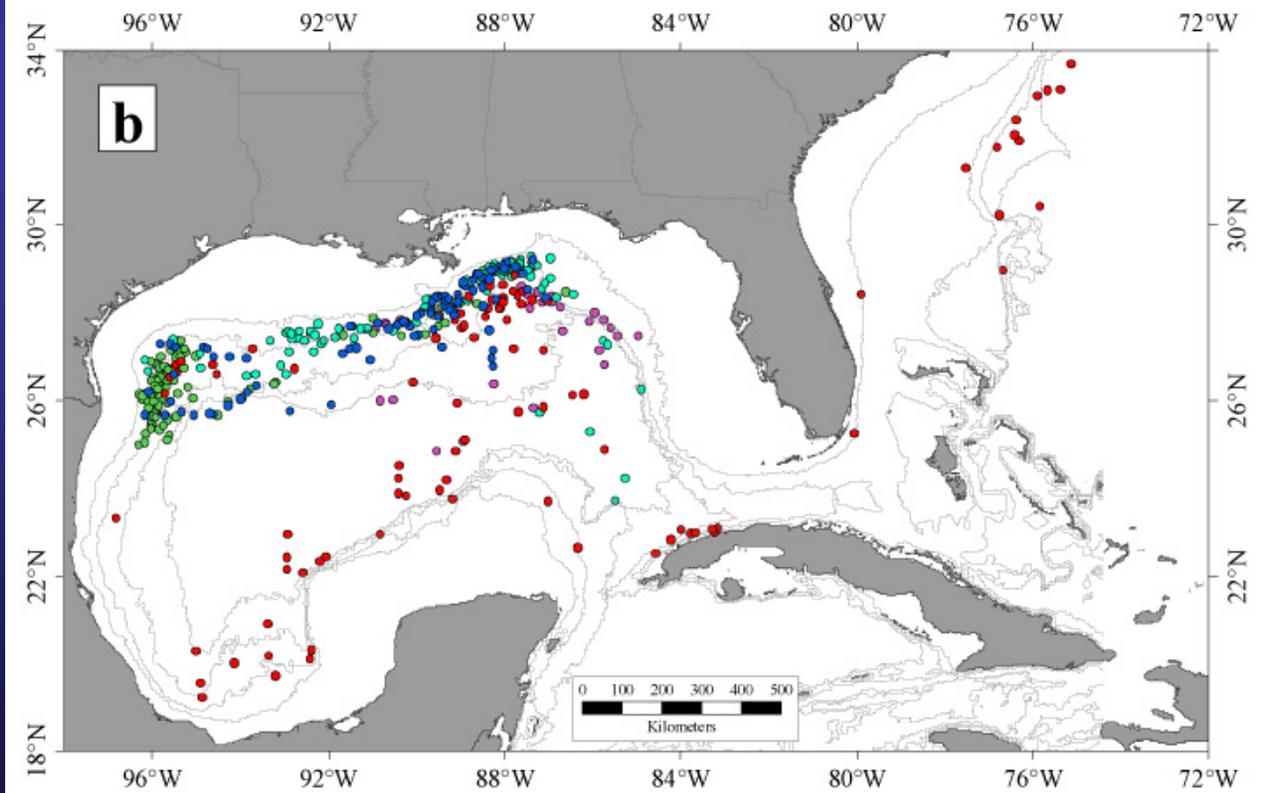
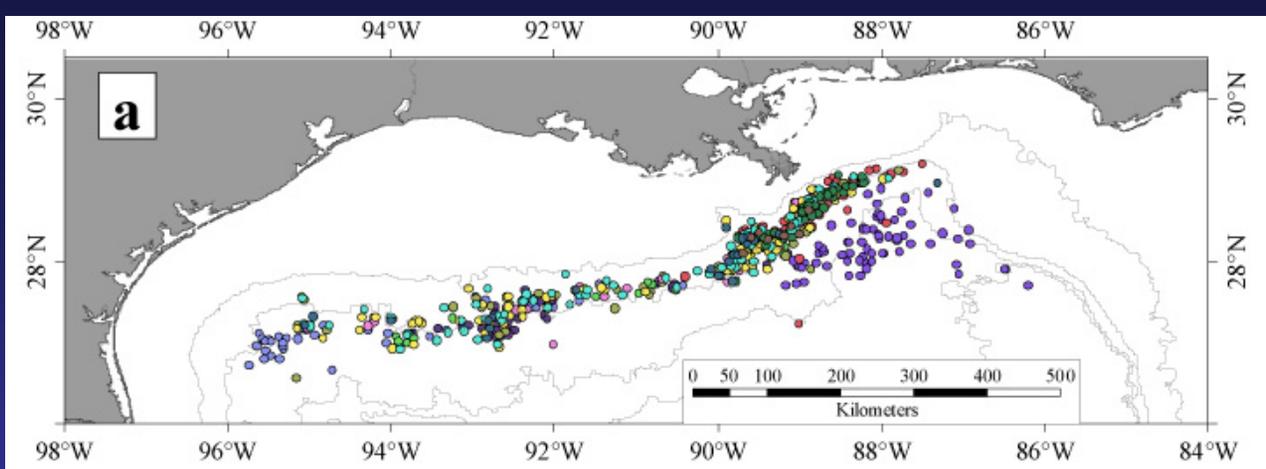
- Length 7.5 – 12m (2005 whales smallest)
 - 2002 males = 10.5m, females = 10.6m
- Speed averaged 1.35 km/h (95% = 3.7)
 - 0-9.6 km/h with significant differences between individuals and sexes
- Total number of locations = 4276
 - 3269 (76.4%) retained after screening
 - 50% were $LC > 1$ (1 km)
 - 3 – 187 locations/whale (mean 62)

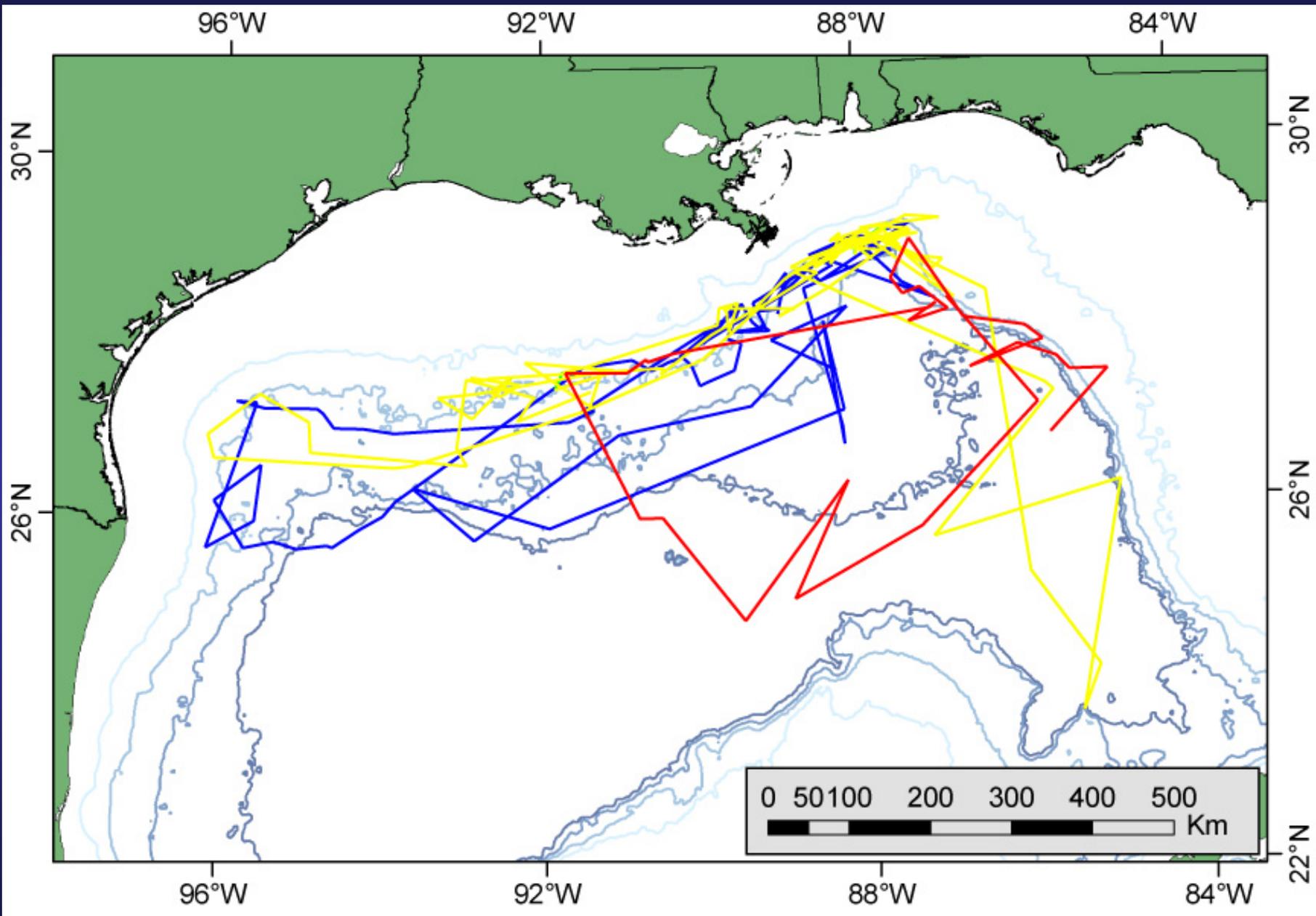
Tag Duration Statistics

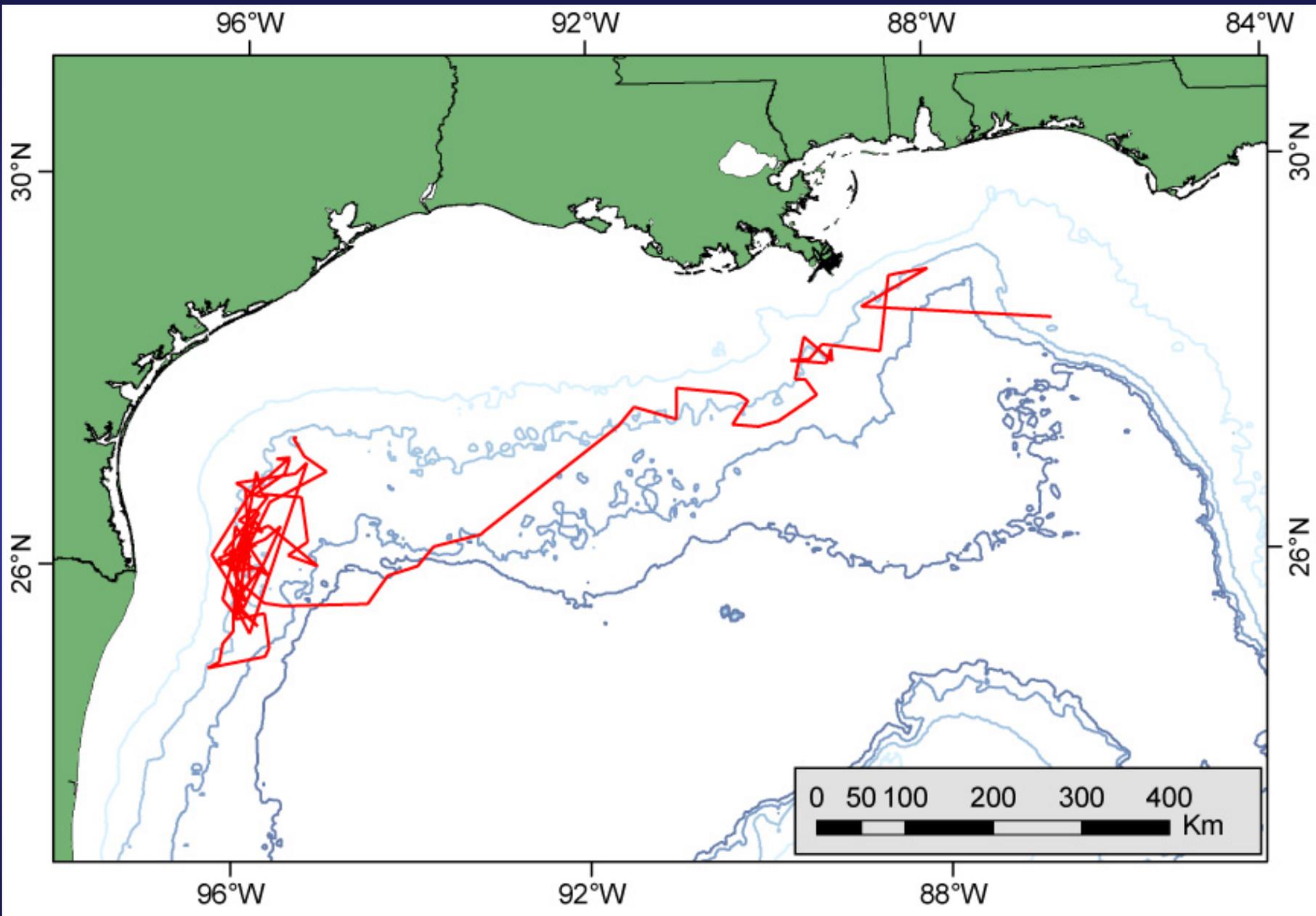
- **Duration 11 – 620 days (mean = 192d)**
 - **>200d = 21 (40%)**
 - **>300d = 12 (23%)**
 - **>1 year = 8 (15%)**
 - **Males average 328d (n=6)**
 - **Females average 187 d (n=33)**

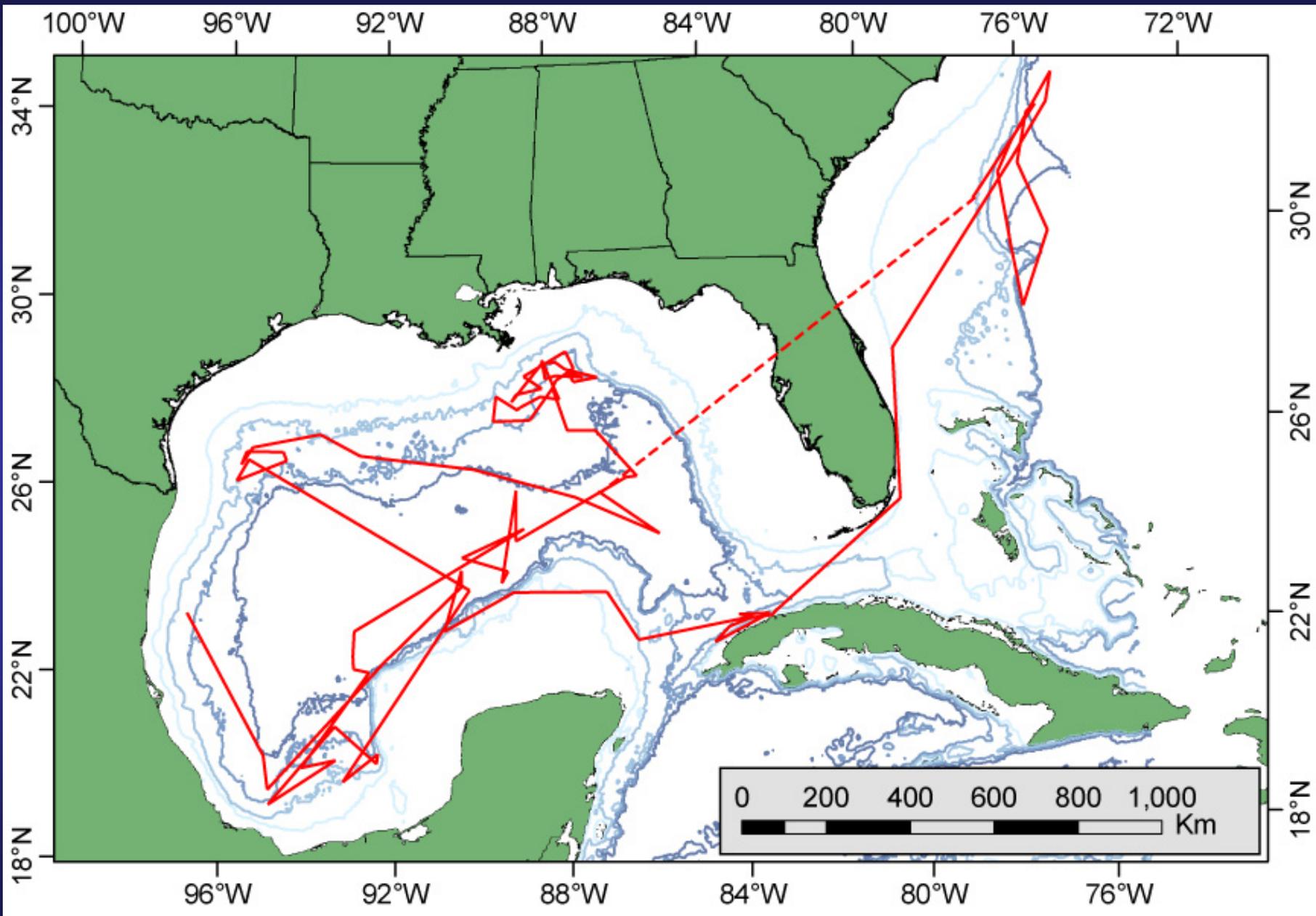
[Click to see video.](#)











**Sperm Whale Movements
Male 5725**

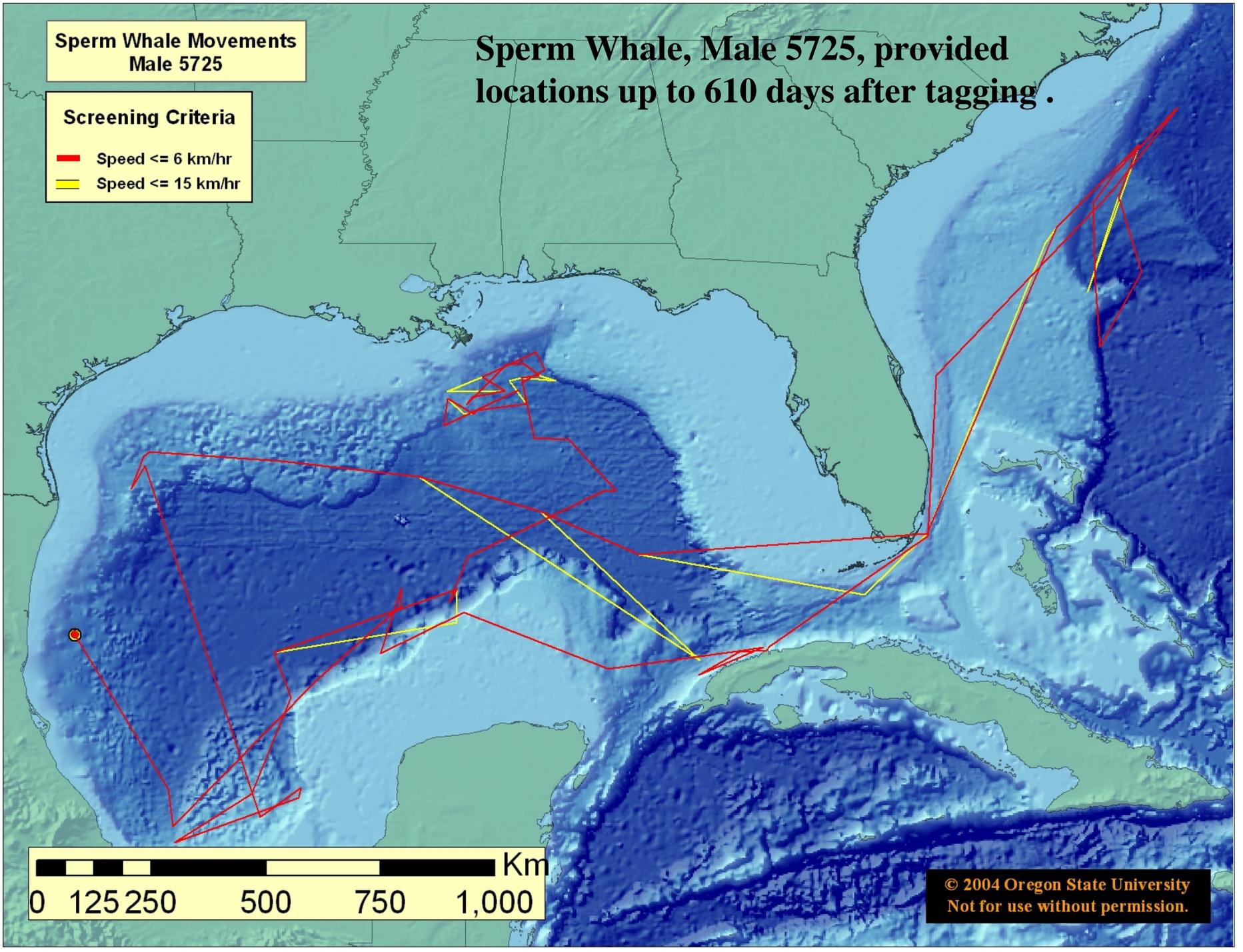
Screening Criteria

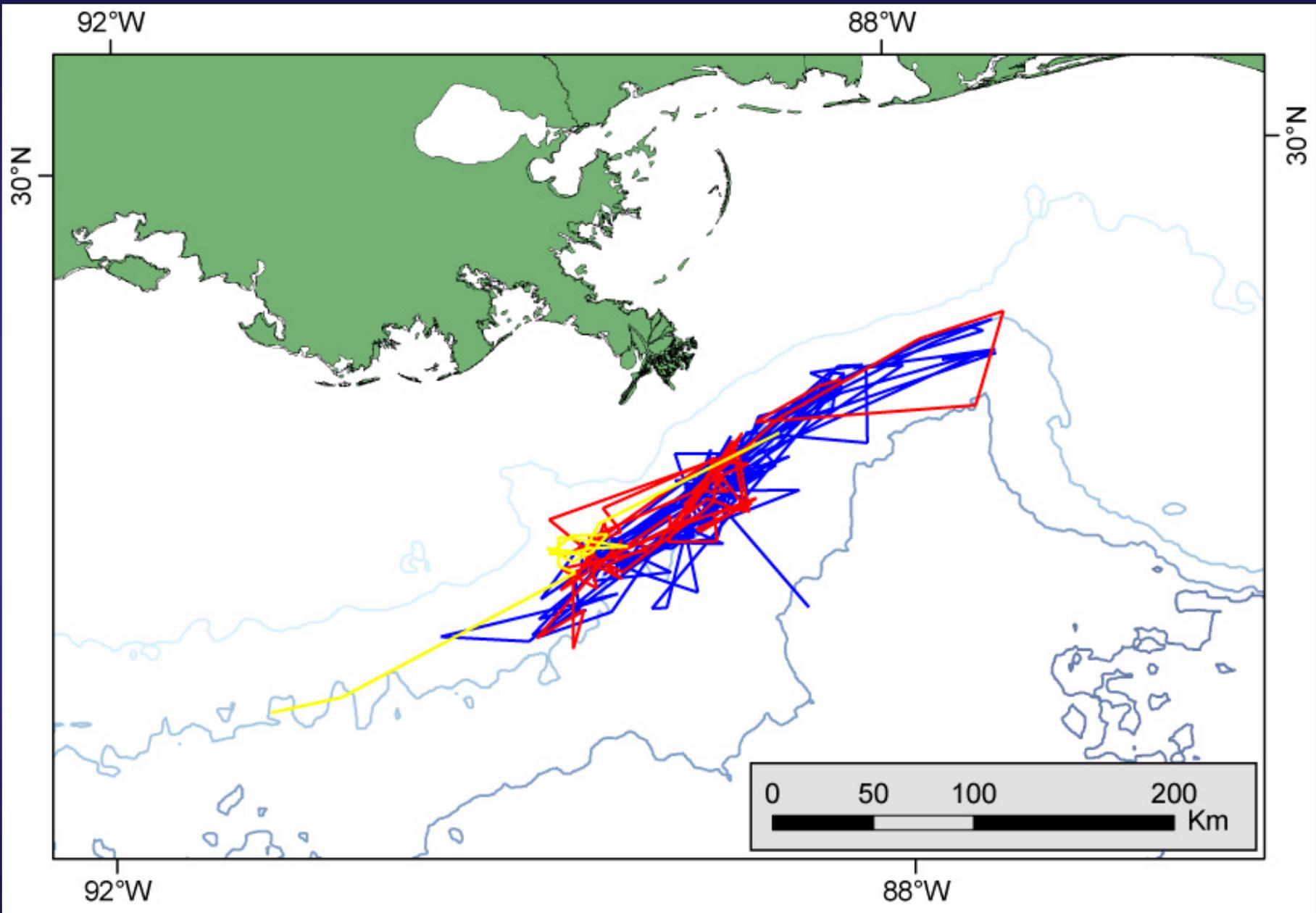
- Speed \leq 6 km/hr
- Speed \leq 15 km/hr

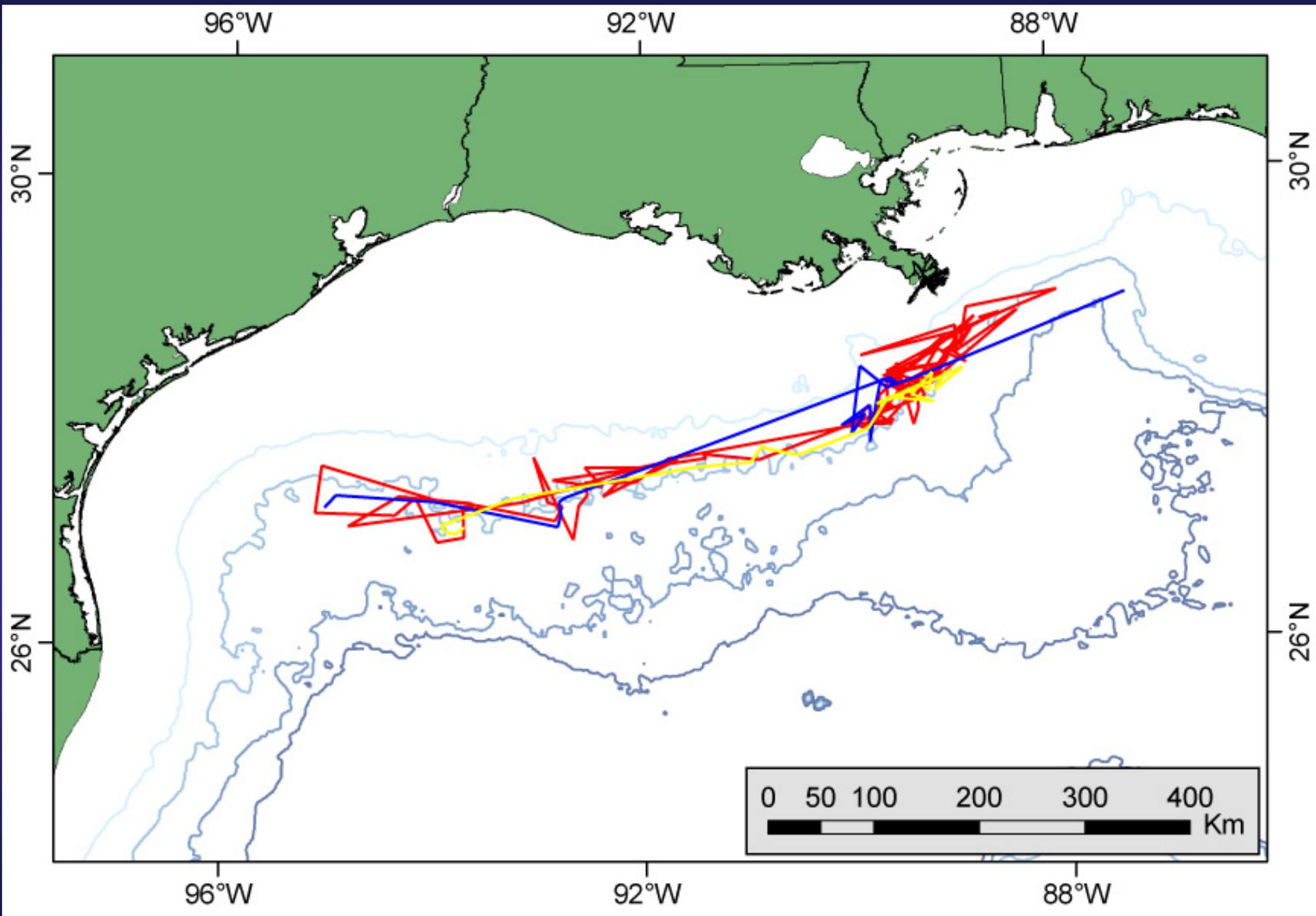
**Sperm Whale, Male 5725, provided
locations up to 610 days after tagging .**

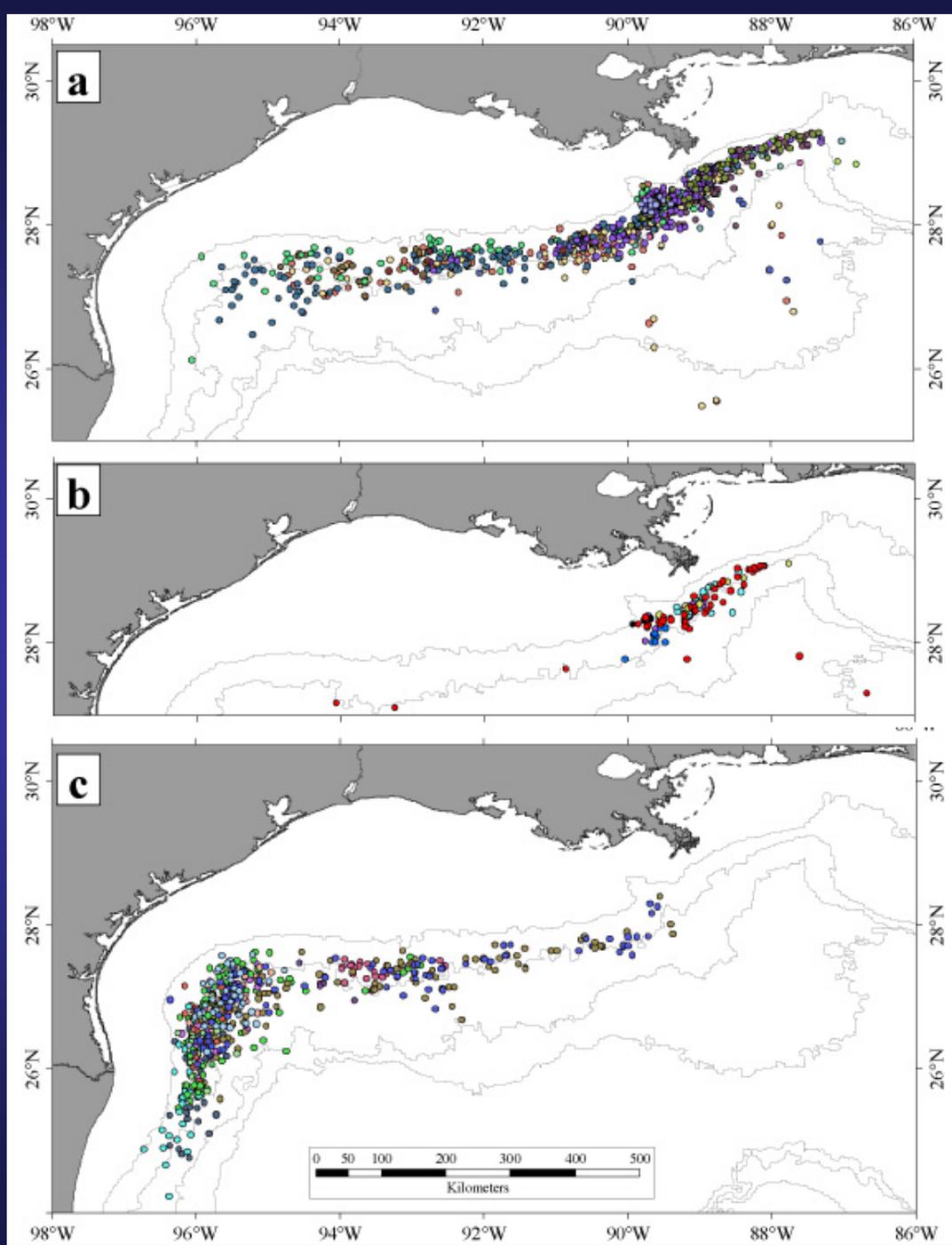


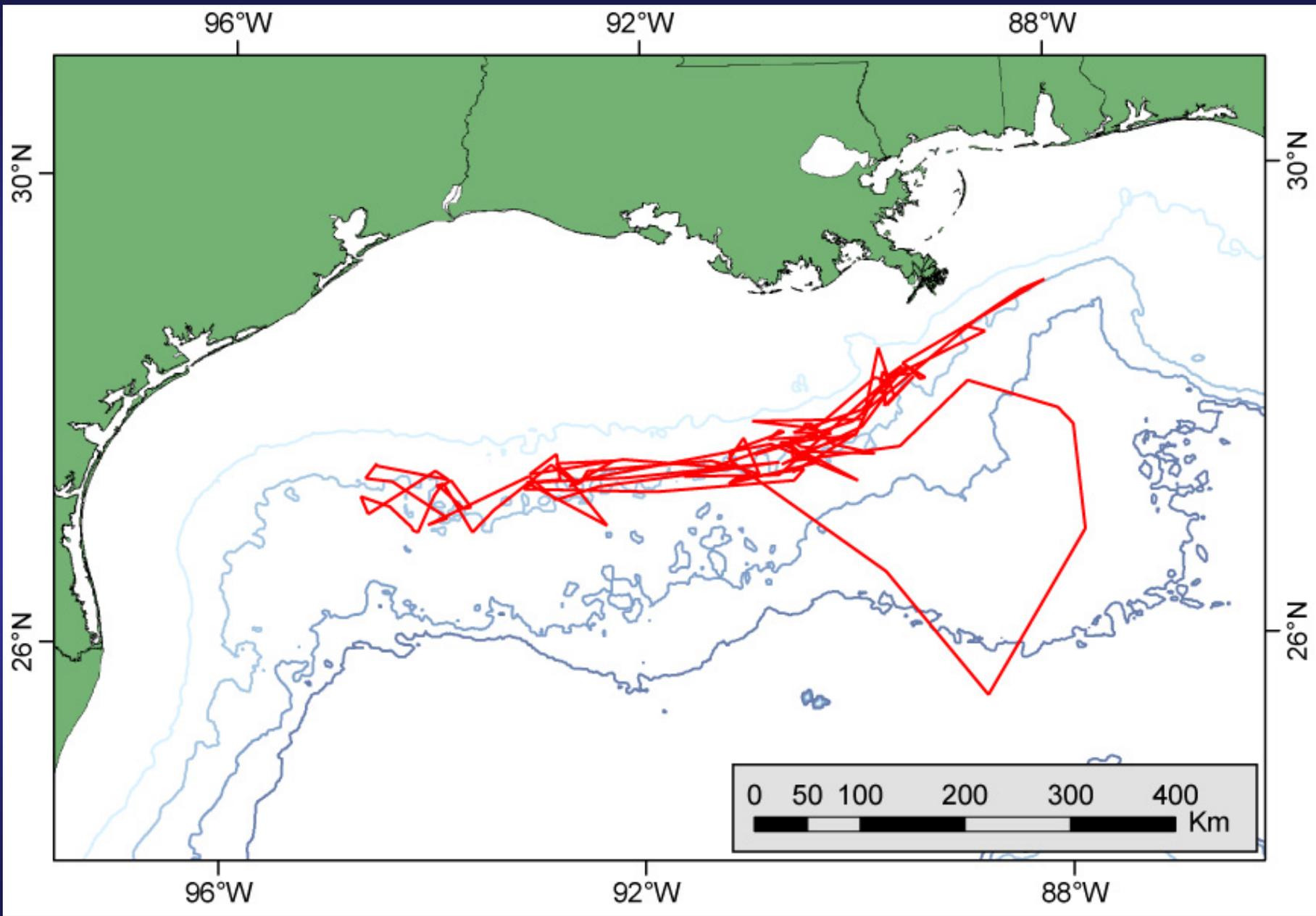
**© 2004 Oregon State University
Not for use without permission.**

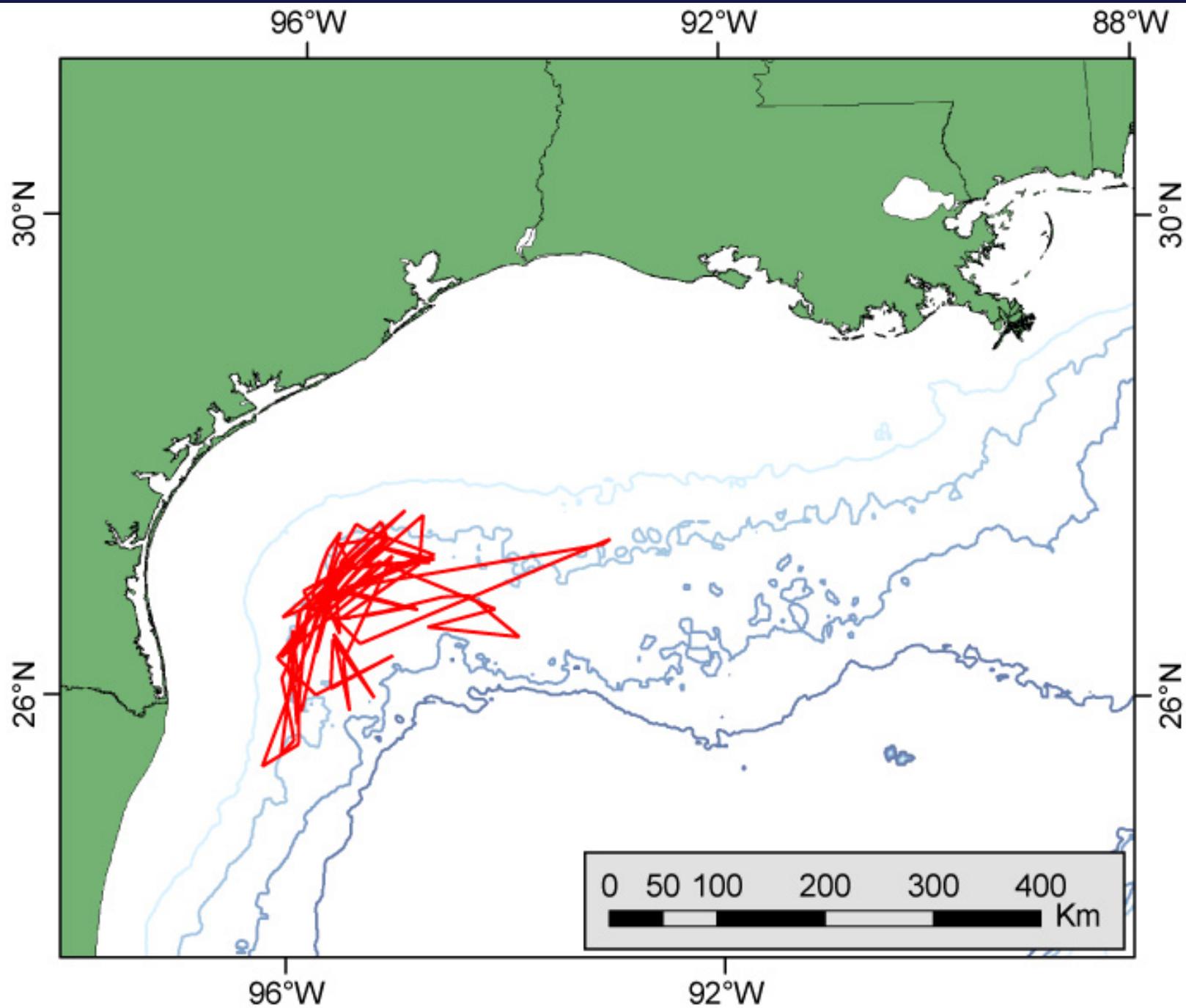












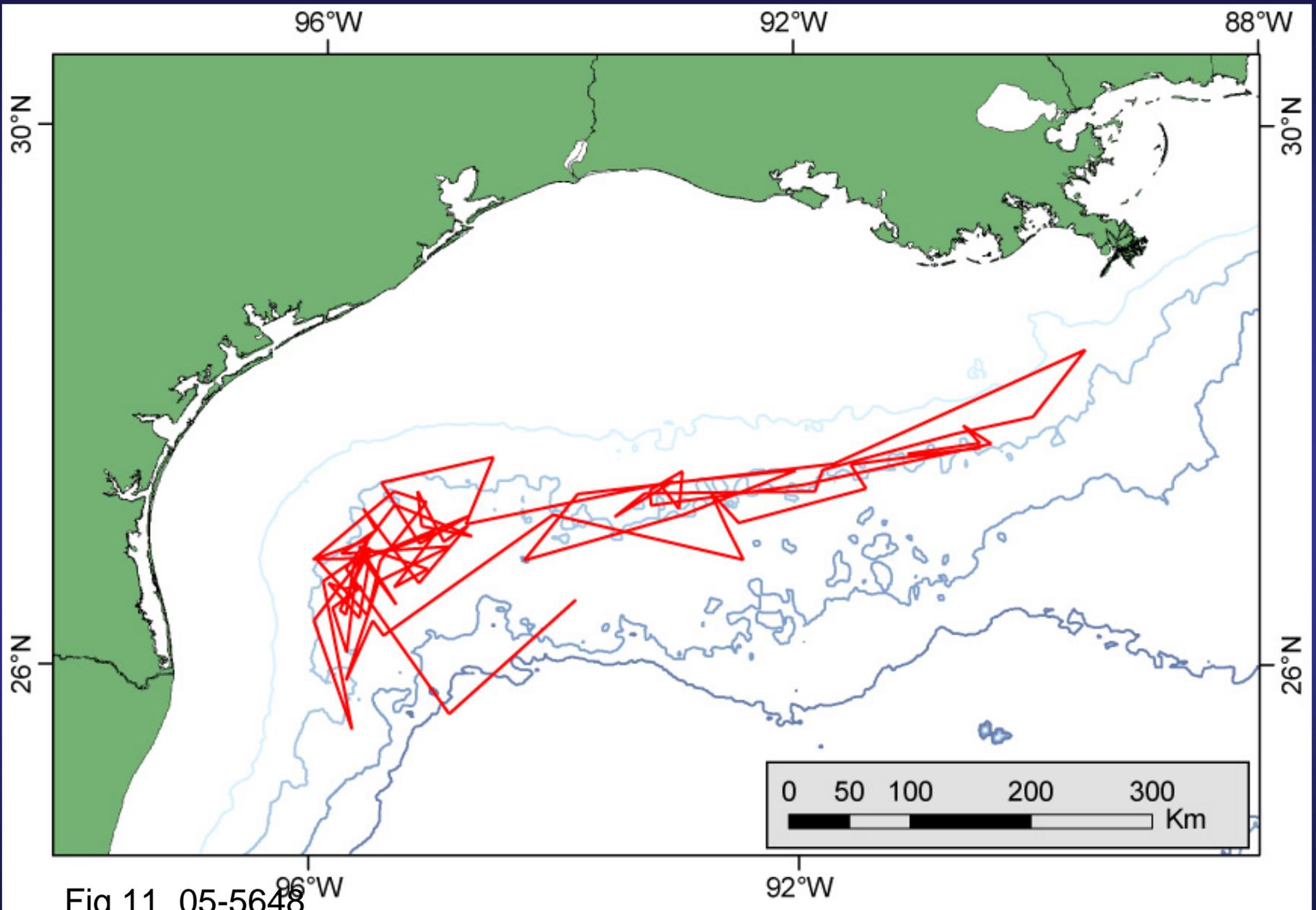


Fig 11_05-5648

Minimum Distance Traveled = 155,613 km

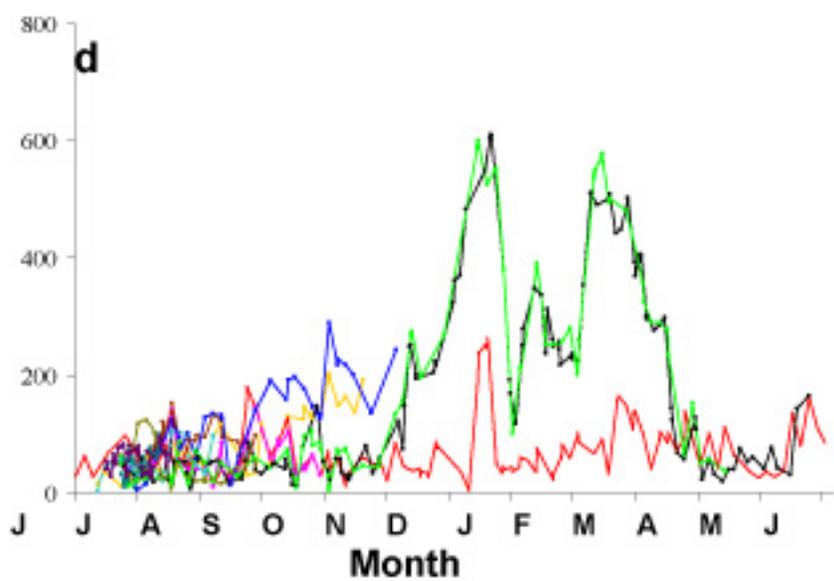
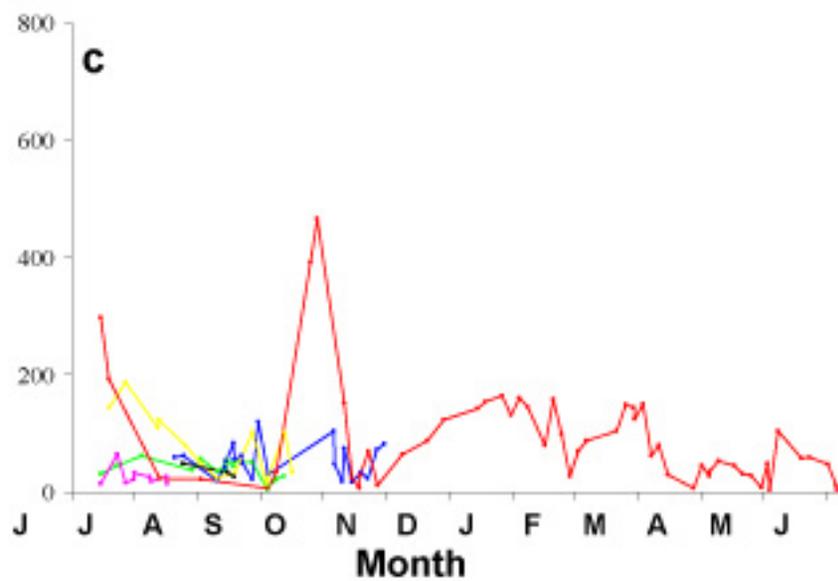
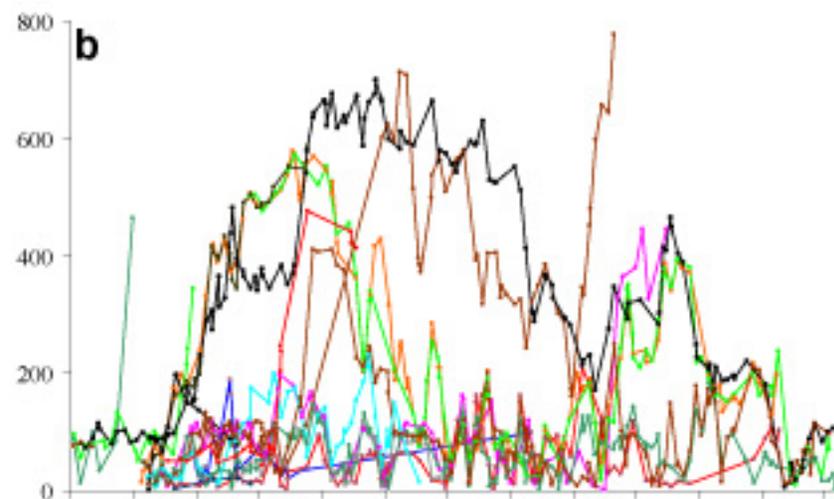
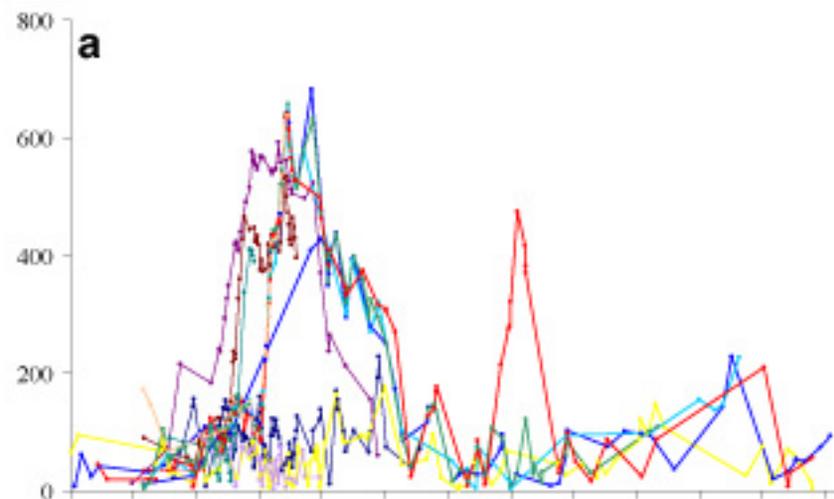
– Females: 92,202 km

- 49 – 778km (usually < 200 km from tagging site)
- rarely in water >1,500 m
- avg. max. displacement = 335 km

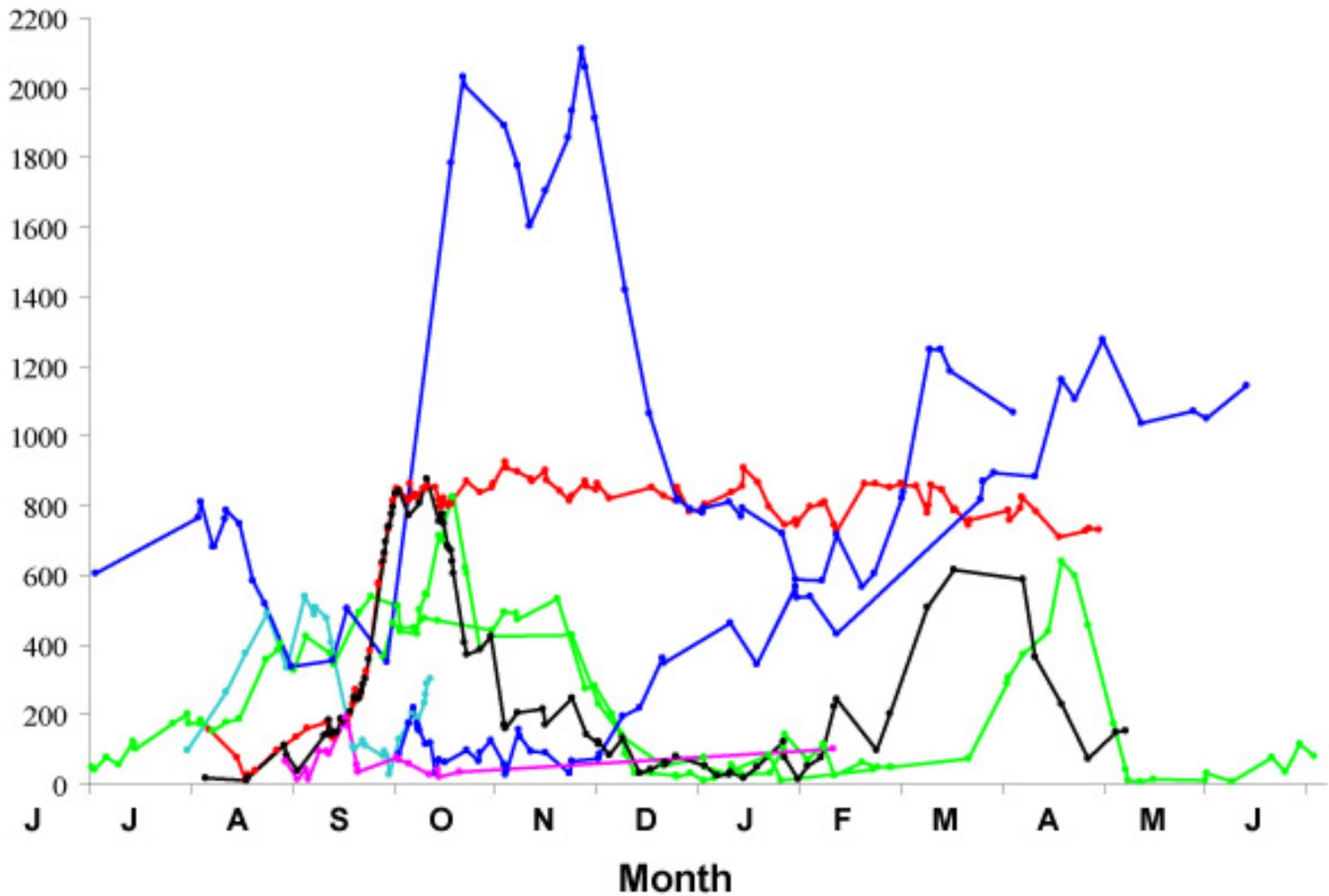
– Males: 35,598 km

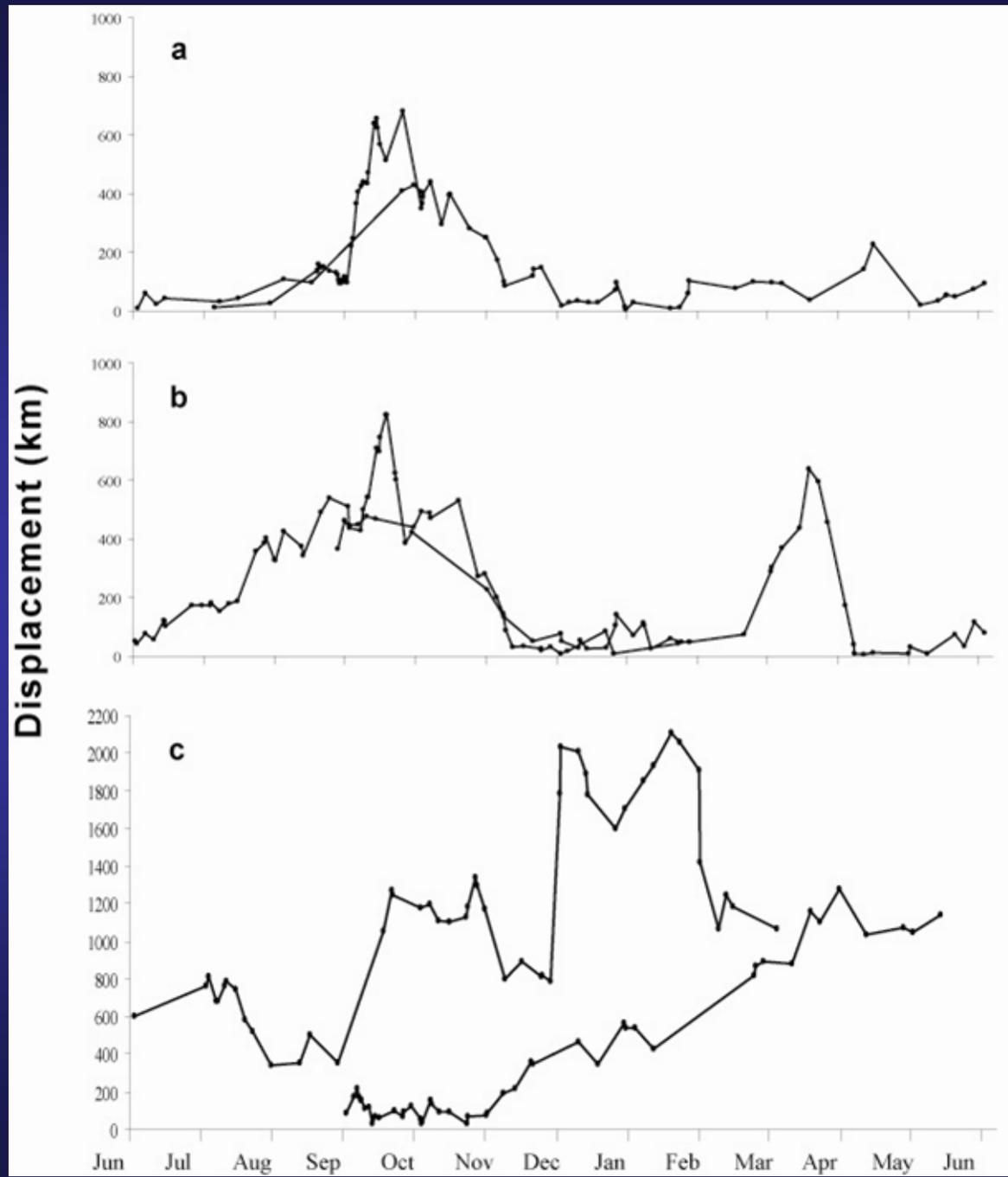
- 190 – 2100 km, more variable
- deeper water (often >3000 m)
- avg. max. displacement = 910 km

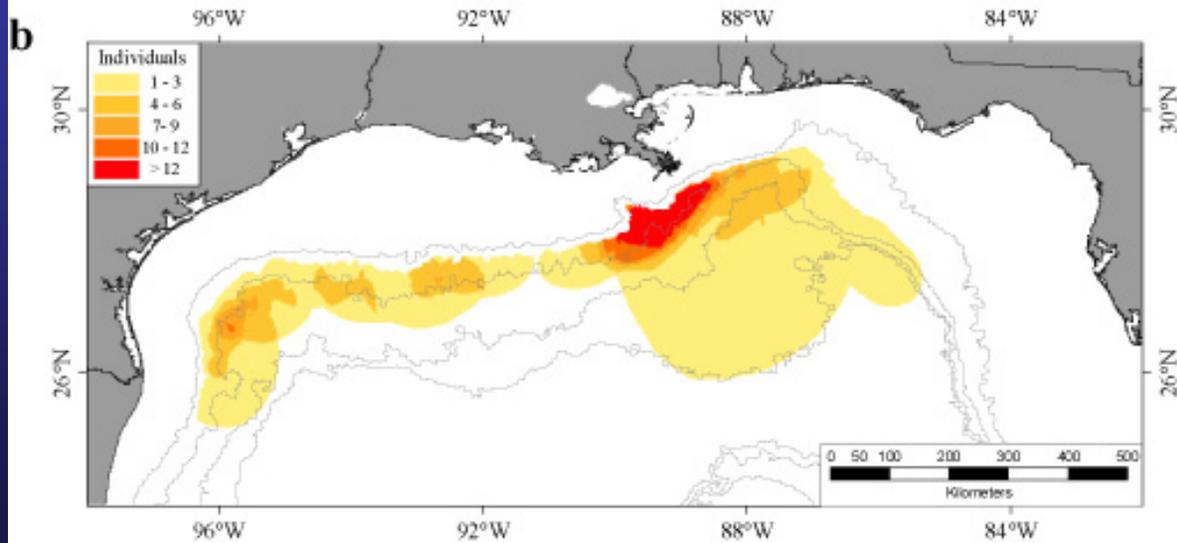
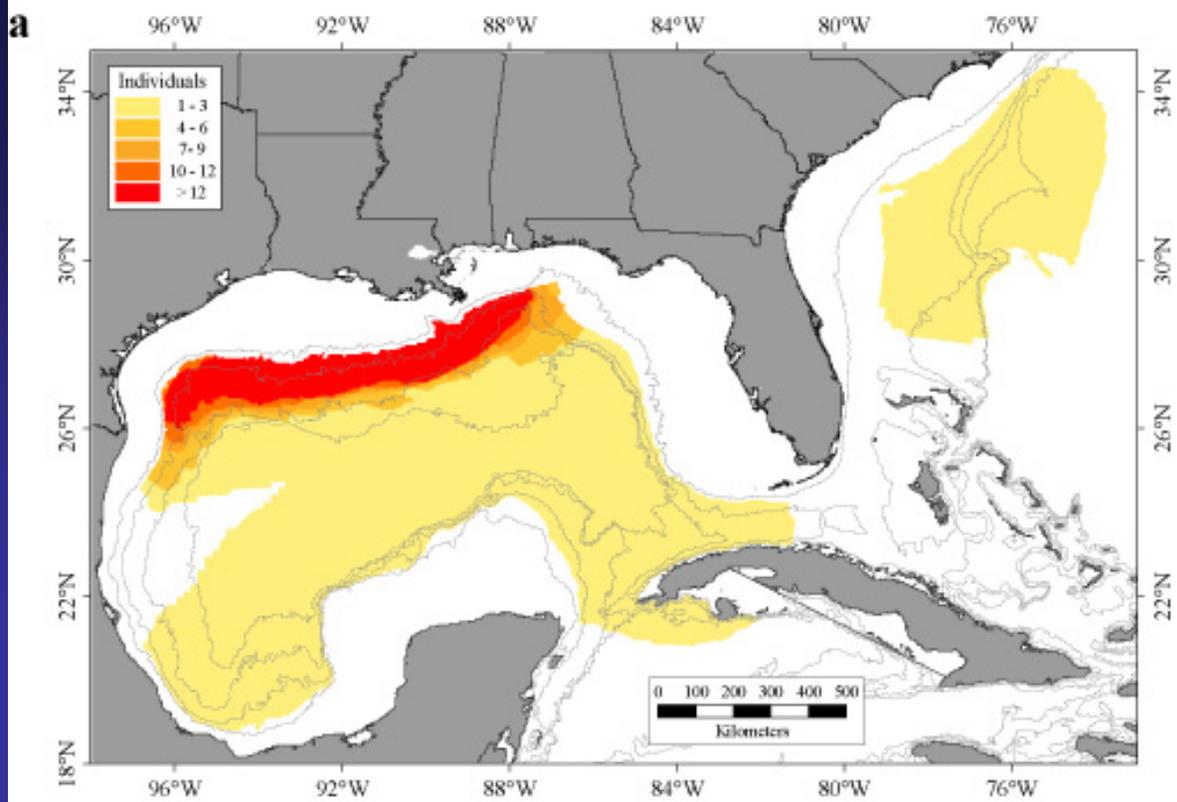
Displacement (km)



Displacement (km)







Home Ranges and Core Areas

- **Home range (95% utilization distribution probability area) for whales w/>30 locations**
 - Range: 1463 – 1,136,092 km²
 - Females: 44,717 km² (n=21, SD=31,465 km²)
 - Males: 392,764 km² (n=4, SD=497,664 km²)
- **Core area (50% UD probability area)**
 - range 324 – 101,600, avg.=10,256 km²
 - Female: 8258 km² (n=21, SD=6836 km²)
 - Male: 41,285 km² (n=4, SD=40,604 km²)

Composite Home Range

1,131,365 km²

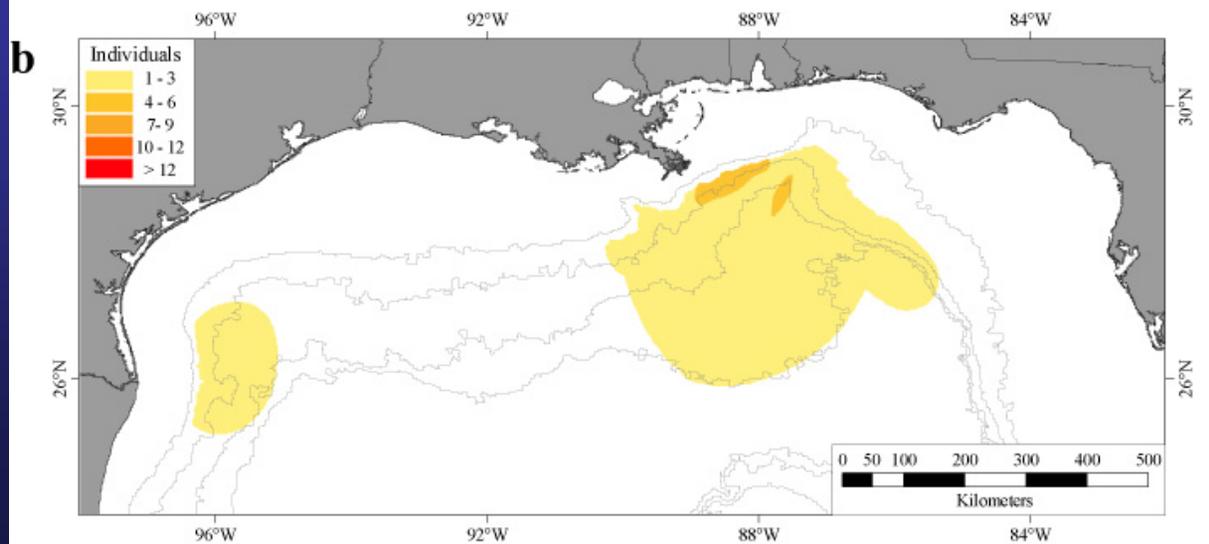
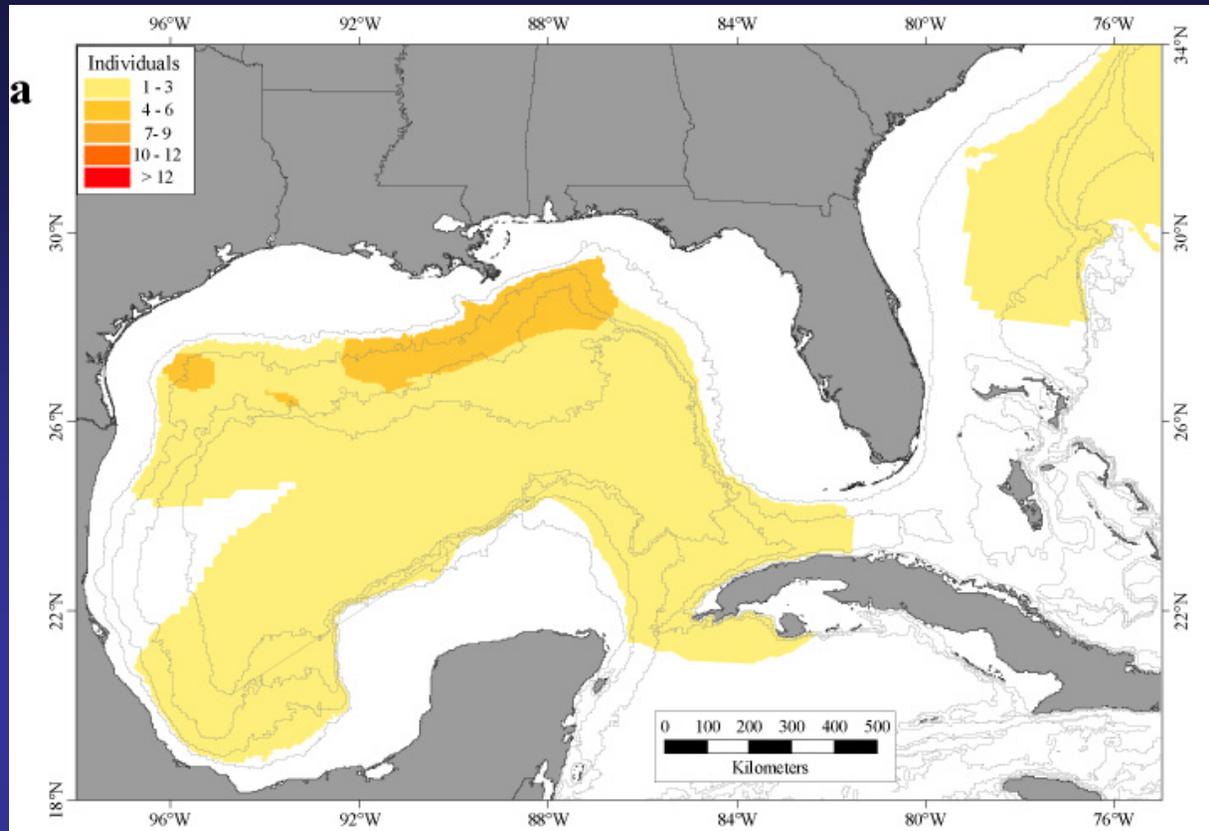
Area (km ²)	%	#whales sharing
970,902	85.8	1 – 3
33,516	3.0	4 – 6
21,862	1.9	7 – 9
16,730	1.5	10 – 12
88,353	7.8	>12

Nearly entire Gulf west of DSC in waters 500 – 2000 m

Composite Core Area 12,691 km²

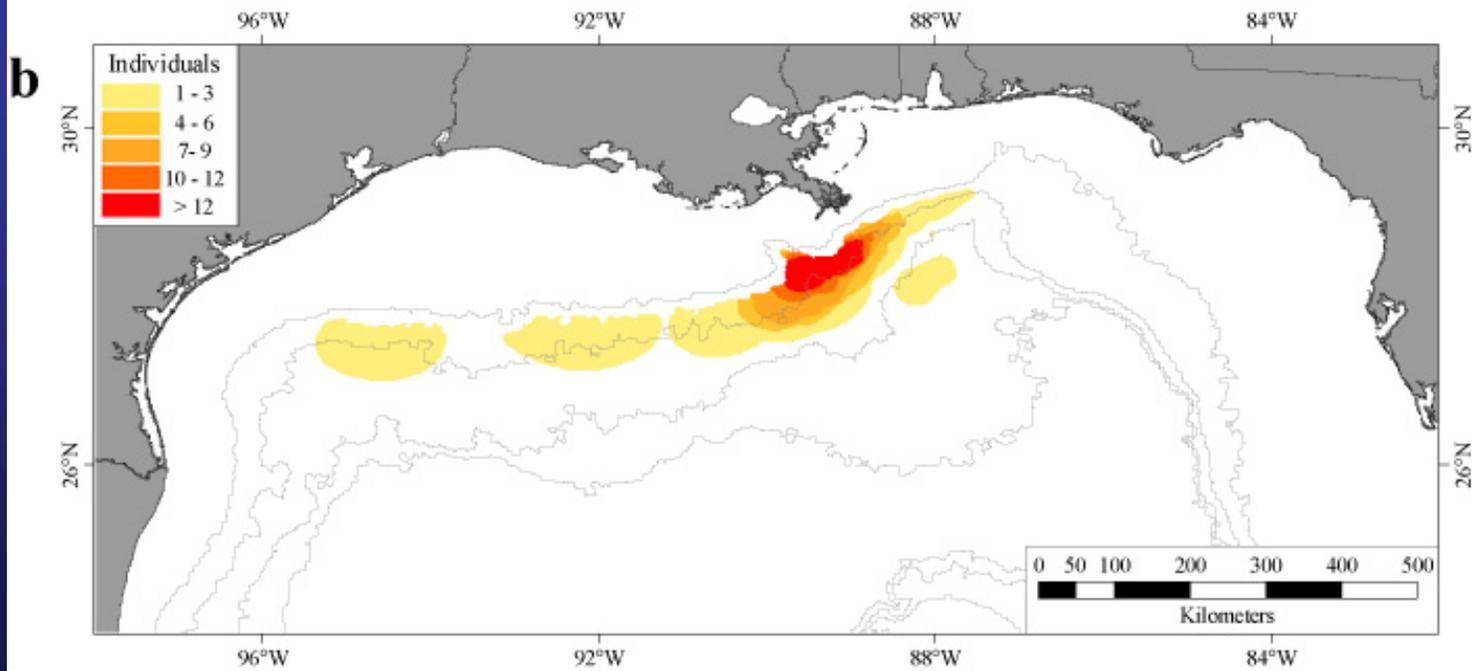
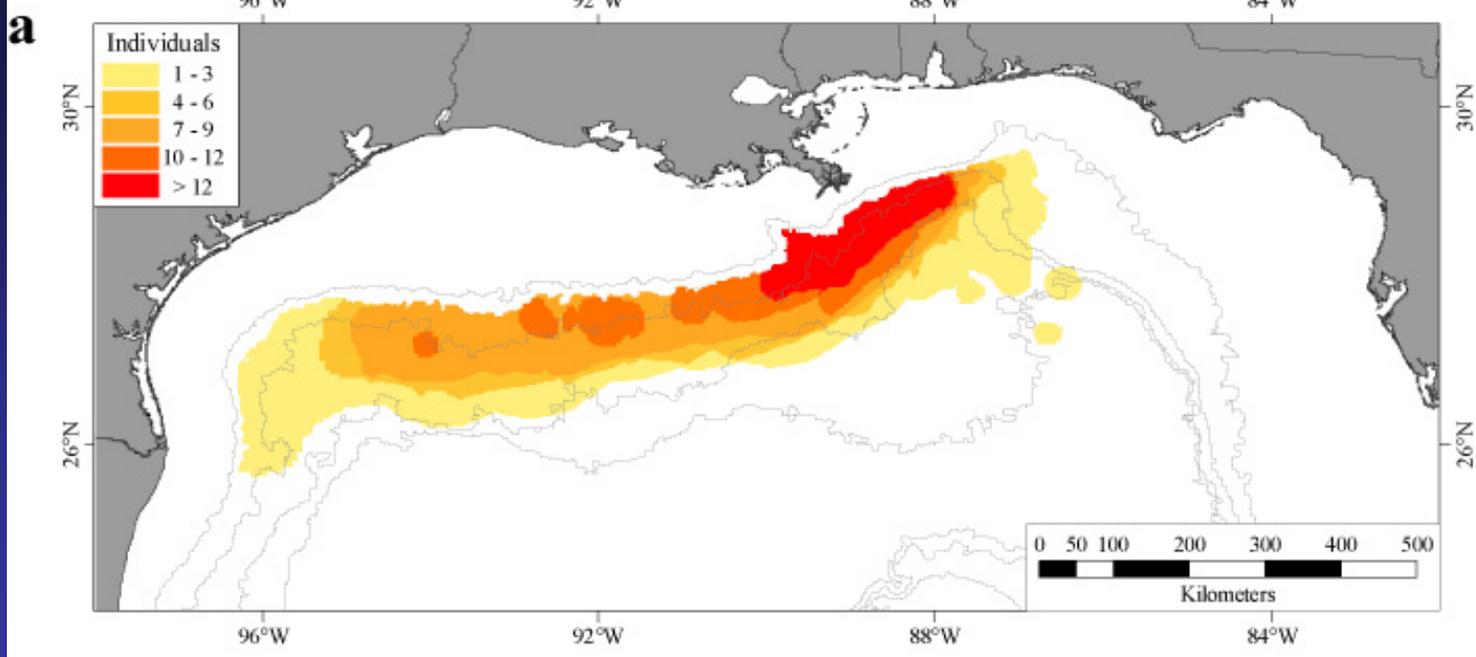
Area (km ²)	%	#whales sharing
12,190	96.1	1 – 3
58	0.5	4 – 6
96	0.8	7 – 9
113	0.9	10 – 12
230	1.8	>12

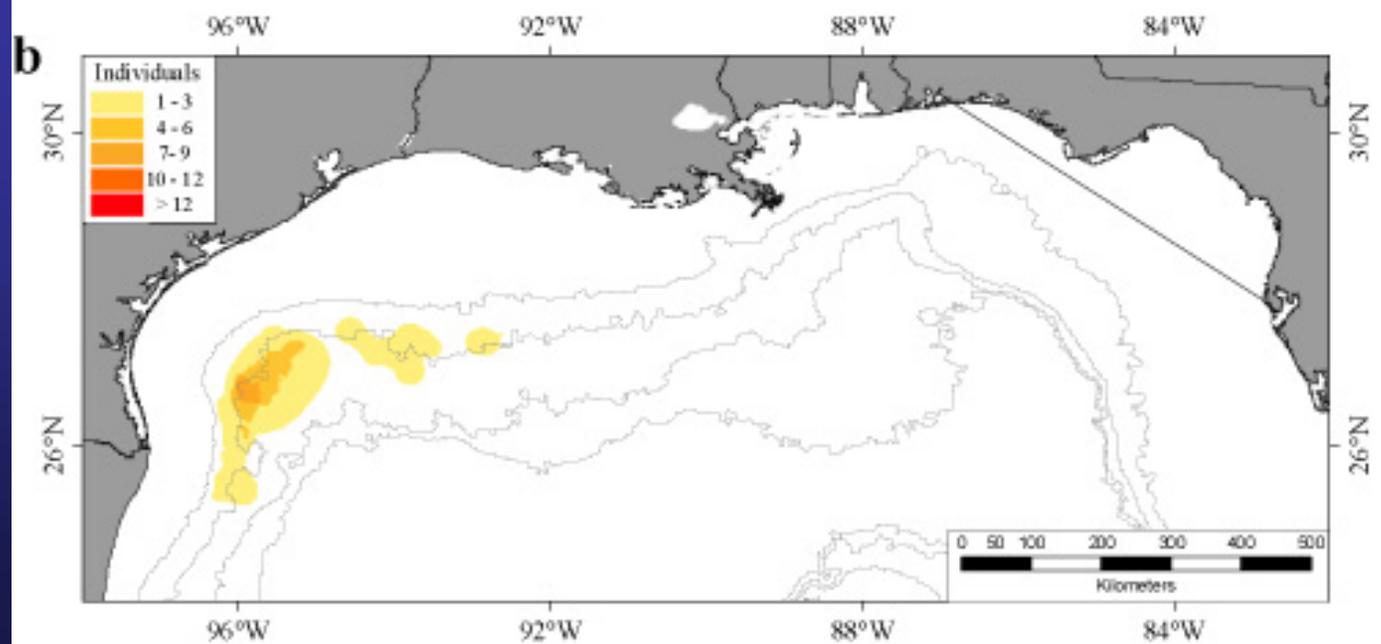
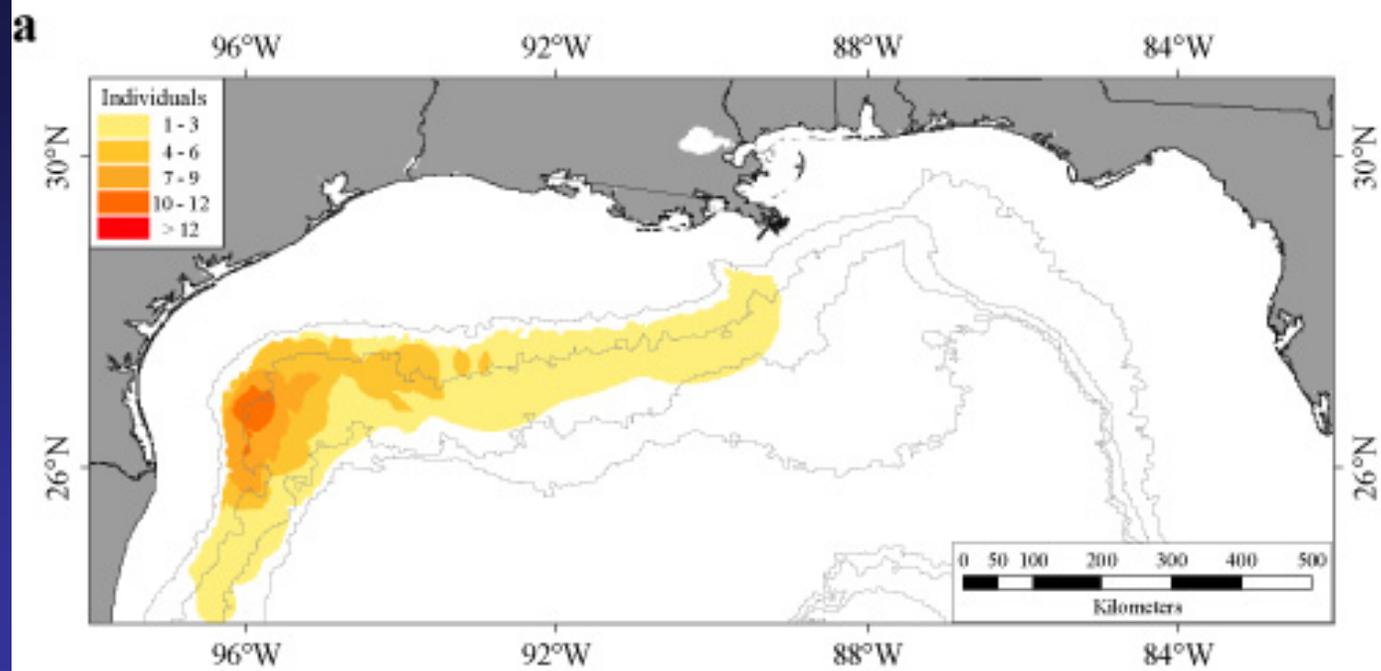
Entire northern upper slope west of DSC in waters 500 – 2000 m



Composite Home Range and Core Area for Males

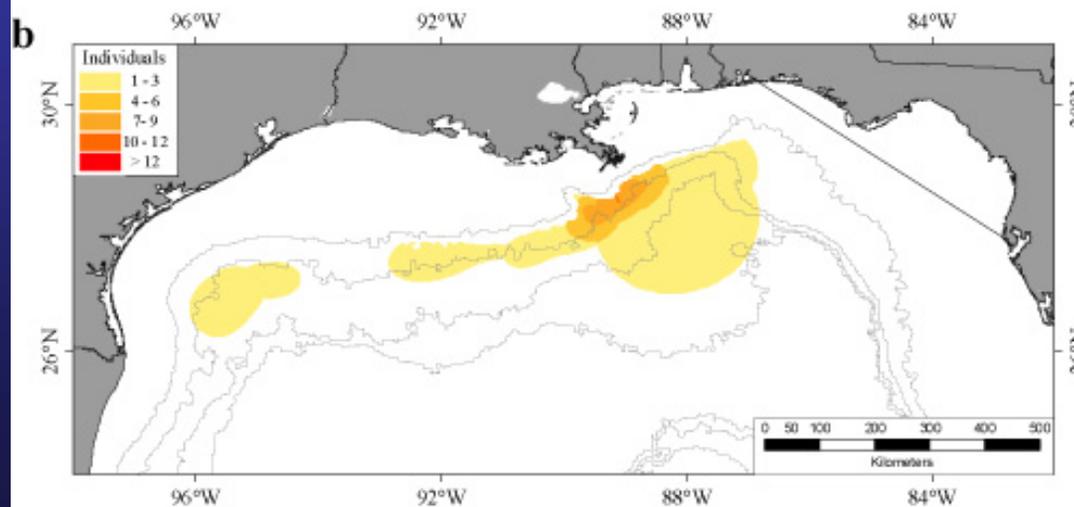
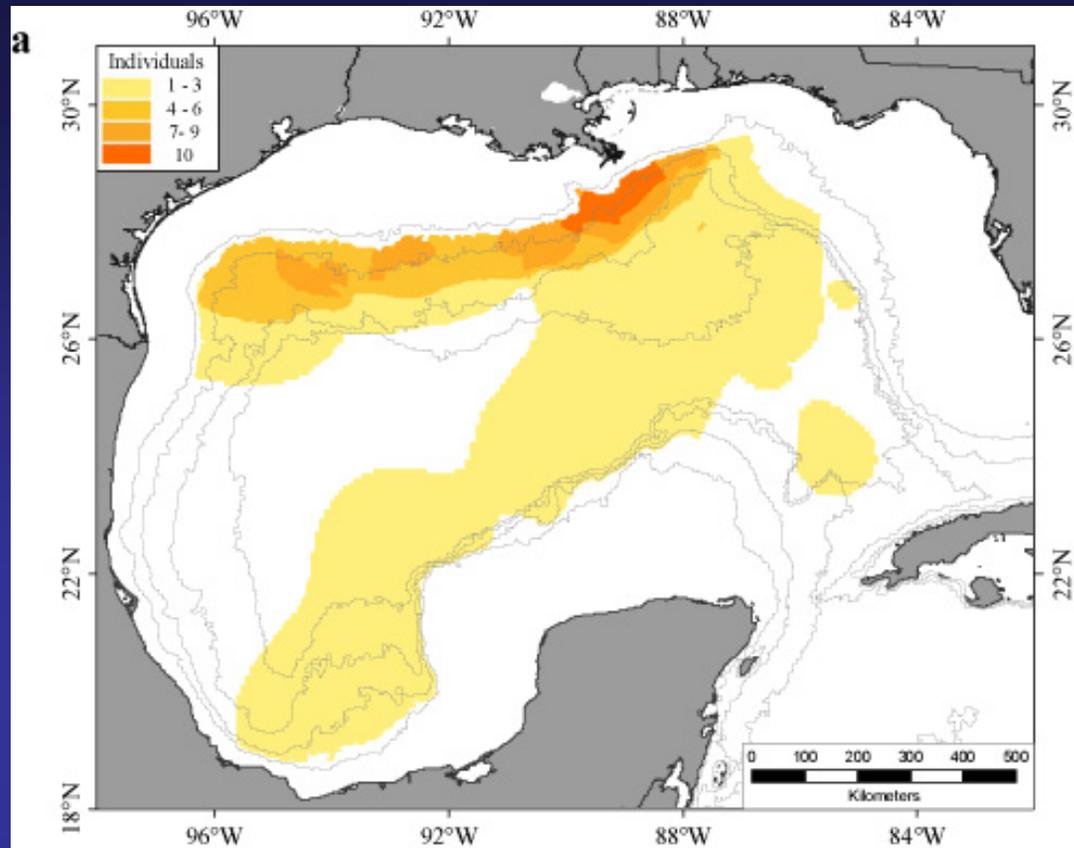
- **HR = 1,131,365 km² = to all whales**
 - one male = 66% of total
 - vs. <1% (4919 km²) of home range shared by all males and 8% shared by 3 males
- **CA = 32,174 km²**
 - Just 2.8% of home range (between MRD and DSC at 500 – 3000 m depth) and at RGS (500 – 2000 m depth), but not in between





Composite HR & CA for Females

- **HR (2002-4) = 140,407 km² = 12.4% of total**
 - Mexico to DSC in 500 – 1500 m
 - CA = 2150 km² MSC to MRD along 1000m contour
- **HR in 2005 (all) = 104,362 km²**
 - RGS to MSC in 500-2,000 m
 - CA (2005) overlapped in part of male CA
- **Combined HR = 156,043 km²**
 - 57% shared by females tagged in MRD and RGS
- **Combined CA = 69,638 km²**
 - 8% shared by females tagged in MRD and RGS



HR & CA for Annual Cycle Whales

- Limited to whales transmitting 340-370 days
- N=10 (6 female, 2 males, and 2 unknown sex)
- HR = 535,723 km² (47% of total for all whales)
 - Lost N. Atlantic (2nd year area)
- CA = 7,149 km² (56% of CA for all whales)
- Despite small # of males, HR and CA most resemble distributions for all males

Conclusions: 1

Observed male and female movements are not “migrations” (annually repeated seasonal movements), but likely linked to food availability.

Synchrony in movements likely the result of social bonds.

Our home range estimates are smaller than those estimated by Whitehead by a factor of 4 for males and 40 for females.

Conclusions: 2

Home ranges of females tagged in different parts of the Gulf overlapped, but core areas did not.

HR of two males included female core areas in the central and western Gulf.

CAs overlapped with tagging areas, suggesting possible bias issues in future study designs.

Possible gradation of whales with water depth and thus questionable exchange between inshore and offshore whales (possibly separate stocks?).

Conclusions: 3

Site-centric patterns indicate modal behavior & suggest similar 200 km diameter CA and <800 km female trips in other upper slope areas like Dry Tortugas or the Bay of Campeche.

More data needed to characterize male movements and seasonal variability.

Tag performance was outstanding (duration, location quality, & minimal observed effects).



Sponsors

- **Minerals Management Service**
- **Office of Naval Research**
- **National Marine Fisheries Service**

Thanks to the SWSS Team

- OSU folks “back home”: Carol DeLancey (administration), Tomas Follett (data management), Barbara Lagerquist (tag construction), Cyndee Pekar (administration)
- OSU tag team: Craig Hayslip, Ladd Irvine, Mary Lou Mate, Dan Lewer, Martha Winsor
- Visual & acoustic teams/observers, including MMS, NOAA & Industry representatives
- TAMU leadership and Gyre crew

Resighting of Tagged Whales

- **Nine whales observed 213 – 355 days after tagging (DAT)**
 - 2 seen on 214 and 330 DAT had lost their tags at 197 and 31 DAT. No effects visible
 - 3 seen at 348, 350 & 351 DAT, which were 72, 279, & 104 days after last transmission was received
 - 4 transmitted 110, 73, 23, & 63 days after last seen on 355, 213, 350, & 346 DAT
- **Only one whale showed any visible effect when last seen (modest localized swelling) 338 DAT.**





