



NOAA Technical Memorandum NMFS-SEFSC-609

**Report on Field Activities to Collect Biopsy Samples
from Bottlenose Dolphins in
Pamlico Sound, NC, Summer 2010**



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ABSTRACT

Some degree of areal overlap is known to occur among the four stocks of bottlenose dolphins (*Tursiops truncatus*) that inhabit North Carolina during all or part of year. This overlap poses challenges to estimating abundance of each stock and assigning bycatch in commercial fisheries to a particular stock. Overcoming these challenges is especially crucial for the NNCES (Northern NC Estuarine System) stock, for which the small estimated population size may make a single incidence of bycatch greater than the population can sustain. As a first step to determining if the NNCES stock can be distinguished genetically from other stocks, a focused field project was conducted during the summer of 2010 to collect biopsy samples from bottlenose dolphins in Pamlico Sound when the NNCES is isolated from the other stocks. We conducted 23 surveys covering 1854.6 km during five weeks of sampling effort, encountering 44 dolphin groups containing 824 individual dolphins. During these encounters, we took over 4230 photographs and collected 41 biopsy samples.

INTRODUCTION

On the east coast of the United States, coastal bottlenose dolphins (*Tursiops truncatus*) occur from southern New York to southern Florida (Waring et al. 2010). In accordance with the Marine Mammal Protection Act (MMPA), much research has been conducted to correctly delineate stock structure in this region (Hohn 1997, Waring et al. 2010, Rosel et al. 2009) and estimate population size and limits to bycatch (i.e., serious injury and mortality) in commercial fisheries for individual stocks (MMPA, 16 U.S.C. 1386 et seq). Thus far, fourteen stocks have been defined along the US Atlantic coast (Waring et al. 2010).

Four of these stocks occur in North Carolina waters during all or part of the year: the Northern Migratory (NM) Stock, the Southern Migratory (SM) Stock, the Northern NC Estuarine System (NNCES) Stock, and the Southern NC Estuarine System (SNCES) Stock (Waring et al. 2010). The migratory stocks are found primarily in coastal waters (seaward of the 72 COLREGS¹ line), and are not present year round. The estuarine stocks are present year round and are found primarily inshore of the COLREGS line; however, at least some dolphins move between the coastal and estuarine habitats. Currently, there is no established method to assign an individual dolphin to one of these four defined stocks during times and locations in which mixing is likely to occur. The management implication of this sympatry, therefore, is that estimating abundance is challenging and animals caught incidental to commercial fisheries cannot be assigned to a particular stock. For the estuarine stocks, which have small population sizes, a single incidence of bycatch could exceed sustainable levels (i.e., Potential Biological Removal (PBR) level) (see MMPA, 16 U.S.C. 1362 [20] and Barlow et al. 1995).

Bycatch of bottlenose dolphins is known to occur in various fisheries throughout their range in the western North Atlantic, particularly in NC gillnet fisheries (Rossman and Palka 2004, Byrd et al. 2008, and Waring et al. 2010). As a result, a Bottlenose Dolphin Take Reduction Team (BDTRT) was convened in 2001 (Federal Register 2001) per MMPA requirements (MMPA, 16 U.S.C. 1387[118]) to develop a take reduction plan with short- and long-term goals of reducing bycatch mortality and serious injury of bottlenose dolphins in the western North Atlantic incidental to commercial fisheries below PBR for each stock. The BDTRP was implemented in April 2006 (Federal Register 2006) and included regulations for ocean gillnets.

This plan was developed before the two North Carolina estuarine stocks (NNCES and SNCES) were defined, and so the BDTRT met again in September 2009, in part, to review the new stock structure and the 2006 plan's conservation measures given the revised stock structure. Data presented at the 2009 meeting indicated that bycatch of the NNCES stock may be approaching or exceeding its PBR level given the potential for their occurrence in ocean waters when bycatch has been documented. As a result, the BDTRT provided consensus

¹ 72 COLREGS demarcation line (International Regulations for Preventing Collisions at Sea, 1972)

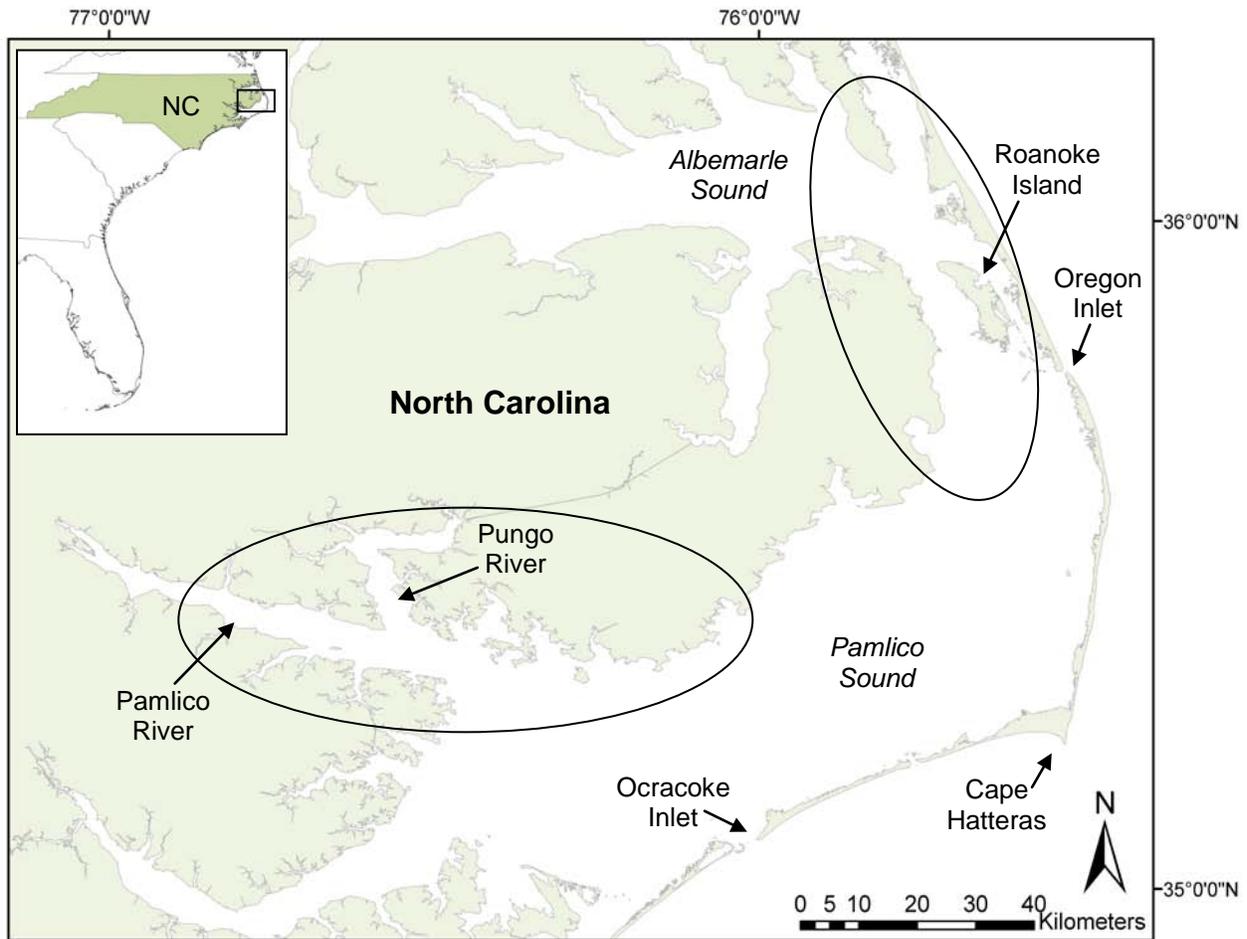


Figure 1. General study areas for June (Pamlico and Pungo Rivers) and July/August (around Roanoke Island) for biopsy surveys of bottlenose dolphins in 2010.

recommendations to refine the understanding of stock distribution in estuarine and ocean waters because of the mixing of the NNCES and coastal stocks. One of the recommendations was to conduct a study to determine if the stocks can be distinguished genetically by collecting biopsy samples of residents in the NNCES stock during the summer (July and August).

Consequently, during the summer of 2010, we collected biopsy samples from bottlenose dolphins in areas of northern and western Pamlico Sound, presumably inhabited by non-coastal animals (Waring et al. 2010). This report documents that field effort and sampling.

METHODS

We collected skin samples using remote biopsy sampling (Gorgone et al. 2008) during small-vessel surveys. Surveys were conducted during one week in June primarily in the Pamlico and Pungo Rivers, and for one week in July and three weeks in August around Roanoke Island (Fig. 1). These survey sites and time frames were determined based on the current understanding

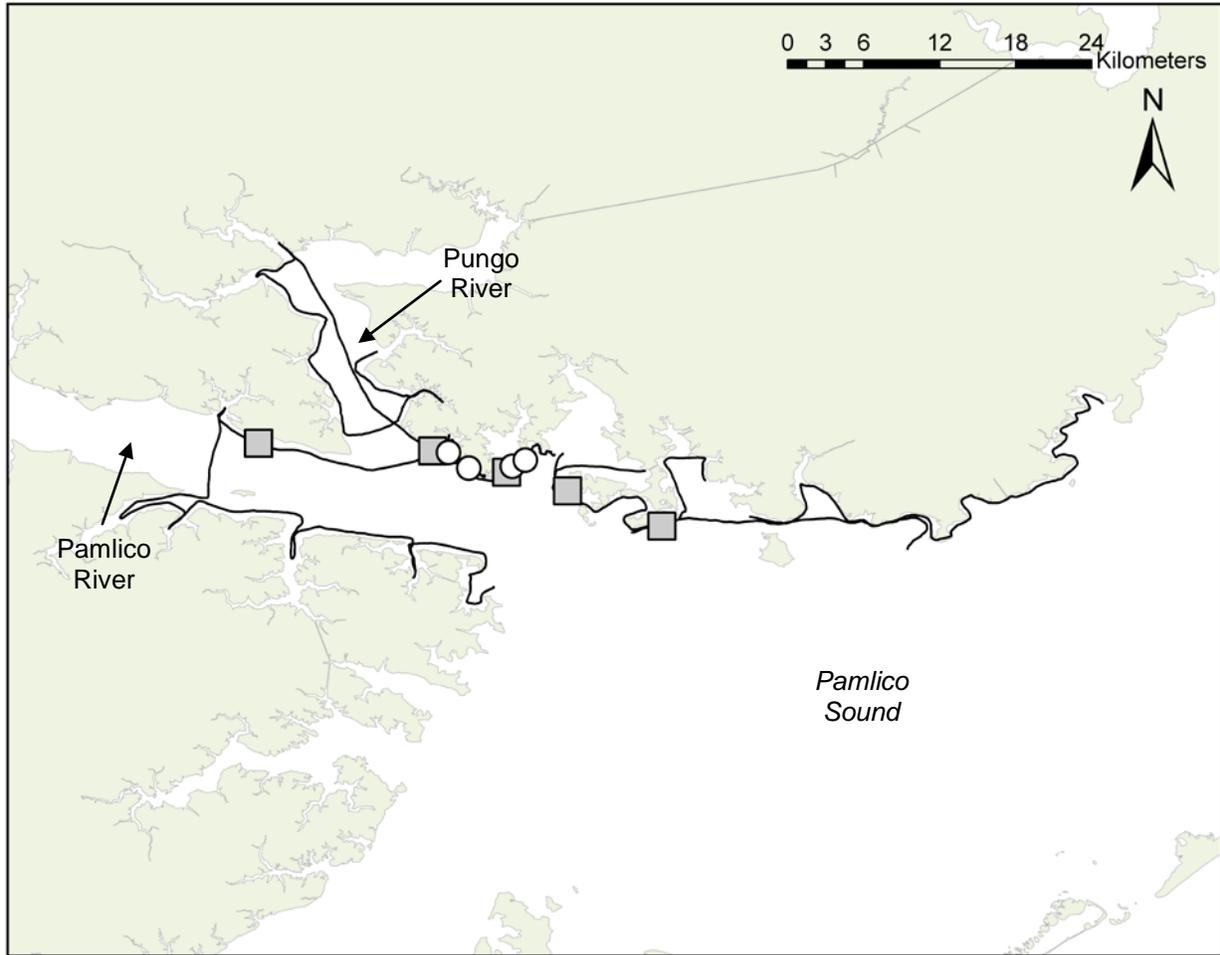


Figure 2. On-effort tracklines and tracklines while following dolphins (272.3 km) during surveys 1-4 June 2010. Dolphin sightings (squares) and biopsy samples (circles) are also shown.

of when and where the NNCES stock is isolated from the coastal stock (Waring et al. 2010). Surveys on the southeastern side of Roanoke Island were conducted close to the island to reduce chances of inadvertently sampling a coastal dolphin that had traveled inshore from Oregon Inlet.

At the beginning of each week, our goal was to cover as much of the area as possible in a given day. Priority was given to areas that were not surveyed the day before; in addition, days with high winds necessitated coverage of more protected areas. Each survey was conducted from a 6-m ridged-hull inflatable vessel, the NOAA R/V Julius, with two 90 hp Honda 2-stroke engines. The boat was crewed by a driver, photographer, data recorder, and biopsy sampler. When on effort, the vessel was driven at approximately 10-14 km/hr. For each sighting, we reduced vessel speed and traveled parallel to the dolphin group to minimize disturbance. We collected samples with a crossbow using methods described in Gorgone et al. (2008), except that we only used the 25 mm stainless-steel cylindrical punch. For each biopsy sample obtained, the photographer attempted to capture a photograph of the animal that was biopsied. Immediately



Figure 3. Bottlenose dolphin seen in Pamlico River on 4 June with pronounced skin lesions.

after a biopsy sample was taken, the following data were recorded: the location on the dolphin's body from which the sample was taken, geographic position, biopsy reaction level (Gorgone et al. 2008), and number of other animals in the group reacting to the biopsy. Biopsy attempts were terminated and the sighting was ended when any of the following occurred: after 10% of the group was sampled, after one hour with the same group, or after it was determined that the dolphins' behavior precluded the vessel from getting into correct position for biopsying. Group size, number of neonates (defined according to Mann and Smuts 1999), young-of-year (YOY), depth, salinity, sea state (Beaufort wind scale), and geographical position were recorded after the sighting ended. A GPS was used to record positions along the track approximately every 20 seconds as well as positions for each sighting and biopsy. For group sizes less than 15, we counted the number of dolphins in each group. For groups of 15 or greater, we usually estimated group size and often rounded to the nearest five animals.

After each boat survey day, part of the skin was removed from each sample and frozen for stable isotope analyses. The remaining sample was placed in 20% DMSO saturated with

Table 1. Data collected for each sighting of bottlenose dolphins during biopsy surveys in Pamlico Sound during 2010. Sampling weeks are indicated by differences in shading.

Trip Date	Sighting		Longitude	Group size	# of biopsies	# of YOYs	# of Neonates	Depth (m)	Temp (C)	Salinity (ppt)
	Number	Latitude								
02-Jun-10	1	35.35750	-76.46423	20	2	1	1	0.5	25.9	10.50
02-Jun-10	2	35.36184	-76.42092	9	0	0	0	2.6	27.0	10.30
02-Jun-10	3	35.33682	-76.35402	3	0	0	0	1.8	27.1	10.70
04-Jun-10	1	35.39567	-76.67132	1	0	0	0	3.0	27.6	4.80
04-Jun-10	2	35.39026	-76.51684	35	2	2	0	0.6	27.6	8.10
13-Jul-10	1	35.90905	-75.70733	12	0	0	0	3.0	28.9	15.80
13-Jul-10	2	35.87958	-75.62412	8	0	1	0	2.7	29.1	19.50
14-Jul-10	1	35.80547	-75.62433	5	0	0	0	2.4	28.3	17.60
14-Jul-10	2	35.91351	-75.63844	10	0	0	0	1.5	27.9	19.80
15-Jul-10	1	35.85015	-75.66462	20	2	0	0	2.4	28.1	17.50
15-Jul-10	2	35.91364	-75.71601	18	3	0	0	1.8	28.0	9.60
15-Jul-10	3	35.91751	-75.72340	7	2	0	0	1.8	29.3	8.70
15-Jul-10	4	35.85629	-75.61370	6	0	0	0	2.7	29.8	17.40
10-Aug-10	1	35.88918	-75.62834	20	1	4	0	2.7	29.9	21.30
10-Aug-10	2	35.94490	-75.72467	4	0	0	0	2.7	29.8	9.80
10-Aug-10	3	35.82045	-75.61280	25	1	5	1	1.5	29.6	20.90
11-Aug-10	1	35.84518	-75.60765	25	0	1	0	1.5	29.2	17.70
11-Aug-10	2	35.84619	-75.60920	15	0	1	0	1.5	30.9	20.30
12-Aug-10	1	35.87072	-75.67313	8	0	0	0	3.4	29.4	11.90
13-Aug-10	1	35.90411	-75.74344	15	1	1	0	4.0	29.4	8.80
13-Aug-10	2	35.89579	-75.73400	15	2	0	0	4.9	29.2	8.90
13-Aug-10	3	35.91389	-75.64640	15	0	1	0	0.9	30.1	13.80
16-Aug-10	1	35.82003	-75.65749	2	1	0	0	2.4	28.7	20.30
16-Aug-10	2	35.81721	-75.65233	70	4	5	1	3.0	30.3	17.00
16-Aug-10	3	35.79003	-75.72606	30	1	0	0	3.0	30.5	17.10
17-Aug-10	1	35.95266	-75.64034	28	1	4	0	1.2	29.6	11.50
17-Aug-10	2	35.99072	-75.69360	40	2	0	0	1.5	29.4	11.80
17-Aug-10	3	35.91239	-75.65134	30	3	0	0	2.1	30.5	14.10
18-Aug-10	1	36.01220	-75.73347	30	1	1	0	2.4	30.9	8.8
19-Aug-10	1	35.82457	-75.72211	25	0	0	0	2.1	29.2	9.2
19-Aug-10	2	35.79749	-75.63044	30	0	0	0	1.8	29.8	21.1
20-Aug-10	1	35.84463	-75.60487	3	0	0	0	2.1	28.6	19.8
20-Aug-10	2	35.82679	-75.61206	8	0	0	0	3.0	28.7	16.9
20-Aug-10	3	35.82444	-75.66335	25	2	1	0	3.7	29.1	20.5
20-Aug-10	4	36.00227	-75.72841	35	0	3	0	1.5	29.6	7.2
23-Aug-10	1	36.05795	-75.78259	30	5	0	0	2.4	29.0	7.4
23-Aug-10	2	35.84929	-75.61031	7	1	0	0	1.8	29.2	17.9
24-Aug-10	1	35.98779	-75.69583	25	2	1	0	1.5	28.2	10.3
25-Aug-10	1	35.81019	-75.64272	40	2	2	0	1.8	25.4	18.5
25-Aug-10	2	36.00176	-75.72551	20	0	1	0	0.9	26.2	6.4
25-Aug-10	3	35.96563	-75.65556	7	0	0	0	1.2	27.0	10.8
26-Aug-10	1	35.84888	-75.61254	18	0	0	0	2.4	27.0	22.1
27-Aug-10	1	35.88520	-75.62787	20	0	0	0	2.7	27.9	13.0
27-Aug-10	2	35.87540	-75.62199	5	0	0	0	2.7	28.0	11.4

sodium chloride for genetic analyses at the NOAA Fisheries SEFSC Marine Mammal Molecular Genetics Laboratory, Lafayette, LA.

RESULTS

During June, we surveyed 272.3 km while searching for or sampling dolphins primarily in the Pungo and Pamlico Rivers (Fig. 2). There were relatively few dolphin sightings ($n = 5$) (Table 1), and all dolphins ($n = 68$) were sighted close to the northern shore of the Pamlico River. Group size ranged from 1 to 35 (mean = 13.6; SD = 14.1). These groups included one neonate and 3 YOYs. Four biopsy samples were collected and approximately 657 photos were taken. Salinity ranged from 4.8 to 10.7 ppt where dolphins were sighted. One sighting consisted of a single individual that had severe skin lesions (Fig. 3); salinity at that sighting location was 4.8 ppt.

In July and August we surveyed 341.1 and 1241.2 km, respectively, in waters around Roanoke Island (Figs. 4-7). Similar to June, most sightings were nearshore, occurring around Roanoke Island, near Nags Head and Kill Devil Hills on the east side of Pamlico Sound, and Manns Harbor on the west side. We encountered 39 dolphin groups and approximately 756 individuals, including two neonates and 32 YOYs (Table 1). Group size ranged from 2 to 70 (mean = 19.4; SD = 13.5). Salinity ranged from 6.4 to 22.1 ppt. Thirty-seven biopsy samples were collected and approximately 3575 photos were taken.

DISCUSSION

The project goal was to obtain 40 samples from bottlenose dolphins found in Pamlico Sound but away from Oregon Inlet to optimize sampling of estuarine residents. The project successfully accomplished this goal with 41 samples collected. These samples will be used to determine if dolphins in Pamlico Sound are genetically and isotopically divergent from dolphins in nearby coastal waters, as well as from other coastal, bay, and estuarine stocks along the coast. An additional goal is to determine whether an individual dolphin can be assigned to a coastal or estuarine stock using genetic or isotopic results. Further analyses of characteristics of dolphin groups, resightings, and other analyses of the data are ongoing.

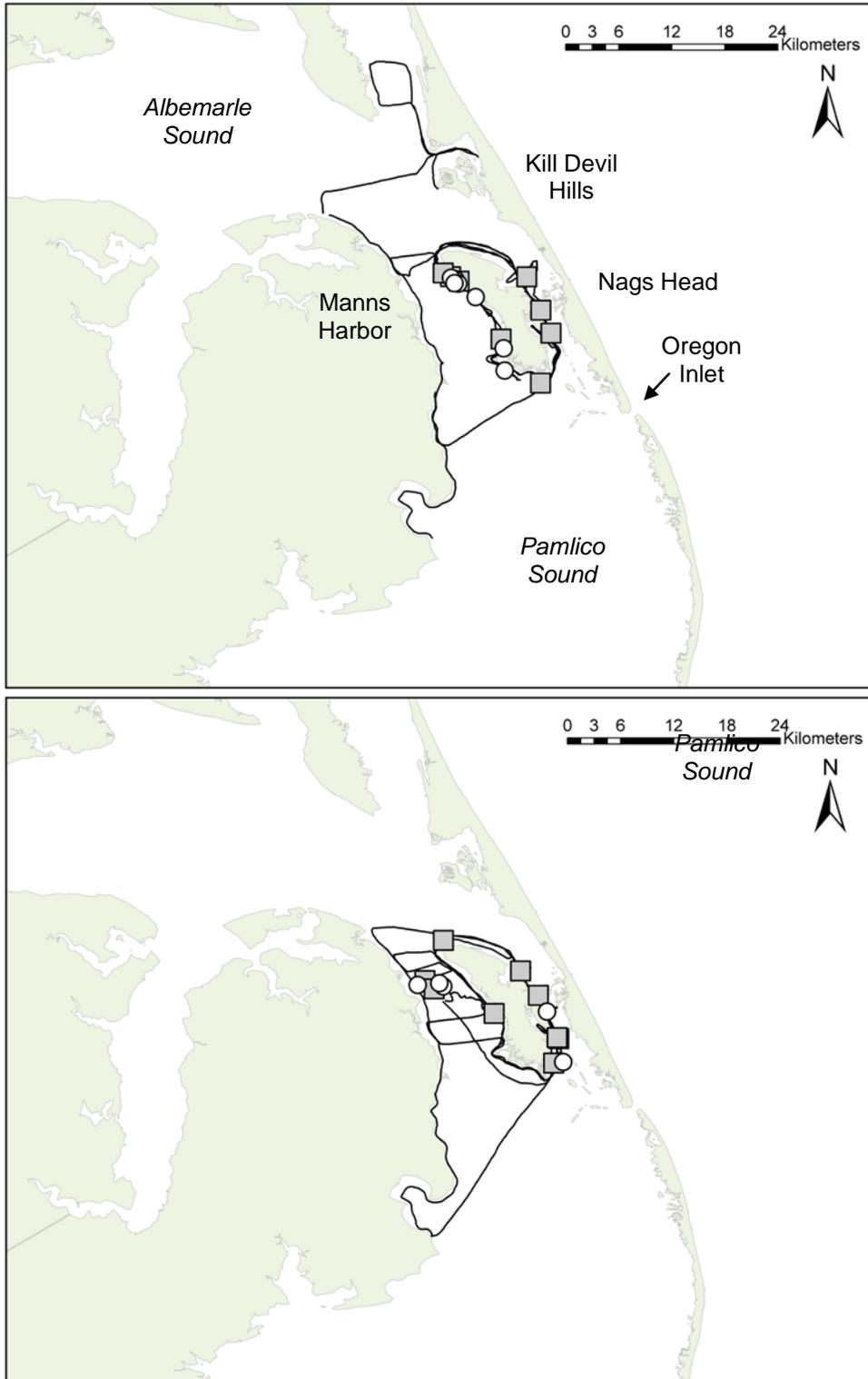


Figure 4. On-effort tracklines and tracklines while following dolphins during surveys 12-16 July 2010 (top; 341.1 km) and 10-13 August 2010 (bottom; 299.2 km). Dolphin sightings (squares) and biopsy samples (circles) are also shown.

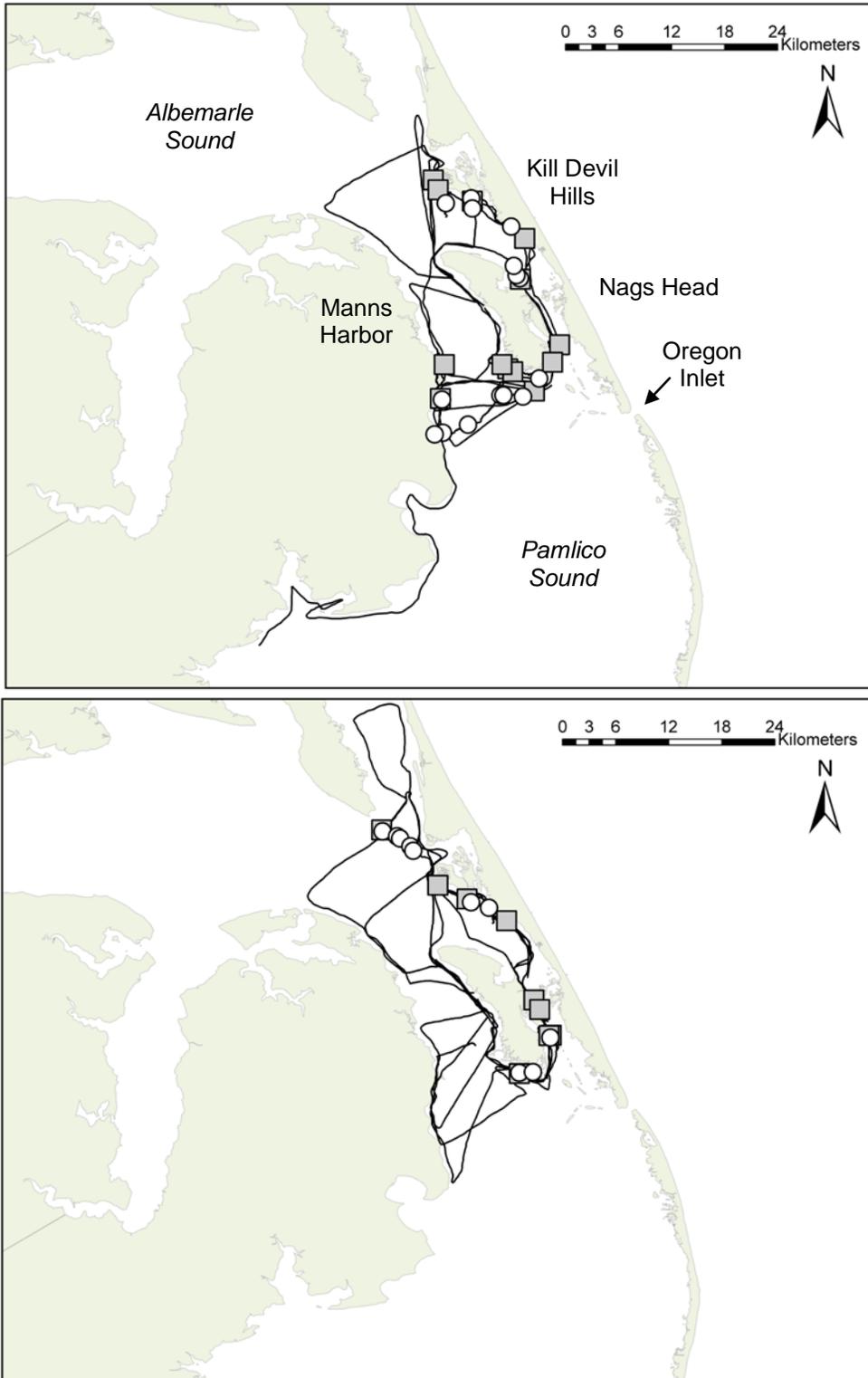


Figure 5. On-effort tracklines and tracklines while following dolphins during surveys 16-20 August 2010 (top; 465.3 km) and 23-27 August 2010 (bottom; 476.7 km). Dolphin sightings (squares) and biopsy samples (circles) are also shown.

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