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Characteristics of sea turtles incidentally captured in the U.S. Atlantic sea scallop dredge fishery

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ABSTRACT

Interactions between sea turtles and sea scallop dredges are an important conservation issue. In this paper, we present information which can be used to inform bycatch mitigation strategies. We collected samples and data from turtles observed in the U.S. commercial scallop dredge fishery and examined interactions and injuries, genetic samples, and turtle size. Observers documented injuries in about two-thirds (52 of 74) of the live and fresh dead turtles. When the location of the turtle in the gear was described, it was most frequently reported in the dredge ($n = 19$), in the bag ($n = 9$), or on top of the catch ($n = 7$). Although several different injury and interaction scenarios were described by observers, the most common was an injured turtle, caught in the dredge, and brought aboard the fishing vessel. The timing of injuries was often unknown, but when observer comments provided information about timing, most injuries likely occurred before the turtle was brought aboard the vessel. The majority of turtles observed in the scallop dredge fishery were juvenile loggerheads. Mixed stock analysis using genetic data, suggested that most loggerheads captured in the scallop fisheries are from the south Florida nesting population, however there was a high level of uncertainty in these estimates.

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1. Introduction

Interactions between threatened and endangered sea turtles and Atlantic sea scallop (*Placopecten magellanicus*) dredge gear (Fig. 1) are an important conservation issue. The National Marine Fisheries Service (NMFS) estimates that hundreds of turtles have been captured and injured in the scallop dredge fishery (Murray, 2004a,b, 2005). The NMFS and the scallop industry are researching ways to modify scallop dredge gear to reduce turtle injuries (DuPaul et al., 2004; Smolowitz et al., 2005; Haas et al., 2006; Smolowitz, 2006). NMFS must continue to investigate and implement additional gear modifications to reduce the severity of the interactions between turtles and scallop dredge gear (NMFS, 2008). There are few small-scale examinations of the turtle interactions with scallop dredge gear (DuPaul et al., 2004; Smolowitz et al., 2005) but a comprehensive examination is needed to develop gear designs which reduce turtle bycatch and to measure the effect of these interactions on the status of turtle populations.

In order to design and evaluate gear modifications which reduce turtle injuries, information is needed on the size of turtles and types of interactions and injuries that have been observed in the scallop dredge fishery. Turtle size information can be used by gear researchers when evaluating the distance between hard parts of the dredge (such as the spacing of the bale support bars or the configuration of turtle excluder devices). Information on the types of interactions and injuries can be used to focus gear modifications on the parts of the dredge that that are associated with most turtle interactions and injuries.

The Endangered Species Act requires NMFS to determine whether federal fisheries result in reductions in reproduction, numbers or distribution of turtles. The turtle species most commonly documented as bycatch in the scallop fishery is the threatened loggerhead (*Carretta caretta*, Murray, 2004a,b, 2005). Loggerheads originate from a variety of nesting beaches, including the United States (northeast Florida to North Carolina, south Florida, northwest Florida, Dry Tortugas), Mexico, Greece, Turkey and Brazil (Bass et al., 2004; Bowen et al., 2004; Bolten et al., 1998; Encalada et al., 1998), but information on the nesting beach origins of turtle bycatch in the scallop dredge fishery is currently missing. Summaries of size class and loggerhead stock composition of turtles captured in the scallop fishery would allow better assessment of the effects of the scallop fishery on loggerhead nesting groups.

In this paper, we present and analyze information collected from turtles incidentally captured in the scallop dredge fishery.

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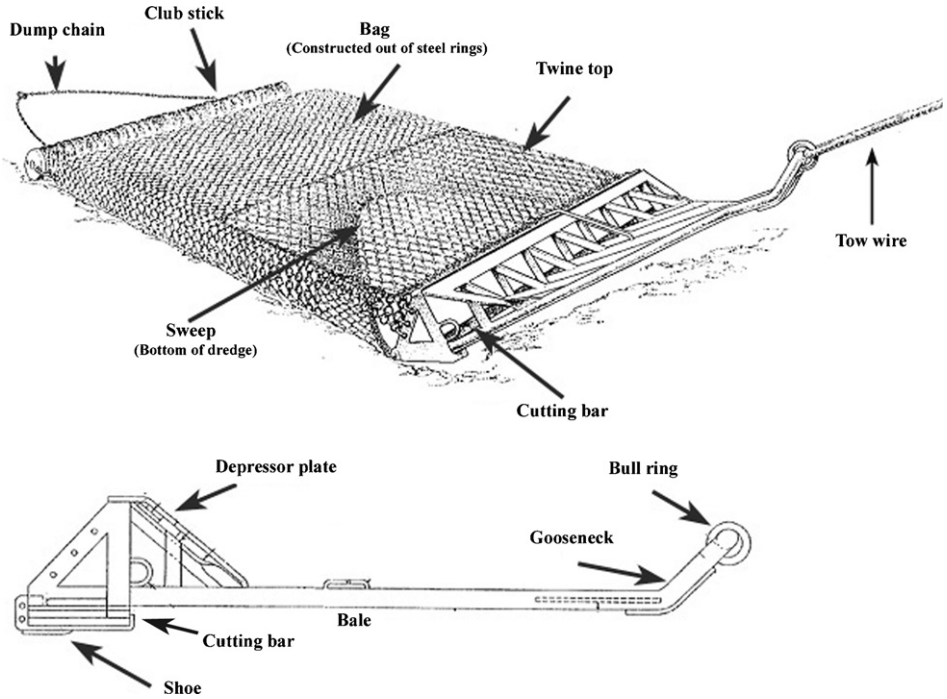

Fig. 1. Anatomy of a standard scallop dredge. The top drawing is of a scallop dredge frame and bag together. The bottom drawing is of scallop dredge frame only.

We report the number of turtles associated with various parts of the dredge and summarize the types of injuries associated with different types of interactions. We evaluate the nesting beach origin (based on tissue samples) and describe the size-classes of the captured turtles.

2. Methods

The data analyzed were obtained from the NMFS Northeast Fishery Observer Program (NEFOP), which assigns observers to commercial fishing vessels. We used the term "capture" to describe all turtle-gear interactions recorded by NMFS NEFOP observers in the scallop fishery even though turtles were not always physically captured. Observers were instructed to identify the species, photograph identifying characteristics and injuries, describe new and old injuries, obtain three body measurements, look for flipper and PIT (passive integrated transponder) tags, apply flipper tags (if appropriate), collect tissue samples for genetic analysis, draw diagrams of turtles, assess the condition of the turtle, and write a description of the animal and gear interaction. We evaluated all available information for each turtle capture and created categorical variables to describe injuries and interactions. We examined the electronic observer records, copies of original data logs, observer comments in the incidental take logs and haul logs, diagrams, photographs, notes on the trip data, and notes from interviews with observers. The information we reviewed far exceeded that reported in Smolowitz et al. (2005) because we had access to more data sources.

The size, injury, and interaction analyses within this paper were based on 74 turtles that were reported observed from 1996 to 2005 in association with scallop dredge gear. Some of the turtles were captured in a dredge equipped with rock chains, but none were captured in a dredge equipped with chain mats even though dredges with chain mats were observed in 2004 (Murray, 2005). Most of the captured turtles were observed in the summer and fall in the Mid-Atlantic region (Fig. 2). The earliest observed capture occurred on 17 June, and the latest occurred on 21 October. In general, observer coverage was higher and observer comments were more extensive in the later years (especially 2003 and 2004, see Murray, 2004a,b, 2005 for more details).

In addition to the 74 turtles in this analysis, observers reported 9 turtles as moderately or severely decomposed. We excluded these decomposed turtles because their decomposition suggested they died before interacting with the observed dredge gear. Six of the decomposed turtles were tangled in gillnet gear and were captured on the same trip in two non-consecutive hauls. We included turtle captures in both on-watch (when an observer is on duty and systematically collecting data) and off-watch hauls (when an observer is off duty, but may opportunistically collect data).

2.1. Injuries

We based our injury determinations on all available information. We defined an injured turtle as a fresh-dead or live turtle with any

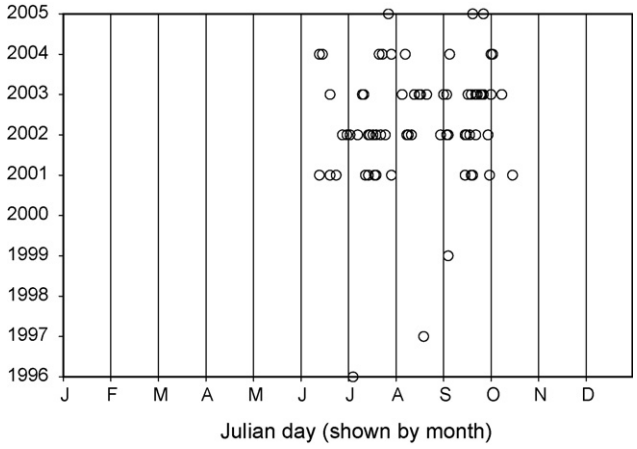

Fig. 2. Year and Julian day of observed turtle bycatch in the scallop dredge fishery. Vertical grid-lines represent the first day of each month. Moderately and severely decomposed turtles not included.