TES Mitigation and Monitoring Techniques to Increase Dredging Windows and TES Protection

Dredging Operations Environmental Research (DOER) Program

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Focus Area

Dredged Material Management

Problem

The primary engineering control to reduce threaten and endangered species (TES) turtle and sturgeon take in the U.S. is the draghead deflector. This engineering control has resulted in dramatic reductions in the rate of incidental take of sea turtles but use of the deflector "significantly decreases production efficiency of the hopper dredge" (Henrikson et al., 2015) and increases the draghead cutting force such that the vessel requires greater propulsion power (that generates more emissions) to overcome this additional resistance. Henriksen et al. (2016) conducted field trials that reported an increase of fuel consumption of 190% measured in normal dredging conditions with two deflectors in the sediment and pumps on. Tickler chains (TC) are used as the primary sea turtle protection tool on international hopper dredging projects. This technology consists of a chain array attached to the dragarm of a hopper dredge forward of the draghead. This chain array is designed to stream freely in the water column or be dragged along the seafloor to startle or motivate a turtle on or near the seafloor to move away from the oncoming draghead. While there have been claims of how well these TC work, there no scientifically-defensible data presented to the USACE or U.S. regulatory agencies for evaluation. If TC could be proven effective in reducing TES take risk and replace the deflectors, the additional advantages of increased dredge production rates and reduced emissions could also be realized. There is also currently a lack of understanding of the spatial and temporal occurrence of sea turtles within the dredging projects. Expensive investigations with (tagged) sea turtle tracking have been conducted for collecting limited spatially and temporally-based occurrence data. This dearth of data and information is, in large part, due to the absence of a near-real time survey system that is capable of detecting and discriminating different types of turtles on much-larger spatial scales less expensively.

Study Description

Full-scale implementation strategies must be developed and extensive coordination among USACE, National Marine Fisheries Service (NMFS), dredging contractors project delivery team members, and other stakeholders must be done to facilitate opportunities to allow the use of TC such that its effectiveness in moving turtles and sturgeon away from the drag head can be evaluated and documented to facilitate the use of TC instead of draghead deflectors. The DOER program coordinated and leveraged assets with POH, SPN, and NWP to successfully evaluate TC performance on the hopper dredge ESSAYONS while operating in Hawaii. The main performance metric being evaluated was that the chain array did not entangle during deployment while in the water column or on the sea bottom that would form a drowning hazard for turtles. The TC performance was observed in great detail in videos produced by a high-resolution acoustic camera installed on the ESSAYONS' dragarm (turbidity degraded quality of the other deployed conventional underwater cameras). In FY19 a full-scale TC demonstration projects was conducted. NAN, with DOER technical support, modified a Fire Island beach nourishment dredging contract to include a requirement for using TC for Atlantic sturgeon protection. The contractor elected to use two hopper dredges and dredged 2,355,550 yd^3 without any reported takes. While this "no takes" tally is encouraging, it was based only on Observer data with no auxiliary data collected to know if any TES came into contact with the TC. Adoption of TC by the regulatory agencies requires that its effectiveness for moving TES away from the path of a draghead be proven before it is accepted to be used to reduce entrainments. This will require evaluation and documentation of the behavioral responses of TES to a TC array or similar physical stimuli. Future dredging projects and close coordination between participants will be required to gain acceptance of this TES take reduction engineering control. Acoustic-based camera systems are being investigated to evaluate TC performance and are also being applied in the development of a turtle survey system capable of quickly detecting and discriminating different types of turtles on a larger spatial scale in navigation channels than the existing limited and expensive tagged turtle approach.

Products

TTC hard deliverables will include an engineering design of TC and dredging contract technical specifications. A technical report will document TC performance metrics in reducing takes and provide guidance in their use. Additionally, the success of the TC will highlighted in a corporate communication video that will be posted on the DOER website and ERDC YouTube channel.

Summary

The objectives of this research task will be to coordinate with USACE divisions and districts and regulatory agencies to; 1) improve engineering controls (TC) to reduce TES turtle and sturgeon takes and 2) develop a more efficient and less expensive turtle survey system to collect spatially and temporally-based occurrence data for making scientifically-defensible risk mitigation decisions.

Balancing operational and environmental initiatives and meeting complex challenges of dredging and dredged material placement in support of the navigation mission.

Brian McFall
Coastal Hydraulics Laboratory, Brian.C.McFall@usace.army.mil

January 2022