

STUDY TITLE: Ship Shoal: Sand, Shrimp, and Seatrout

REPORT TITLE: Blue Crab (*Callinectes sapidus*) Use of the Ship/Trinity/Tiger Shoal Complex as a Nationally Important Spawning/Hatching/Foraging Ground: Discovery, Evaluation, and Sand Mining Recommendations based on Blue Crab, Shrimp, and Spotted Seatrout Findings

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APPLICABLE PLANNING AREA: Central

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KEY WORDS: Gulf of Mexico, Ship Shoal, Trinity Shoal, Tiger Shoal, Louisiana, sand mining, blue crab, white shrimp, brown shrimp, spotted seatrout, condition factor, fecundity, spawning grounds, coastal restoration

BACKGROUND: The Minerals Management Service (MMS) is addressing the recent demand for U.S. continental shelf sand resources for coastal erosion management, a critical challenge to Louisiana's ecosystems and economies. Louisiana considers barrier island restoration as a promising way to combat wetland loss, with sand mined from Ship Shoal as the most feasible sediment source. Additional sand resources on Trinity and Tiger Shoals are also being considered. Since this area supports major demersal fisheries on white and brown shrimp (*Litopenaeus setiferus* and *Farfantepenaeus aztecus*), the present study was conducted as part of a larger effort to understand the sand-mining ecology of the Ship/Trinity/Tiger Shoal Complex (STTSC).

OBJECTIVES: Our overall objective was to evaluate the fishery ecology of the region in relationship to potential sand mining impacts. Initially the focus was white and brown shrimp and spotted seatrout (*Cynoscion nebulosus*, an economically/ecologically important shrimp predator). During the shrimp-directed trawling efforts persistent concentrations of healthy spawning, hatching, and foraging female blue crabs (*Callinectes sapidus*) were unexpectedly found. Little evidence that white and brown shrimp or spotted seatrout were abundant on these shoals was found. Given these dual

findings, the focus shifted to an assessment of the potential impacts of sand mining on the abundance and condition factor/fecundity of blue crabs.

DESCRIPTION: A series of statistical/analytical approaches to 1) to compare the condition factor, fecundity, and abundance of STTSC crabs with those from other, nationally recognized blue crab spawning grounds and 2) monitor sand-mining impacts on STTSC crabs were developed and tested.

SIGNIFICANT CONCLUSIONS: The STTSC is a nationally important, though previously unrecognized and currently unprotected, offshore blue-crab spawning/hatching/foraging ground from at least April through October, and an offshore blue crab mating site. During April-October, mature female crabs appear to be in a continuous spawning cycle, producing new broods approximately every 21 days while actively foraging. Egg production apparently declines slightly as the season progresses, perhaps reflecting ingestion-limited growth of the ovary as infaunal prey densities decline. Condition factor appears to be positively associated with increases in ovarian condition and the presence of nemerteans (*C. carcinophila*) on the gills and negatively affected by a seasonal decline in prey abundance, but does not appear to be negatively impacted by acorn barnacles (*C. patula* and *Balanus* spp.) on the exoskeleton, gooseneck barnacles (*O. muelleri*) on the gills, or nemerteans (*C. carcinophila*) in the sponge (all conditions normally associated with higher salinity waters). Within the STTSC, Ship and Trinity Shoals appear to be the most important blue crab habitat, especially in August.

Despite comparatively high salinities, STTSC crabs are as fecund and 'meaty' as those from any known U.S. blue-crab spawning ground. Sand mining is expected to result in some decline in blue crab fecundity and condition factor through a reduction in food supply. In addition, increases in suspended sediments may increase mortality of crab larvae. Sand mining practices which minimize these potentially negative impacts should be carefully considered, along with harvest regulations which protect the stability of the inshore fishery.

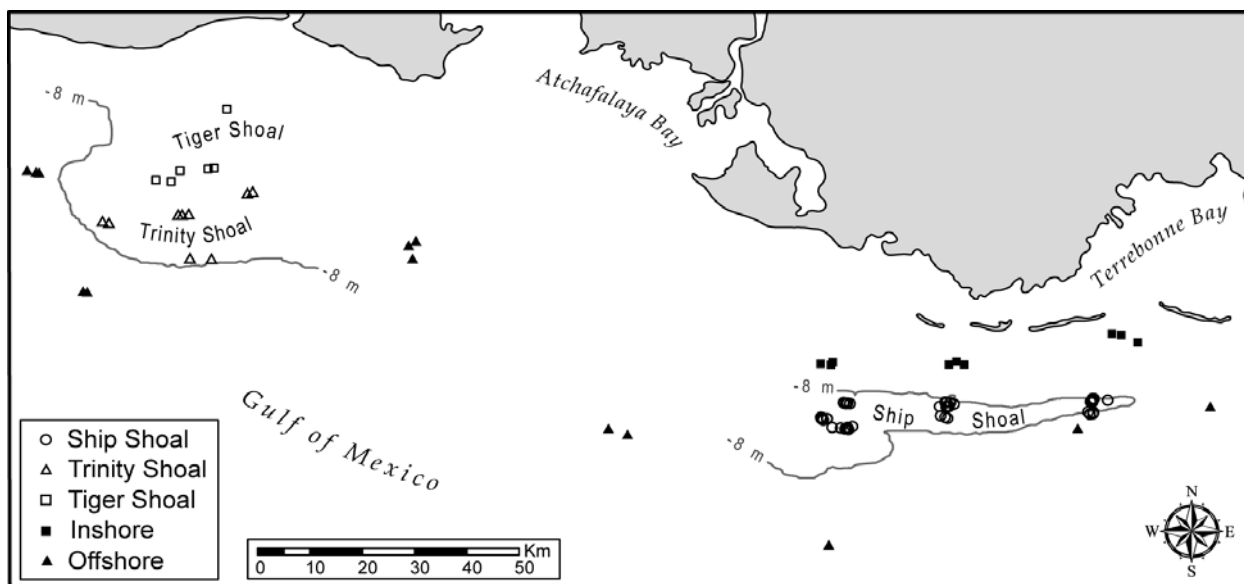
STUDY RESULTS: Our study represents at least five blue crab firsts. 1) It is the first time statistical analyses have been used to evaluate condition factor and reproductive vigor of mature female blue crabs within and across spawning areas; 2) the first documentation of an extensive blue crab spawning/hatching/foraging ground in offshore waters; 3) the first evidence that mating of blue crabs is not limited to estuaries; 4) the first indication that the nemertean *Carcinonemertes carcinophila* may have an observable effect on blue crab health or weight; and 5) the first statistical suggestion that prey reduction through crab predation has resulted in a decline in crab fecundity. In addition we present evidence that the STTSC crabs are in a continuous spawning cycle from at least April through October and that the currently used index of blue crab size (width of the carapace across the lateral spines) should be replaced with better indicators of overall size and volume.

This study resulted in the discovery of an important spawning/hatching/foraging ground for blue crabs in an unexpected environment and during a period of national concern for the Chesapeake Bay and North Carolina blue-crab fisheries. Given the lessons being

learned in Chesapeake Bay and North Carolina, and the current lack of a directed fishery on the reproductively active STTSC, conservative management will move to assure the stability of the current inshore blue crab fishery in Louisiana by protecting STTSC blue crabs from a directed harvest until their contribution to the health of the Louisiana fishery can be assessed.

STUDY PRODUCTS: Condrey, R.E. and C.G. Gelpi. 2009. Blue crab (*Callinectes sapidus*) use of the Ship/Trinity/Tiger Shoal Complex as a nationally important spawning/hatching/foraging ground: Discovery, evaluation, and sand mining recommendations based on blue crab, shrimp, and spotted seatrout findings. U.S. Dept. of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA. OCS Study MMS 2009-043. 54pp.

Gelpi, C.G., R.E. Condrey, J.W. Fleeger, and S.F. Dubois. In review. Discovery, evaluation, and implications of blue crab, *Callinectes sapidus*, spawning/hatching/foraging grounds in federal (US) waters offshore of Louisiana. Bulletin of Marine Science.



Study area for blue crab (*Callinectes sapidus*) use of the Ship/Trinity/Tiger Shoal Complex.