BLACKBURN CARTER
A Professional Corporation
Lawyers

James B. Blackburn, Jr.
jbb@blackburncarter.com

Mary W. Carter
mcarter@blackburncarter.com

4709 Austin
Houston, Texas 77004
Telephone (713) 524-1012
Telefax (713) 524-5165

www.blackburncarter.com

Charles W. Irvine
charles@blackburncarter.com

Adam M. Friedman
afriedman@blackburncarter.com

June 8, 2009

Via E-Mail: sraabe@sara-tx.org
Steven J. Raabe, P.E.
Administrative Agent for Region L
c/o San Antonio River Authority
P.O. Box 839980
San Antonio, Texas 78283-9980

Re: Draft SAGES Report San Antonio Guadalupe Estuarine System Linking Freshwater Inflows and Marsh Community Dynamics in San Antonio Bay to Whooping Cranes

Dear Mr. Raabe:

In the following paragraphs, we have presented our comments on the Draft SAGES Whooping Crane Study. As will be noted, we have serious concerns with the method and conclusion of the SAGES Study. We have also included as Attachment 1 some comments and concerns regarding the SAGES report prepared by Dr. Ronald Sass, Harry C. and Olga Keith Wiess, Professor of Natural Sciences, Emeritus, Rice University.

In our opinion, the major problem with the SAGES study is the statistical relationships between salinity and blue crab abundance. The conclusion reached in the SAGES study is contradicted by most of the literature on Blue Crabs and by an analysis of long term data collected in San Antonio Bay. The faulty conclusions likely arise from an inadequate understanding of life history requirements of the crabs and poor study design. The direct result of these flawed relationships is that the greater the freshwater inflow, the worse off the Blue Crabs and thus the less food for Whooping Cranes and the opposite that increased freshwater inflow is detrimental to Whooping Cranes. This finding is strongly contradicted by a review of recent and longer term responses of the Whooping Crane population to low flows.

Longley (1994) cites over a dozen studies (p. 187-188) and concluded that higher catch rates are observed from lower salinity areas. (p. 137) Specifically for San Antonio Bay he found that "juvenile blue crabs are generally most abundant in vegetated habitats in the lower and middle bay where salinities range from 6 to 25 ppt" Trawl samples show significantly higher catches both in areas with mean salinities of less than 20 ppt and in areas influenced by the Guadalupe River flow." (p. 151 -152) While the Longley report recognized that Blue Crabs utilize different salinity zones throughout their different life stages (an issue for which the SAGES study is silent) they also found that "adult males are found in low salinity waters, where

salinities are less than 10 ppt, while females move to these lower salinity areas to mate and return to higher salinity areas afterward." (p 174)

The most recent freshwater inflow study conducted in San Antonio Bay (Pulich et al 1998) analyzed TPWD fisheries independent monitoring data and found the preferred salinity zone for Blue Crab to be between 5-20 ppt. This range is consistent with the more recent Matagorda Bay Health Evaluation (BioWest 2008) which reported similar ranges as optimal for Blue Crab. This finding is further supported in the Gulf State Regional Management Plan for the Blue Crab Fishery (Guillory et al 2003) which reported summaries for other studies that report similar preferences for lower and mid range salinities (p. 3-5)

The SAGES study cites a single laboratory study evaluating the effect of salinity on juvenile blue crab growth (Cadmen and Weinstein 1988). According to the authors of the SAGES report, one of the findings in Cadmen and Weinstein is that for "salinities below 27 ppt, blue crabs incur increasing high metabolic demands and osmoregulatory stress with decreasing salinity." Notably the abstract for that paper states that optimal growth occurs at 23 ppt though this finding is not presented in the SAGES report. This study also finds that crabs do most poorly at low salinity and high temperature though the authors of SAGES do not cite any other quantitative findings from Cadmen and Weinstein to specify at what low salinity levels these deleterious effects are manifested nor whether similar harmful effects occur at higher salinities.. While most studies on Blue Crabs and salinity acknowledge that very low salinities (< 1.0PPT in Holland et al 1971 cited in Longley, 1994) are detrimental to Blue Crab none that we've reviewed suggest that Blue Crabs only benefit from saltier conditions as is presented in the SAGES report.

So where did the SAGES report go wrong? It would be difficult to say without carefully reviewing their data, however here are a few ideas. First they do not acknowledge and therefore do not refute the long list of studies which result in relationships that contradict the one present in the SAGES report. While they include Guillory 2003 in their references, they don't mention any of the studies that he cites that suggest lower optimal salinity ranges. This leads us to suggest that they did not do a very thorough review of the literature. To completely ignore such an obviously controversial issue is perplexing.

It appears to us that life stage is an important factor in understanding the effect of salinity. One theme that seems common is the younger and smaller crabs may have a greater affinity to higher salinities. This is obviously true of the larval stages since they spawn off shore as high salinities are required for early life stages. The SAGES report acknowledges that the samples used to develop the regressions were smaller sub-adults as opposed to the sizes that Whooping Cranes eat, but they suggest that these sub-adults provide a good estimate of recruitment into the size classes consumed by cranes. An alternative hypothesis might be that these higher salinities might lead to lower recruitment into the larger class than would be achieved by salinities reflective of more accepted description of adult blue crab salinity preferences.

The main problem with this study has to do with design. Although samples were taken monthly, only about two and one half years worth of data where collected. In the second year, inflows were very low and salinities much higher than normal. The highest densities were observed in the fall of 2006 during the period of highest salinities, which leads to the conclusion that higher salinities lead to more blue crabs. This two years worth of data really represents only two data points corresponding to two seasons during which crabs migrated into the bay. This is insufficient to develop the regressions presented in this study and overturn without even acknowledging the overwhelming contradictory finding of most other studiues. Data for the periods when most crabs are off shore spawning and drifting in as juveniles are not particularly relevant to this analysis.

Other issues

The inflow salinity regressions would probably be improved by the inclusion of an antecedent flow term. After conducting the first inflow study on San Antonio Bay (Pulich 1998) the state agencies recognized this and included a term to account for inflows in the days 30-60 prior to the current day for the inflow studies on all of the other major bays in Texas. An antecedent salinity term would be even better. The "noise" about the regression equation covers about 10 ppt and thus simulated salinities do not do as good a job of predicting salinity as they could. Use of the existing salinity model for San Antonio Bay perhaps recalibrated and validated using some of the data collected in the present study would be even better.

The salinity regressions fall apart at flows less than about 600 cfs. At low flows they predict salinities that were deemed by the project team as unreasonably high and thus salinities are always cut off at 30 ppt if they predict higher than that. Sustained flows less than 600 cfs are rare in San Antonio Bay however the regressions are not useful predictors for droughts or potential future low flow scenarios predicted to result from increased diversions.

The study acknowledges that they were unable to develop a complete understanding or connectivity between the bay and the marsh and instead simply note that there is a correlation between salinities in the two areas. This is unfortunate and it would seem that a more carefully designed study could have made more progress on this critical issue.

It is unclear why the analysis focused on smaller sub-adult crabs in the marsh. It is possible that the larger adults had selected more desirable (lower) salinity conditions for mating especially in 2006 and thus insufficient numbers were collected to develop relationships for this age class.

Although not a prominent discussion in the written report, much was made of the ability of Whooping Cranes to switch from Blue Crabs to Clams or other sources when crabs are scarce. While this may happen it is not clear that these alternatives will provide satisfactory nutrition.

As a final note we mention that we have not had time to give the energy budget analysis the attention it needs but at the very least it is woefully simplistic and begs for a careful evaluation.

Thank you for the opportunity to present these comments on this very important issue.

Sincerely,

BLACKBURN CARTER, P.C.

by _____
James B. Blackburn, Jr.

Attachment

REFERENCES

BIO-WEST. 2007. Final Report Matagorda Bay Health Evaluation Habitat Assessment. Technical report prepared for the Lower Colorado River Authority and San Antonio Water System.

Cadman, L. R. and M. P. Weinstein. 1988. Effects of temperature and salinity on the growth of laboratory-reared juvenile blue crabs Callinectes sapidus Rathbun. Journal of Experimental Marine Biology and Ecology 121:193-207.

Guillory, V., H. Perry, P. Steele, T. Wagner, W. Keithly, B. Pellegrin, J. Peterson, T. Floyd, B. Buckson, L. Hartman, E. Holder, and C. Moss. 2001. The blue crab fishery of the Gulf of Mexico, United States: A regional management plan. Gulf States Marine Fisheries Commission. Ocean Springs, MS.

Longley, W.L. 1994. Freshwater inflows to Texas bays and estuaries: ecological relationships and methods for determination of needs. Texas Water Development Board and Texas Parks and Wildlife Department, Austin. 386 pp. Matsumoto, J., 1992. Users Manual for The Texas Water Development Board's Circulation and Salinity Model: TxBLEND. Texas Water Development Board.

Pulich, Jr., W., W.Y. Lee, C. Loeffler, P. Eldridge, J. Hinson, M. Minto, and D. German. 1998. Freshwater inflow recommendation for the Guadalupe Estuary of Texas. Coastal Studies Technical Report No. 98-1. Texas Parks and Wildlife, Austin, Tx. 100pp.