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Charles (Pete) Peterson (*Chair*), University of North Carolina, Morehead City
Committee on Best Practices for Shellfish Mariculture and the Effects of Commercial Activities in Drakes Estero, Pt. Reyes National Seashore, California

RE: National Academy of Sciences Report on Shellfish Mariculture in Drakes Estero

Dear Dr. Peterson:

I would like to comment on the prepublication copy of the National Academy of Science's (NAS) Report on Shellfish Mariculture in Drakes Estero, Point Reyes National Seashore. In particular, I am responding to the interpretation of my work on the effects of mariculture on shorebirds in the nearby estuary of Tomales Bay (Kelly et al. 1996). The NAS report accurately represented results from our study but apparently ignored or underrated the conclusion of the paper, that the data revealed "a net decrease in overall shorebird use of open tidal flats developed for aquaculture."

The NAS report (Section VII-D on Birds, page 45) conveyed correctly the following results from our work:

> Two of the most abundant shorebirds, dunlin and western sandpipers, demonstrated significant avoidance of mariculture plots. One shorebird, the willet, exhibited significant attraction to mariculture plots, and four others (black-bellied plover, marbled godwit, sanderling, and least sandpiper) did not vary in abundance as a function of the presence of culture bags…
> …Consequently, only the obligate probers are likely to be negatively affected by mariculture on intertidal flats in Drakes Estero, while most species remain unaffected and some that forage visually on surface prey may benefit from invertebrates associated with culture bags and epibiotic growth on the bags and oysters.

However, the NAS report failed to acknowledge important quantitative results indicating a significant net decline in overall shorebird use. Differences measured in the study suggested that the avoidance of mariculture plots by dunlins and western sandpipers substantially outweighed the selection of mariculture areas by willets—in terms of both absolute numbers and proportional abundances scaled to baywide wintering population sizes. By excluding these comparisons, the report appears to imply incorrectly that significant reductions in shorebird use were compensated for by the expected result that some shorebirds forage in mariculture areas.

The SUMMARY section of NAS report (page 4) also indicated correctly:

> The oyster farm likely has some impacts on birds caused by culture bags lying on intertidal sand flats, which limit access to and availability of soft-sediment invertebrate prey. Other shorebirds may

> benefit from enhanced foraging on small crustaceans and other invertebrates growing on and around intertidal bags and other mariculture structures.

However, as in the body of the NAS report, the SUMMARY statements above did not account for the differential effects of species' avoidance vs. selection on overall shorebird abundances in our study and, as a result, excluded evidence of significant overall avoidance of mariculture areas.

Following the explanations cited above, the Scientific Conclusions in the NAS report regarding shorebird use (page 52) were limited to the following text:

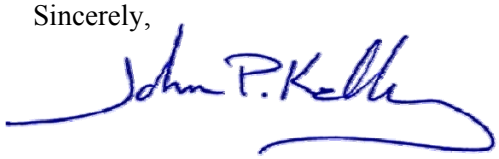
> … the presence of lines of oyster bags on the intertidal flats is likely to diminish the feeding area for some probing shorebirds, while enhancing food supplies for other shorebirds willing to consume epibiotic amphipods and other invertebrates associated with algal growth on mariculture bags.

Although literally correct, the conclusion above appears to imply that enhanced foraging opportunities for some shorebirds are likely to compensate for the adverse effects of mariculture on other shorebirds. This implication contrasts with the evidence provided by our study on Tomales Bay, which revealed a net decrease in total shorebird use in areas used for mariculture. The relevance of our results is strengthened by strong similarities in the relative abundances of shorebird species in Tomales Bay and Drakes Estero (Page et al. 1992, report by PRBO Conservation Science).

Although the NAS report correctly pointed out a lack of evidence regarding population effects on shorebirds (SUMMARY, page 6), it did not clearly acknowledge the importance of habitat protection as a basis for shorebird management. Strong consideration for the effects of mariculture on species' habitat values is appropriate and consistent with a precautionary approach to management—even if population effects are unknown. The U.S. Shorebird Conservation Plan emphasizes three major goals at different spatial scales for developing effective management practices. Goals for maintaining shorebird populations are considered at national and hemispheric scales. At the regional scale, the primary conservation goal is to identify and maintain adequate quantity and quality of habitat to support shorebirds that breed, winter in, and migrate through each region. Accordingly, evidence of significant effects on shorebird use of habitat areas should be acknowledged as an important basis for addressing regional shorebird conservation goals in Drakes Estero.

Thank you for this opportunity to comment

Sincerely,



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