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The Attraction vs. Production Debate: Does it Really Matter from the Management Perspective? A Response to the Commentary by Shipp, R.L., 1999, *Gulf of Mexico Science* XVII, 51-55

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COMMENTARY

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THE ATTRACTION VS. PRODUCTION DEBATE: DOES IT REALLY MATTER FROM THE MANAGEMENT PERSPECTIVE? A RESPONSE TO THE COMMENTARY BY SHIPP, R. L., 1999, *GULF OF MEXICO SCIENCE* XVII: 51–55.

Impetus for a response to the aforementioned Commentary began while the first author attended the 7th International Conference on Artificial Reefs and Related Aquatic Habitats (CARAH) in San Remo, Italy, in October 1999. During this conference, two compelling truths about artificial reefs (ARs) emerged from the various presentations: 1) worldwide, most of the funds expended (>90%) on ARs have been devoted to construction, with precious little money going to research on ecosystem function; and 2) the attraction vs. production debate rages on, with little or no consensus about whether ARs simply aggregate fish or actually contribute to the production of new fish biomass (but see Grossman et al., 1997; Bortone, 1998). Although it is beyond the scope of this Commentary to attempt to settle the debate, we were alarmed by the suggestion that its resolution may not be important from a management perspective, especially given the implications of the first truth above. Thus, our intent here is to encourage managers who are considering the use of ARs as a management tool to acknowledge the current primitive level of understanding about the role of ARs in ecosystem dynamics (but see Pickering and Whitemarsh, 1997; Steimle and Meier, 1997; Bortone, 1998) and not to be lured only by the prospects of improving regional fishing opportunities. To illustrate our concerns, we offer a different interpretation of the Alabama shelf case study presented in *Gulf of Mexico Science* XVII:51–55.

The Alabama shelf case study: An alternative interpretation.—Interpretation of data as presented in the case study (Shipp, 1999) lead the author to argue that placement of artificial reefs in shelf habitats where hard bottom is limited, such as found in the north-central Gulf of Mexico (Gulf), resulted in a fundamental transformation of habitat leading to a fundamental change in biota. On the Alabama shelf, placement of ARs displaced a fish fauna dominated by small benthic species with larger reef related forms, thus vastly improving fishing opportunities for Alabama citizens (Minton and Heath, 1998). Based upon this improvement in fishing, it was further argued that while this change (in habitat) may or may not result in a net change in fish biomass (or biomass production), does it really matter from the management perspective?

We suggest that the answer to this question is a resonant yes! By the author's admission, placement of ARs on the Alabama shelf led to a fundamental change in habitat that resulted in the displacement of small benthic fishes. Examination of table 1 in Shipp (1999) reveals that 66% to 87% of the specimens caught in trawls prior to deployment of the ARs were juveniles. Some of these were juveniles of reef species that later, after AR deployment, were harvested from the area as adults of exploitable size. Thus, it appears that the fundamental transformation of habitat occurred at the expense of a region on the shelf that provided a nursery function to many species of fishes. In short, nursery habitat was traded for adult habitat, complete with a rich set of predators, without consideration of the ecosystem consequences of the tradeoff. Many species of reef fishes have evolved a life history strategy such that juveniles have very different habitat requirements than adults; it is often unclear where in the life history of these species that limits to year class success are imposed.

Red snapper: A case in point.—As a case in point, red snapper *Lutjanus campechanus,* is one such species. Juvenile (age 0 and age 1) red snapper occur most frequently on flat, sandy and muddy bottoms in the northern Gulf and thus are vulnerable to capture as bycatch in trawl fisheries. It is believed by fishery scientists (Goodyear, 1995) that limits to snapper year class success are imposed during the juvenile life stage, as a consequence of both high natural and anthropogenic (bycatch) mortality rates. There is no empirical evidence that the availability of hard bottom (natural reefs) currently limits, or has ever limited, the stock size of red snapper in the northern Gulf. Rather, as Shipp (1999) pointed out, Mobile has long been (since the late 1800s to early 1900s) a major port of landing for commercially caught red snapper. Moreover, the red snapper now occupies only a fraction of its former range in the Gulf due to a dramatic reduction in population levels (Goodyear, 1995). Thus, we are uncertain whether ARs in the northern Gulf off Alabama

are benefiting red snapper, even though they clearly are benefiting Alabama's fishers. In fact, if Alabama's reefs are only attracting fish, one could argue these reefs may be increasing the vulnerability of adult red snapper to fishing pressure while at the same time diminishing the nursery capacity of natural habitat for red snapper juveniles in a 1,200 square mile area. Although we do not have data in support of such an extreme view, we also cannot refute it. All we really know is that fishing has improved, we suspect at least partially in response to strict regulations of harvest and recent evidence of some stock recovery (Schirrippa, 1998). We do suggest, however, that large scale deployments of ARs can result in large-scale modification of ecosystem function, with effects both good and bad depending on specifics of critical habitat requirements and recruitment bottlenecks. Research is underway in our laboratory to address questions relevant to this argument.

The responsibility of management.—Large-scale management actions in the absence of knowledge about effects on biological conservation are contrary to a risk-adverse approach and are generally not accredited in the management arena. However, the rate of deployment of ARs is increasing in the United States and worldwide, yet there is little known about the attraction vs. production capacity of ARs in the environments in which they are deployed, nor are many being deployed as "no-take" refuges from fishing pressure. Moreover, based upon presentations at the 7th CARAH, the reasons for deployment most often stated are a means to enhance fishing opportunity and only secondarily as a conservation measure. We suggest that this attitude towards ARs is not only counterintuitive from a conservation standpoint, but contrary to the United States' National Standards of Federal Fisheries Management (Magnuson-Stevens Act Section 301(a) (16 U.S.C. 1851(a))), which places biological conservation in higher priority than socioeconomic matters.

It is not our intent to give the impression that ARs are all bad nor to discourage their use as management tools where appropriate. Rather, we wish to *encourage* managers to consider the types of biological tradeoffs that we described above when contemplating any large scale habitat modification and to suggest the need for comprehensive, integrative research about the role of ARs in ecosystem function before wholesale deployment occurs. There is much we do not know. Let us not put the cart before the horse.

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