

A comment on fishing effort allocation in the Turks and Caicos Islands

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Introduction

Marine ecosystem-based management is gaining acceptance as a management paradigm and will be especially important for multi-species artisanal fisheries where fishers use multiple gear types, move rapidly between sites and may switch target species on an intra-day basis. Understanding fisher incentives and behavior is crucial if we are to understand how various policy tools can simultaneously address critical conservation and economic development objectives in tropical island nations.

Béné and Tewfik (2001) recently analyzed the fishing effort allocation between queen conch and spiny lobster fishery for artisanal fishers in the South Caicos region of the Turks and Caicos Islands (TCI). South Caicos is the primary commercial fishing area, accounting for 60% of TCI lobster landings in 1998 (Halls et al., 1999). In their attempt to identify factors that affect switching behavior between the two export-oriented species, Béné and Tewfik found that fishers allocated more effort to fishing lobster than would be expected based on strictly bioeconomic rationale. Based on their analysis (Figure 8), they assert that “when the lobster fishery stops being more attractive than the conch fishery (on the basis of the bioeconomic indicator $RPUE_{ij}$), the TCI fishermen still allocate more than 63% of their fishing effort on lobster” (p. 176). They point out that lobster fishing requires higher skill relative to conch fishing and state that peer pressure “reinforces and extends their preferences for lobster beyond the incentives induced by the bioeconomic (i.e., RPUE) condition of the two stocks” (p. 178-179). By extension, the authors further postulate that switching from lobster to conch fishing causes a ‘statutory’ loss: “By switching to a more labor intensive, less skilled, less remunerative, and above all else less socially valued species, these fishermen have lost part of their social status in the eyes of the community” (Béné and Tewfik, 2001: 182).

Even though Béné and Tewfik claim to use an integrated, holistic approach in their analysis, they neglected to consider the domestic fishery for reef fishes. This crucial domestic fishery for

groupers, snappers, grunts, hogfish and other reef fish species is used for subsistence purposes and provides an important source of income for fishers who sell their landings directly to restaurants throughout the TCI. Consideration of this component of the multi-species TCI fishery is essential for a holistic understanding of the fishers' behavior, fisheries management and policy options for conserving valuable high profile reef species like the Nassau grouper (Rudd and Tupper, 2002).

Reef Fish Occurrence and Use

Important commercial reef fish tend to occur in the same patch reef and shelf edge habitats in which lobsters are found (Tupper, in press; Tupper and Rudd, 2002). Queen conch, on the other hand, are found primarily in sand/algal plains that provide unsuitable habitat for adult reef fishes (Tupper, in press). Reef fishes are commonly speared opportunistically by lobster fishers (Tupper and Rudd, 2002) and most landings are 'bycatch' of the lobster fishery. Trap boats play a minor role in the TCI, accounting for only 5-10% of lobster landings (Medley and Ninnes, 1997) and minor reef fish landings (M. Tupper, University of Guam Marine Laboratory, personal communication). Like lobster, the mean size of several of the most important reef fishes tends to increase with depth (Tupper, in press). Thus, skilled lobster divers who can free dive to 15 meters or more are most likely to encounter large, valuable reef fishes such as Nassau grouper. Because the marginal costs associated with harvesting reef fish is low for lobster fishers (essentially zero), economic theory suggests that we should observe relatively heavy landings of reef fish.

Conch and lobster are delivered to one of six export-oriented processing plants in the TCI. There has been a consistent discrepancy of about 50 to 100 tonnes between landed and exported lobster volume going back to the 1970s (Olsen, 1986), indicating that some frozen lobster is sold in domestic markets via the processing plant. Almost all reef fish landings, on the other hand, are sold by fishers directly to restaurants (Halls et al., 1999; Rudd, in press a) or distributed to

families or friends for subsistence (M. Tupper, University of Guam Marine Laboratory, personal communication). Therefore, most lobster and conch landings will tend to be recorded in government statistics, whereas reef fish landings are not recorded at all.

How important is the reef fish harvest for lobster divers? This question can be approached from both the supply and the demand sides. On the supply side, a dockside monitoring program (Tupper and Rudd, 2002) found CPUE of 3.2 kg/hour/fisher for reef fishes landed by lobster fishing boats operating in fished areas (n = 133 fisher interviews totaling 456 hours fishing effort). Assuming six hours per day fishing effort, this equates to 19 kg/fisher/day of reef fish landings. In lightly fished areas (the eastern shores of South and East Caicos), CPUE for reef fishes rose to 17.8 kg/hour (n = 28 fisher interviews totaling 98 hours fishing effort), although this figure was skewed upwards by some fishing trips that specifically targeted large groupers.

On the demand side, Olsen (1986) used per capita consumption figures (35 kg fish/person/year) to estimate annual domestic TCI fish consumption in excess of 310 tonnes. More recently, a restaurant survey (Rudd, in press a) estimated annual domestic restaurant consumption of local reef fishes to be 96 tonnes. Estimates of total domestic consumption of reef fish, based on a conservative per capital consumption rate (15 kg fish/person/year), are 230 and 338 tonnes for 1991 and 2001, respectively (Rudd, in press b).

Overall fishing effort has not changed substantially over the last decade, staying roughly in the 13,000 to 15,000 person-day range (see Béné and Tewfik, 2001 for a chart of monthly effort). If 300 tonnes of reef fish were landed annually by lobster fishers, this implies mean landings of approximately 21 kg/day, a figure that coincides closely with demand-side landing surveys from regularly fished commercial fishing grounds.

Reef Fish Value and Revenue

Reef fish has historically been intermediate in value between conch and lobster, around US \$2.20 per kg over much of the last decade (see price chart for conch and lobster in Béné and Tewfik, 2001). More recently, reef fish has been fetching around \$3.25 per kg although fishers may earn up to \$15.00 per kg selling directly to restaurants on the tourist island of Providenciales (Rudd, in press a). Increasing numbers of South Caicos fishers are willing to make the 60-km trip when they land numerous large fish (Rudd and Tupper, 2002). Seafood used locally for subsistence is a substitute for expensive imported protein sources.

Accounting for reef fish revenue would shift the curve in Figure 8 of Béné and Tewfik, (2001) to the right. Increases of revenue of around US \$44 per day (based on 20 kg/day at US \$2.20 per kg) for lobster fishers would, in fact, shift the curve so that the intercept is close to zero (Figure 1). This implies that (1) the *combined* returns of reef fish and lobsters has made lobster fishing relatively more profitable than conch fishing for all years, 1989 to 1997, and (2) fishers effort allocation to conch and lobster fishing, contrary to Béné and Tewfik's conclusion, appears to be made in an economically consistent manner.

<< insert Figure 1 about here >>

Conclusions

Béné and Tewfik, (2001) provide useful background on the TCI fishery and some of the factors that influence fisher behavior. An important conclusion of their research – that lobster fishing is preferred over conch fishing because of peer pressure and community norms – does not, however, follow when all components of the multi-species artisanal fishery are considered. There is no doubt that social structure and norms play an important role in economic efficiency (Rudd, in press c), but to downplay the crucial role that economic factors play in artisanal fisher decision making can lead to faulty policy recommendations and could potentially jeopardize efforts to

conserve important reef species and habitats. Like terrestrial farmers and forest users in developing countries, the decisions of artisanal fishers tend to be uncompromisingly economic in nature when all factors – information availability, risk preferences, and wealth (or lack thereof) – are considered. Fishers in the TCI tend to be marginalized ethnically or socially, and the fishery acts as the *de facto* social safety net. In circumstances such as these, fishers tend to be highly cognizant of risk and rewards even if the dockside banter centers on diving skill. Artisanal fishers' economic decision-making capacity should not be underestimated.

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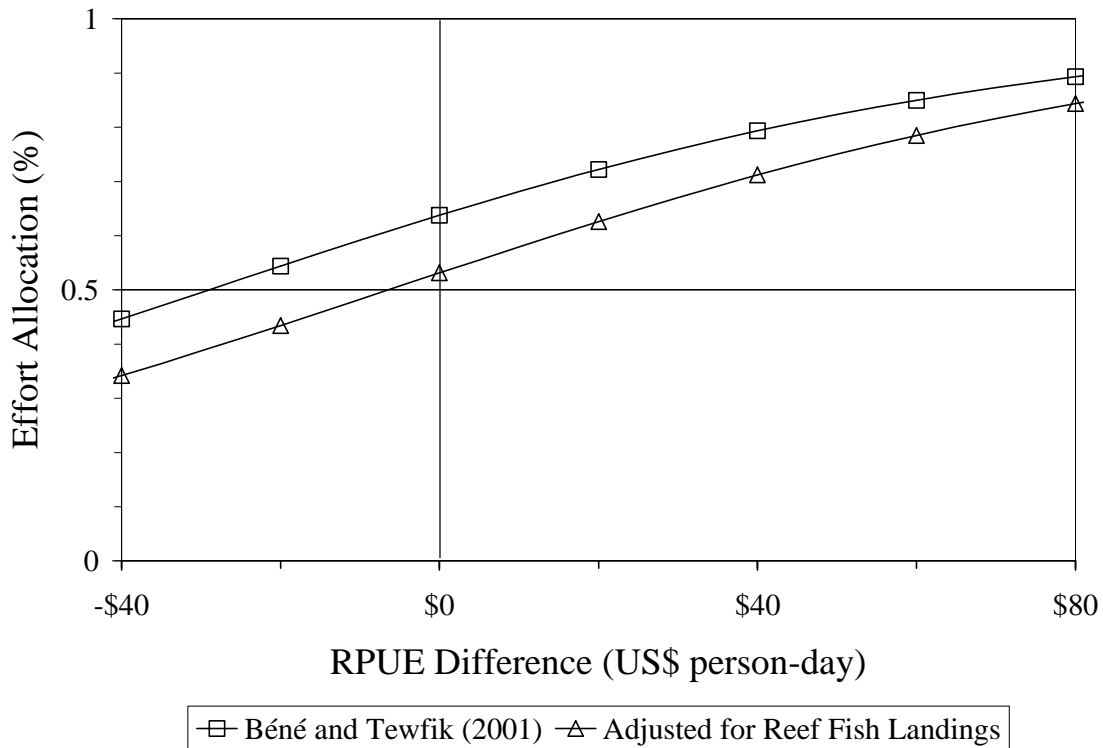


Figure 1. Distribution of TCI fisher effort between conch and lobster stocks (Y-axis) as a function of Revenue per Unit Effort (RPUE) difference ($RPUE_{\text{lobster}} - RPUE_{\text{conch}}$). The Béné and Tewfik (2001) curve is based on their regression results, $Y = 0.0195x + 0.566$, where effort allocated to lobster fishing, y , was transformed using $Y = \ln(y/(1-y))$. The curve for the adjusted lobster fishing allocation when reef fish landings are considered is given by $Y = 0.0195x + (0.566 - 0.44)$, where 0.44 shifts the curve by the estimated average value (US \$44) of reef fish landings per person-day. In Béné and Tewfik (2001), the intercept was calculated as 63.8% (fishers allocate 63.8% of annual effort to lobster diving when there is zero difference between conch and lobster RPUE). When adjusted for reef fish landings, the intercept is 53.1%.