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The Minimum Sizes of Fish Sanctuaries and Fishing Effort Reductions Needed to Achieve Sustainable Coastal Fisheries in Calauag and Tayabas Bays

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The impact of the sizes of fish sanctuaries and fishing effort reductions (i.e., number of fishers and fishing days per year) and various combinations thereof on projected catch per fisher were assessed for Calauag and Tayabas Bays. This study explored the likely impact and viability of the options available to fishery managers to sustain coastal fisheries in these bays. Using recent data from the Fisheries Resource Management Program and an updated, bay-level version of the steady-state model FISH-BE (Fisheries Information for Sustainable Harvests-BioEconomic), thousands of individual model runs were made and reduced to fishing capacity charts, which are introduced here as graphical guide for managers to allow them to examine the consequences of various scenarios.

Results showed that both bays are still overfished. FISH-BE estimates revealed only around 1,100 of the 1,500 municipal fishers in Calauag Bay can be supported sustainably over the long term (i.e., >5 yr) under current conditions. Tayabas Bay's fisheries are in a more critical state because it has six times more fishers but the bay is only three times larger in area than Calauag Bay. FISH-BE simulations showed only 2,800 of about 9,500 municipal fishers in Tayabas Bay could be supported sustainably over the long term. If all 1,500 fishers are to be supported, at least 20% (150 km^2) of Calauag Bay should be set aside as no-take sanctuaries. For Tayabas Bay, if the number of municipal fishers is not reduced, no-take fish sanctuaries totaling at least 55% of the bay's waters (or 1,385 km^2) need to be set up. Fisheries management in these bays clearly requires a combination of measures which are outlined in this report.

Key Words: fish sanctuaries, fisheries management, FISH-BE (Fisheries Information for Sustainable Harvests-Bio-Economic)

Abbreviations: FISH-BE – Fisheries Information for Sustainable Harvests-BioEconomic model, MARXAN – **MAR**ine SPE**XAN** (**SP**atially **EX**plicit **An**nealing); software designed to aid systematic reserve design on conservation planning, MPA – marine protected area

INTRODUCTION

Marine protected areas (MPAs) have become the de facto tool for the management of coastal fisheries due to the relative ease of their implementation and presumed long-term benefits to both fisheries and biodiversity conservation. The use of MPAs as fish sanctuaries (no-take zones) is already recommended in the Philippine Fisheries Code (Republic Act 8550). Laws protecting large parts of the sea from fishing have been issued in many countries. For instance, the United States has recently established last June 2007 the largest MPA in the world at the NW Hawaiian Islands (NWHI) encompassing 362,000 km^2 and including the healthiest and least disturbed coral reefs in US jurisdiction (MPA News 2006). Most of this NWHI Marine National Monument will eventually be made up of no-take zones. As of July 2004, 115,000 km^2 or one-third of the 344,400 km^2 Great Barrier Reef Marine Park has been protected as no-take zones, setting up the then largest network of no-take areas in the world (MPA News 2004). In the latter effort, planners aimed to set aside as no-take 20% of each habitat type using a variety of geographic information system tools, including MARXAN (MPA News 2004).

No-take zones need not be large, just consistently managed, to have a significant impact on fisheries catch. This is perhaps best illustrated in two islands in central Philippines each with a small MPA but with a complex his-