

Monitoring landed seahorse catch in a changing policy environment

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Table S1. Size and year of establishment for Project Seahorse-facilitated marine reserves. We also indicate the management effectiveness rating of these marine reserves in 2007 and or 2009 based on the Coastal Conservation and Education Foundation (CCEF) rating system (White et al. 2006). This rating system uses 38 survey questions that assess enforcement, monitoring, local community participation, planning and economic viability of the MPA. According to this rating system, reserves are ranked as: (I) initiated and passing, (II) established and fair management, (III) enforced and good management, (IV) sustained and very good management, or (V) institutionalized and excellent management. Key informants indicate whether or not the protected area met specific management effectiveness criterion. Some of these reserves were assessed using a more general rating system and were ranked in 2011 as: (1) ‘Inactive’ marine reserves have not been managed, (2) ‘not processed’, indicating that it did not completely undergo the legal process of MPA establishment by approving a municipal ordinance, or (3) ‘ongoing’ indicating that the reserve is managed

Name	Year of establishment	Size (ha)	Management effectiveness rating
LIBAONG MARINE SANCTUARY (HANDUMON)	1996	50	2007/2009–V
PANDANON FISH REFUGE AND SANCTUARY	1996	20	Ongoing
CATABAN FISH SANCTUARY	1996	19.9	2007–IV; 2009–V
MAGTONGTONG	1996	18.8	Ongoing
BATASAN MARINE SANCTUARY	1999	19.5	2007/2009–V
BILANG-BILANGAN MARINE SANCTUARY	1999	10.51	2007–IV; 2009–III
MACAAS MARINE SANCTUARY	1999	12.7	Ongoing
PINAMGO MARINE SANCTUARY	1999	37.8	2007/2009–IV
ASINAN REEF FISH SANCTUARY	2000	50	2007/2009–V
LAJOG FISH SANCTUARY	2000	6	Inactive
NAHAWAN FISH SANCTUARY	2000	15.8	Inactive
U-OG SANCTUARY	2000	10.97	Not processed
JAGOLIAO FISH REFUGE AND MARINE SANCTUARY	2002	10.5	Inactive
JAGOLIAO SEA GRASS SANCTUARY	2002	20.6	Inactive
JANDAYAN NORTE MARINE SANCTUARY	2002	24.86	2007–V; 2009–IV

JANDAYAN SUR MARINE SANCTUARY	2002	4.7	2007–V; 2009–III
PANDANON (NEW)	2002	33.25	2009–III
HINGOTANAN EAST MARINE SANCTUARY	2002	13.5	Ongoing
ALUMAR MARINE SANCTUARY	2003	7.35	Not processed
MAHANAY MARINE SANCTUARY	2003	59	Not processed
BANTIGIAN MARINE SANCTUARY (Saguise)	2004	10.6	2007–III; 2009–IV
SIDLAKAN MARINE SANCTUARY (Saguise)	2004	21.43	2007–III; 2009–IV
SINANDIGAN MARINE SANCTUARY	2004	51	2007/2009–III
BANTIGUE ISLAND MARINE SANCTUARY	2005	8.56	Inactive
BILANG-BILANGAN EAST MARINE SANCTUARY	2005	44	2007–V
BUSALIAN MARINE PROTECTED AREA	2005	17	2007–I
GAUS MARINE SANCTUARY	2005	9.59	2009–II
UNION MPA	2005	7.6	Not processed
GUINDACPAN	2005	8	2009–IV
TUGAS MARINE SANCTUARY (A)	2006	8.32	2009–IV
LIPATA MPA	2008	10	Ongoing
MINANTAW	2008	215	Ongoing

Tables S2a–c. Model summaries

Table S2a. Summary of final generalised additive mixed-effects model on the number of fishers per day. We used the ‘varIdent’ variance structure that allowed for different residual spread varying amongst different months and sites for the number of fishers per day and amongst different years and sites for the number of seahorses caught per fisher per day. For this and all other models, year was fitted as a non-parametric cubic regression smoother and month was included as a random factor. We used restricted maximum likelihood (REML) estimates of variance components

Number of fishers per day	df	F	p
Smoother (Year)	1.6	3.2	0.04
Season	1	14.8	0.0002
Seahorse sold per fisher per day			
Smoother (Year)	2.0	57.8	<0.0001
Season	1	73.3	<0.0001
Site	1	45.4	<0.0001

Seahorses sold total per day^a			
Season	1	24.6	<0.0001
Site	1	73.4	<0.0001

^aSmoother for year was not statistically significant

Table S2b. Results of the general additive mixed-effects models for the height of seahorses. In all final models, we used the ‘varIdent’ variance structure that allowed for different residual spread varying amongst different years and sites

Average Height (cm)	df	F	p
Smooth (Year)	8.7	2877	<0.0001
Site	1	31.8	<0.0001
75th percentile (cm)			
Smooth (Year)	8.7	4503	<0.0001
Season	1	6.6	0.012
Site	1	250	<0.0001
25th percentile (cm)			
Smooth (Year)	8.4	588	<0.0001
Site	1	271	<0.0001

Table S2c. Results of the general additive mixed-effects models for the nominal price (Philippines Pesos cm⁻¹ of seahorse) of seahorses and the mean income generated per fisher per day from seahorses (Philippines Pesos fisher⁻¹ d⁻¹). The final models for seahorse price and daily income included a variance structure that allowed for different residuals spreads amongst years

Seahorse price (Pesos cm⁻¹)	df	F	p
Smooth (Year)	2.0	283	<0.0001
Season	1	29.8	<0.0001
Site	1	11.1	0.001
Daily income (Pesos fisher⁻¹)			
Smoother (Year)	2.0	67.4	<0.0001
Season	1	7.1	0.009
Site	1	113	<0.0001

LITERATURE CITED

White AT, Alino PM, Meneses AT (2006) Creating and managing marine protected areas in the Philippines. Fisheries improved for Sustainable Harvest Project, Coastal Conservation and Education Foundation and University of the Philippines Marine Science Institute, Cebu City