Avoiding tradeoffs between global seafood production and seafloor impacts through fishery innovation

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Supplemental Methods

Standardizing recovery rates

Recovery of seafloor habitats was parameterized as the time to recover from 5% to 95% (τ^*) following an asymptotic recovery trajectory. Three benthic recovery meta-analyses [1–3] were used parameterize τ^* for soft, hard, and rocky reef seafloor habitat types. However, each of these analyses employed different recovery trajectories in their estimation of recovery. Grabowski et *al*.[2] reported the mean time to recovery ($\bar{\tau}$); Hiddink et *al*.[1] estimated an intrinsic growth rate, r, of a logistic recovery curve; and Graham et *al.*[3] reported the yearly proportional recovery, C_{rp}, along a linear recovery path, equivalent to the slope of the recovery line. In order to standardize recovery rates across these analyses, we calculated τ^* from each of the respective recovery functions. In the following equations we set $H_0 = 0.05$ and $H_1 = 0.95$, representing recovery from 5% to 95%.

The Hiddink et *al*. r parameter was converted as:

$$\tau^* = -\frac{1}{r}\log\left(\frac{\frac{1}{H_1}-1}{\frac{1}{H_0}-1}\right) \quad \text{(S.1)}$$

The Graham et *al*. t parameter was converted as:

$$\tau^* = \frac{H_1 - H_0}{C_{rp}} \quad \text{(S.2)}$$

The Grabowski et *al*. $\bar{\tau}$ parameter was converted to recovery parameter $\bar{\tau}$ then calculated from τ^* as follows:

$$\tau^* = \tau[\log(1-H_0) - \log(1-H_1)] \quad \text{(S.3)}$$

Habitat type	Source	Reported value	Description of value	τ^* equivalent (years to recover from 5% to 95%)
Soft substrate	Hiddink et al.	$r = 0.82$	Recovery to pre-trawl biomass	7.2
		$r = 1.05$	Recovery to pre-trawl abundance from otter trawls	5.6
		$r = 4.49$	Recovery to pre-trawl abundance from beam trawls	1.3
	Grabowski et al.	$\bar{\tau} = 3.25$	High energy mud habitats	9.6
		$\bar{\tau} = 3.13$	High energy sand habitats	9.2
		$\bar{\tau} = 3.00$	High energy granule/pebble habitats	8.8
		$\bar{\tau} = 3.29$	Low energy mud habitats	9.7
		$\bar{\tau} = 3.17$	Low energy sand habitats	9.3
		$\bar{\tau} = 3.14$	Low energy granule/pebble habitats	9.3
Hard substrate	Grabowski et al.	$\bar{\tau} = 2.95$	High energy cobble habitats	8.69
		$\bar{\tau} = 2.91$	High energy boulder habitats	8.57
		$\bar{\tau} = 3.10$	Low energy cobble habitats	9.13
		$\bar{\tau} = 3.06$	Low energy boulder habitats	9.01
Rocky reef	Graham et al.	$C_{rp} = 0.0356$		25.28

Table S1. Reported recovery times from meta-analyses