APPENDIX A:

Calculation of fishing efforts of fleet F (open access) and fleet I (illegal) in the classical bio-economic equilibrium. The profit equation of the fleets is made equal to 0. The aim is to find the value of the fishing effort $E_{j,t}$ for this equality.

Fleet F:

$$\pi_{F,t} = pqE_{F,t}X_{F,t} - cE_{F,t}^{\beta}$$

$$\pi_{F,t} = 0 \quad \Leftrightarrow \quad pqE_{F,t}X_{F,t} - cE_{F,t}^{\beta} = 0$$

$$\frac{pqE_{F,t}X_{F,t}}{c} = E_{F,t}^{\beta}$$

$$\frac{pqX_{F,t}}{c} = \frac{E_{F,t}^{\beta}}{E_{F,t}}$$

$$ln\left[\frac{pqX_{F,t}}{c}\right] = ln\left[\frac{E_{F,t}^{\beta}}{E_{F,t}}\right]$$

$\ln\left[\frac{a}{b}\right] = \ln(a) - \ln(b)$ →

$$ln\left[\frac{pqX_{F,t}}{c}\right] = ln\left(E_{F,t}^{\beta}\right) - ln\left(E_{F,t}\right)$$

$\ln(a^n) = n\ln(a)$ →

$$ln\left[\frac{pqX_{F,t}}{c}\right] = \beta ln\left(E_{F,t}\right) - ln\left(E_{F,t}\right)$$

$$ln\left[\frac{pqX_{F,t}}{c}\right] = ln\left(E_{F,t}\right)[\beta - 1]$$

$$\frac{ln\left[\frac{pqX_{F,t}}{c}\right]}{[\beta - 1]} = ln\left(E_{F,t}\right)$$

$$e^{\frac{ln\left[\frac{pqX_{F,t}}{c}\right]}{[\beta - 1]}} = E_{F,t} \quad \leftarrow \quad e^{ln(x)} = x$$

$$e^{ln\left[\frac{pqX_{F,t}}{c}\right] * \frac{1}{(\beta-1)}} = E_{F,t}$$

$$\boxed{\left[\frac{pqX_{F,t}}{c}\right]^{\left(\frac{1}{(\beta-1)}\right)} = E_{F,t}} \quad \leftarrow \quad e^{ab} = (e^a)^b$$

$$e^{\ln(x)} = x$$

APPENDIX B:

Fleet I:

$$\pi_{I,t} = pqE_{I,t}(X_{M,t} - H_{L,t}) - cE_{I,t}^{\beta} - \theta\phi E_{I,t}$$

$$\pi_{F,t} = 0 \quad \Leftrightarrow \quad pqE_{I,t}(X_{M,t} - H_{L,t}) - cE_{I,t}^{\beta} - \theta\phi E_{I,t} = 0$$

$$pq(X_{M,t} - H_{L,t}) = \frac{cE_{I,t}^{\beta} + \theta\phi E_{I,t}}{E_{I,t}}$$

$$pq(X_{M,t} - H_{L,t}) = \frac{cE_{I,t}^{\beta}}{E_{I,t}} + \theta\phi$$

$$ln\left[\frac{pq(X_{M,t} - H_{L,t}) - \theta\phi}{c}\right] = ln\left[\frac{cE_{I,t}^{\beta}}{E_{I,t}}\right]$$

$\ln\left[\frac{a}{b}\right] = \ln(a) - \ln(b)$ → $ln\left[\frac{pq(X_{M,t} - H_{L,t}) - \theta\phi}{c}\right] = \beta ln(E_{I,t}) - ln(E_{I,t})$

$\ln(a^n) = n\ln(a)$

$$ln\left[\frac{pq(X_{M,t} - H_{L,t}) - \theta\phi}{c}\right] = ln(E_{I,t})(\beta - 1)$$

$$e^{\frac{ln\left[\frac{pq(X_{M,t} - H_{L,t}) - \theta\phi}{c}\right]}{(\beta - 1)}} = E_{I,t} \quad \leftarrow \quad e^{ln(x)} = x$$

$$\left[\frac{pq(X_{M,t} - H_{L,t}) - \theta\phi}{c}\right]^{\left(\frac{1}{\beta - 1}\right)} = E_{I,t} \quad \leftarrow \quad e^{ab} = (e^a)^b$$

$e^{\ln(x)} = x$

APPENDIX C: *Model default parameters*

PARAMETERS	DESCRIPTION	VALUE	SOURCE or Estimation
r	Intrinsic growth rate	0.57	Millage et al., 2021
K	Carrying capacity (tons)	6,876,526	Millage et al., 2021
X_0	Initial biomass (tons)	5,501,221	Estimated as 0.8*K
s	Size of MPA as a proportion of the total system	0.5	---
p	Price (US $/ton)	1,100	Millage et al., 2021
p_L	Price of the ecolabelled fish	2,090	Estimated at 1.9*p
q	Catchability	2^e-5	Millage et al., 2021
c	Variable cost of harvesting (US $)	3,000	Millage et al., 2021
β	Cost coefficient	1.3	Millage et al., 2021
α	Variable cost of enforcement (US $)	5,000	Approximate average cost per vessel day for fishery protection vessels in the Falkland Islands
ϕ	Fine (US $)	1,095,000	Estimated as 365*c
χ	Access fee (US $)	1,500	Estimated as 0.5*c
μ_L, μ_{FPA}	Enforcement-detection scalar	5^e-4 5^e-6	---
o	Parameter describing the relationship between EFAC access fees and fishers' revenues	0.5	---
$d_{MPA,\ MPA}$, $d_{F,F}$	Self-recruitment to the managed and fishing areas	0.7	Millage et al., 2021
$d_{F,\ MPA}$, $d_{MPA,\ F}$	External recruitment to the managed and fishing areas	0.3	Millage et al., 2021

***APPENDIX D**: Sensitivity analyses conducted for various values of the following parameters: Self-recruitment (A, B), Ecolabelled fish price (C, D), EFAC access fee (E, F) and Enforcement costs (G, H). Total population equilibrium relative to carrying capacity (X/K) (A, C, E, G) and total fishery profit (B, D, F, H) for different proportion of the EFAC area in the MPA are represented.*