Exploring technical interactions

Potential relationship between two métiers targeting one species in a mixed fishery :

$$E_{2,y} = \frac{c}{q_{1,2}B_{1,y}} - \frac{q_{1,1}}{q_{1,2}}E_{1,y} \tag{1}$$

Simplified Cobb-Douglas production function :

$$C_{1,2,y} = q_{1,2}E_{2,y}B_{1,y} \tag{2}$$

Biomass can be expressed as :

$$B_{1,y} = \frac{C_{1,2,y}}{q_{1,2}E_{2,y}} \tag{3}$$

We change the biomass term in the Eq 1 :

$$E_{2,y} = \frac{c}{q_{1,2}\frac{C_{1,2,y}}{q_{1,2}E_{2,y}}} - \frac{q_{1,1}}{q_{1,2}}E_{1,y} \tag{4}$$

$$E_{2,y} = \frac{cq_{1,2}E_{2,y}}{q_{1,2}C_{1,2,y}} - \frac{q_{1,1}}{q_{1,2}}E_{1,y} \tag{5}$$

$$E_{2,y} = \frac{cE_{2,y}}{C_{1,2,y}} - \frac{q_{1,1}}{q_{1,2}}E_{1,y} \tag{6}$$

$$\frac{q_{1,1}}{q_{1,2}}E_{1,y} = \frac{cE_{2,y}}{C_{1,2,y}} - E_{2,y} \tag{7}$$

$$\frac{q_{1,1}}{q_{1,2}}E_{1,y} = \frac{cE_{2,y} - E_{2,y}C_{1,2,y}}{C_{1,2,y}} \tag{8}$$

$$E_{1,y} = \frac{q_{1,2}}{q_{1,1}}\frac{cE_{2,y} - E_{2,y}C_{1,2,y}}{C_{1,2,y}} \tag{9}$$

$$E_{1,y} = \frac{E_{2,y}(c - C_{1,2,y})}{C_{1,2,y}}\frac{q_{1,2}}{q_{1,1}} \tag{10}$$

c is the total catch of species 1 :

$$c = C_{1,1,y} + C_{1,2,y}$$

$$E_{1,y} = E_{2,y}\frac{C_{1,1,y}}{C_{1,2,y}}\frac{q_{1,2}}{q_{1,1}} \tag{11}$$