Paul Dolder

Marine and Freshwater Research Centre

Galway-Mayo Institute of Technology

Galway, Ireland

Email: [paul.dolder@gmit.ie](mailto:paul.dolder@gmit.ie)

Phone: +353 838264167

November 10th 2017

*Nature London Office*

The Macmillan Building

4 Crinan Street

London N1 9XW

Dear Editor,

Enclosed is our manuscript “Spatial separation of catches in highly mixed fisheries”. Please accept it as a candidate for publication as a Letter in *Nature*.

**Rationale for publication in *Nature***

How humans exploit heterogeneously distributed wild animal populations is an important research topic as it supports food security, sustainability and managing natural capital. Wild capture fisheries are spatially and technically complex, with fisheries simultaneously catching different size classes of multiple populations with different management or conservation goals. Understanding this multidimensional interaction is a challenge highlighted by recent research on selective and unselective fishing (Reconsidering the consequences of selective fishing, Science 335: 1045 - 1047). This work highlights the importance of species and size selection yet does not address the spatio-temporal complexities inherent. While advances in spatiotemporal modelling have increased our understanding of marine species distribution dynamics (Density-dependent changes in effective area occupied for sea-bottom-associated marine fishes, Proc R Soc. B 283(1840): 20161853), we argue that there is no system presently capable of addressing spatial concerns of the dominant type of wild capture fishery found worldwide - mixed fisheries.

We develop a framework to reduce the complexity of spatiotemporal dynamics in mixed fisheries, capturing key spatial, fishery and species interactions that drive catches. We demonstrate how axes of maximal separation show the potential for - and limitations of - spatial harvesting and underline the importance of the approach in the context of the most significant policy change to face European fisheries in recent times – that of the forthcoming ban on discarding in Europe (‘landings obligation’).

While attracting a high media profile, the considerable scientific challenges and implications of the landings obligation have received less attention in broad scientific journals (Cascading ecological effects of eliminating fishery discards. *Nature Communications*. 2014;5:3893); focusses on the effects on scavenging fish) but has the potential to markedly change how we manage the impact of fisheries on fish populations. We present an approach that goes beyond current practices to show how spatial mitigation can support adaptation to the new European fisheries management system. We feel our work merits review and publishing In *Nature*, as it not only highlights the pressing challenges of a major policy reform with global implications but, moreover, it presents a possible solution to some of the challenges, thus enabling long-overdue scientific discourse on spatial mitigation to commence.

The manuscript is our original unpublished work and it has not been submitted to any other journals for review. Suggested referees are:

* Dr Ana Parma (expert in fisheries modeling, assessment, and management)

Centro para el Estudio de Sistemas Marinos

Centro Nacional Patagónico-CONICET

Blvd. Brown 2915

U 9120 ACF Puerto Madryn, Chubut

Argentina

email: [anaparma@gmail.com](mailto:anaparma@gmail.com)

* Dr Andrew Rosenberg (expert in fisheries modelling, policy and management)

Director, Center for Science and Democracy

Union of Concerned Scientists

Cambridge, MA,

USA

email: [arosenberg@ucsusa.org](mailto:arosenberg@ucsusa.org)

* Dr Daniel C. Dunn

Duke Marine Lab,

Duke University,

135 Marine Lab Road,

Beaufort, North Carolina 28516

United States

email: [daniel.dunn@duke.edu](mailto:daniel.dunn@duke.edu)

**Manuscript details**

We estimate a final draft to be approximately 2,000 words or 3 pages in *Nature* with 31 references. There are four figures. The desired figure sizes are height x width in millimetres:

Figure 1: 100 x 170

Figure 2: 80 x 170

Figure 3: 90 x 170

Figure 4: 140 x 150

An Extended Data section is included.

Yours faithfully,

Paul Dolder, Cóilín Minto and James Thorson