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Dear Editor,

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

**Summary of appeal to a general scientific audience**

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 interactions, as fisheries simultaneously catch different size classes of multiple populations with varying management or conservation goals. Understanding this multidimensional human-animal interface is a challenge highlighted by recent research on selective and unselective fishing (Reconsidering the consequences of selective fishing, Science 335: 1045 - 1047). While advances in spatiotemporal modelling have increased our understanding of species distribution dynamics (Space oddity: the mission for spatial integration, CJFAS 74: 1698-1716), 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 inherent in mixed fisheries thus unlocking key spatial and species interactions that drive catches in space and time. We demonstrate how axes of maximal separation show the potential for - and limitations of - spatial separation of species in a harvested assemblage. We 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 (‘landings obligation’).

**Summary of appeal to a non-scientific audience**

Recently, some European fisheries have turned a corner, capacity has been reduced and stocks have begun to rebuild at varying rates. Now, the major challenge facing managers is addressing the need to ensure all species caught in mixed fisheries are sustainably managed. This challenge has recently been tackled through a significant policy change to the European Common Fisheries Policy (CFP) where fishers will from 2019 on count all catch against quota (the ‘landings obligation’), rather than discarding over-quota catches, as has happened in the past. This has the potential to markedly change how fisheries impact on fish populations and the viability of fishing operations. While attracting a high media profile, the considerable scientific challenges and implications of the landings obligation have received less attention in broad scientific journals.

The challenge of managing all populations in a way that is sustainable yet allowing fisheries to continue to pursue quota for populations that allow higher catches has brought into sharp focus the complexities of spatial processes and dynamics. Spatial mitigation through changes in fishing patterns has been highlighted as an important adaptation to the new fisheries management system. We present an approach that goes beyond current practices and has potential to fundamentally alter the discourse on spatial avoidance as a tool to adapt to a challenging policy change, of great importance to European fisheries.

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 at least 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)

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

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* Dr Keith Sainsbury

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**Manuscript details**

We estimate a final draft to be approximately 5,000 words or 5 pages in *Nature* with 45 references. There are four figures. The desired figure sizes are height x width in millimetres:

Figure 1:

Figure 2:

Figure 3:

Figure 4:

A supplementary Information section is included.

Yours sincerely,

Paul Dolder, Cóilín Minto and James Thorson