

EXPERT OPINION

## One Health Aquaculture – a personal perspective

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Aquaculture is set to provide an increasing contribution to global seafood production and consumption by 2050. To facilitate sustainable growth and generation of safe, tradeable products attention must be focused on integration of diverse sustainability metrics into the supply chain – maximising the benefits to producers and consumers whilst minimising negative impacts on organisms grown in farms, and the environment in which aquaculture takes place. The One Health Aquaculture concept proposes a set of success metrics spanning animal-, human-, and environmental- health which may be used to underpin a new evidence, policy, and legislative framework for aquaculture sustainability.

The One Health philosophy has come to the fore amid the COVID-19 pandemic. Those previously unfamiliar with the phrase, or the conceptual basis on which it was originally formed, have come to appreciate the intricate linkages that exist between the health of wildlife, the environment in which it resides, and those human communities which rely upon these systems for their shelter, livelihoods, recreation, and food. Avoidance or control of zoonotic pandemics (pathogens from wildlife which infect humans, establish within populations, and undergo international spread) such as COVID-19 thus provide the prototype for application of the One Health approach. Dealing with such complexity requires access and alignment of inter-disciplinary evidence and policy traversing human-, environmental- and animal-health, operating on a trans-national basis, with a core requirement for sharing of diagnostics, data, technology, therapeutics, and vaccines. Solving the problem requires joined-up, systems-based approaches – a central tenet of the inclusive and cross-disciplinary One Health philosophy.

One Health thinking is not only applicable to understanding and managing zoonotic threats. Colleagues within my organisation have started to consider how the One Health approach may also be applied to solving other complex problems, such as those relating to the design of sustainable food systems. Here, rather than being deployed as a reactive response to an event (such as a zoonotic disease outbreak) or a means to understand or avoid a negative health outcome for human populations arising from such exposure, the One Health approach is applied proactively – to consider how desired or optimised environmental-, human- and organism- health outcomes (so-called success metrics) may be 'designed-in' to a given system, with a tangible outcome or

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product in mind. We have been testing this on a system with which we have some familiarity (aquaculture) and specifically, in relation to the potential for the sector to provide an increasing proportion of global seafood supply by mid-century. Here, One Health thinking provides a lens through which we can assess, and look to align, our own deep specialisms (in our case, in aquatic animal health and seafood safety) with the desired outcome (a sustainable food sector) but also, to identify those specialisms outside of our immediate expertise that must also be engaged and aligned to ensure that the desired outcome is achieved.

This may all sound a little nebulous – how indeed can individual specialisms (and specialists) engage in such a shared endeavour? The first stage requires recognition that (in this case) aquaculture must be considered not only as an industry where products and wealth are generated, nor simply as the domain of the specialist researcher or policy expert to be debated at seminars, workshops, and conferences. Rather, it should be recognised as the food *sector* (or collection of discrete sub-sectors) that it comprises - operating within the broader food *system*, on land and in water, that attempts to serve to nourish human consumers. When aquaculture (or any other food sector) is considered in this manner, a broader array of interested actors may become animated – the environmentalists, nutritionists, social scientists, economists, policy makers, investors, and most pertinently the consumers (and the non-consumers) amongst the public. When food is made the common denominator, the focal point, the collectively agreed outcome, the debate relating to its ‘sustainability’ (what, how, where, how much, and for who), then extend beyond the specialist domain to this broader community. When this occurs, we may begin to encapsulate the existing value system of those wishing to engage with opinion on how the shared endeavour may be achieved. Importantly, for aquaculture (and any other food sector), this value system is likely to alter across space and time meaning that specific sub-sectors of the industry, operating in given geographical locations, and creating products for different end-users will require discrete treatment using the One Health framework approach.

A paper published recently by our team provides some of the detail (Stentiford et al. 2020). We looked to engage a reasonably broad community of those working across environmental-, human-, and organism-health evidence and policy to propose a set of success metrics that should underpin a sustainable aquaculture (sub)sector. The metrics are diverse, ranging from better control of organism health and biosecurity at the farm-level through consideration of gender equality in the supply chain, to optimal protection of biodiversity at or near to farm sites and in the feed supply sector ([Figure 1](#)). Some of these metrics are not new and indeed may already be embedded within existing industry-level seafood accreditation schemes. However, other metrics may be considered the domain of Governments – provided as public goods when the market cannot adequately provide them. Aquatic animal health and seafood safety services may be examples of such – given that in many cases they cannot easily be

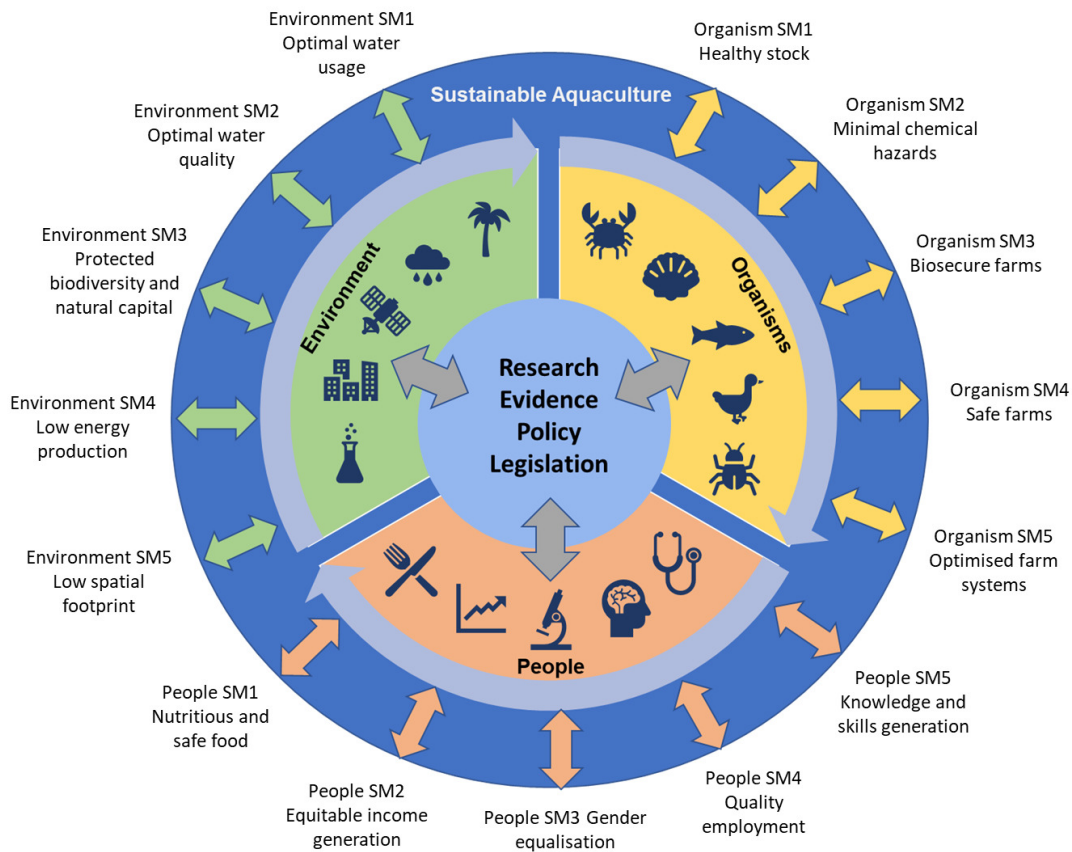


Figure 1. The One Health Aquaculture approach to design of a sustainable aquaculture sector.

The approach proposes 15 success metrics spanning environment-, organism- and human-health; fulfilment of which are underpinned by the availability and application of research, evidence, policy, and legislation. Although some success metrics may be incorporated into available industry accreditation schemes for the aquaculture sector, others are the domain of the State and will require provisioning as a public good. Figure reproduced with permission from Stentiford et al. 2020.

purchased in the marketplace and thus likely require Government intervention to ensure they are enacted. Similarly, protection of the environment in which aquaculture operates from the potential impact of farming and, *vice-versa*, the provision of clean water in which farming can take place, may also necessitate Government intervention and control in a manner outside of industry-level accreditation schemes. The One Health Aquaculture approach thus proposes an enhanced role for the State in assessing the availability of research, evidence, policy, and legislation for fulfilment of specified success metrics. Further, for their enactment, proportional investment in State infrastructures which support their deployment should therefore be considered a multi-faceted public good against which sustainable food supply (here, from aquaculture) is the tangible societal outcome.

The One Health Aquaculture approach is, however, only a starting point for more meaningful societal discourse around aquatic food supply. It is built upon the recognition that food systems, including those in water, are increasingly considered as a conduit around which biodiversity may be lost and gained, climate change mitigation strategies may succeed or fail and, human communities may be well nourished (and remunerated) or, impoverished. The

aquaculture sector exists within this broader food system on land and in water. Intuitively, it follows that the sustainability of the aquaculture sector can therefore only be measured *relatively* against other sectors from which our food is provisioned. When we add our own cultural value systems (and biases) to this – including the way that our land- and waterscapes appear to us, how we earn money from them, how they have provisioned our food in the past and how they have found their way in to our art and music - we may begin to understand why defining ‘sustainability’ for a discrete component of the whole food system is inherently problematic. Despite a rapidly emerging technical literature on the environmental merits of aquaculture production (particularly non-fed and extractive species) relative to other animal production sectors, it may well require a deeper cultural shift to occur for these potential merits to be understood and embraced. The One Health Aquaculture approach attempts to facilitate this journey but, it may take some time.

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