ONE HEALTH ATLAS

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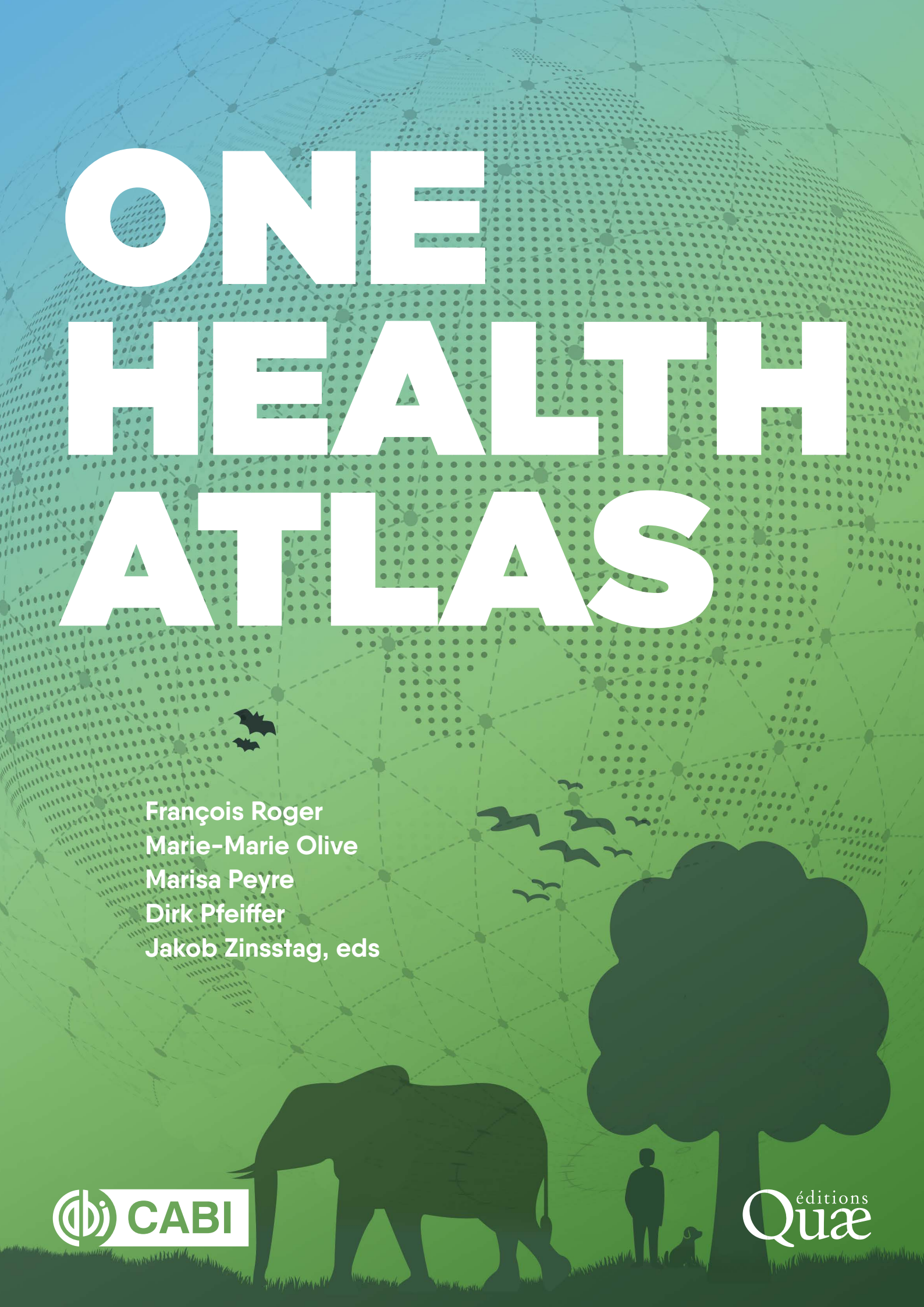

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One Health in aquaculture: antibiotic use in an era of global warming

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One Health in aquaculture is more a conceptual idea than part of an operationalization framework. One Health is typically viewed through the narrow lens of zoonosis. But because zoonosis is less reported in aquaculture, the use of antibiotics, antimicrobial resistance (AMR) and the worsening effect of AMR due to global warming in this sector is often considered a lesser priority.

Where aquaculture is concerned, antibiotic use is highest in southern and southeast Asia, where 85% of global fish is produced. Antibiotic use per tonne of fish production is highest in India, followed by Indonesia and China (Figure 1). The most frequently reported antimicrobial-resistant bacteria in aquaculture is *Vibrio* spp. (25%), which can cause severe infections in fish and humans and pose a serious One Health threat. Given the threats to the aquaculture sector and the associated human health risks, major aquaculture-producing countries have begun including aquaculture in their national AMR action plans. Despite commitments to regulate antibiotic use in aquaculture, the use of these products is expected to continue to grow until 2030 (Figure 1) in China (the world's largest producer), with a slight decline anticipated among other major producers.

Antimicrobials in aquaculture are administered mainly through therapeutic and prophylactic approaches. While efforts are under way to better regulate therapeutic antibiotic use by 2030, the future use prophylactic antimicrobials remains an open question. AMR can increase over time and will likely worsen with global warming; interactions with other chemicals (e.g. disinfectants) used in aquaculture can also be detrimental. Moreover, the risks from aquaculture are numerous and the level of unpredictability is higher since aquaculture systems are often connected (directly or indirectly) with open aquatic environments that are reservoirs of antimicrobial-resistant bacteria. These bacteria can come from a variety of sources, including sewage waste, hospital effluents and agricultural run-off from livestock and crops. A cumulative hazard perspective is needed to address these issues. Dealing with such complex challenges will require establishing a global coordinated initiative, ensuring better representation of aquaculture in One Health platforms and developing tools to operationalize One Health in aquaculture (Figure 2).

References

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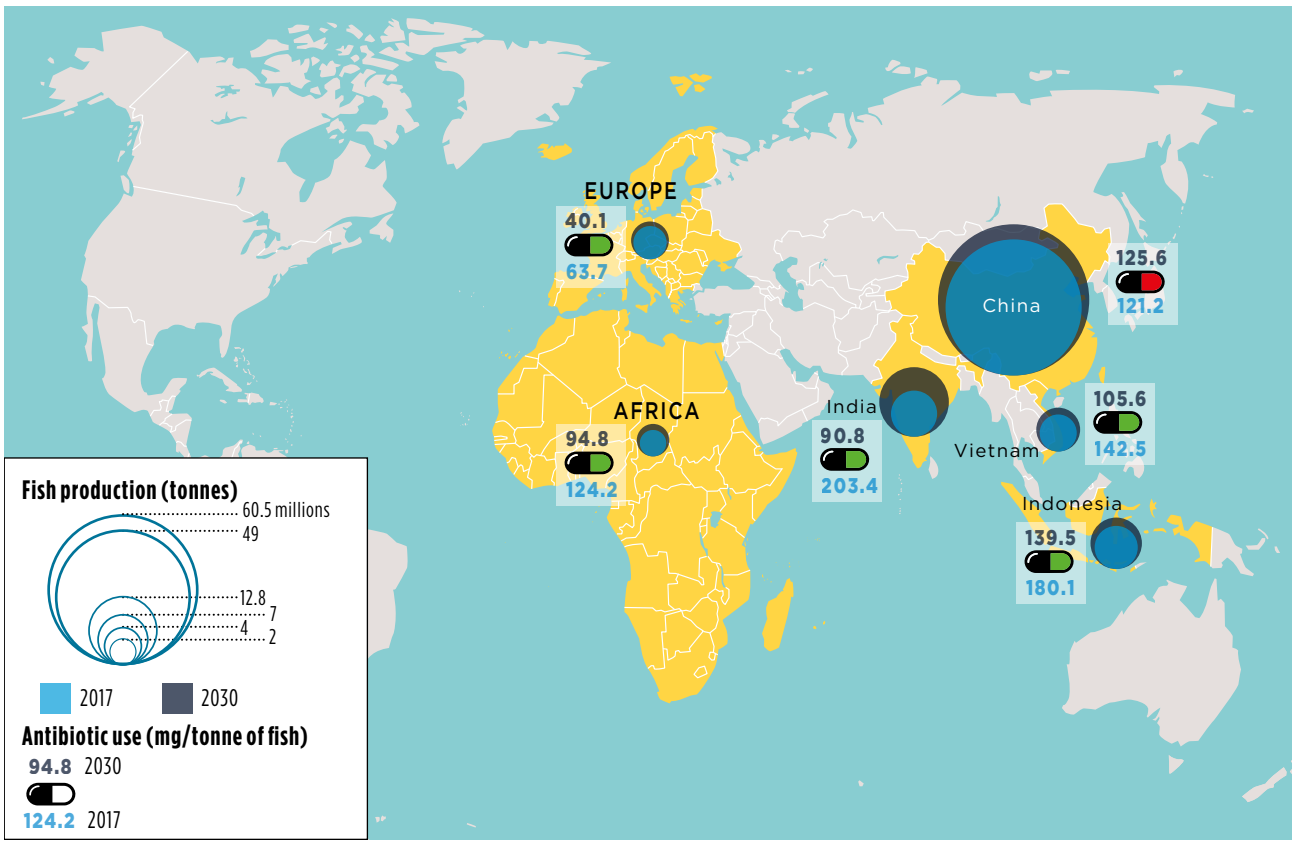

Figure 1. Projected antimicrobial use in aquaculture by country (2017 vs 2030).
This figure presents estimated antibiotic use in aquaculture across major producing countries, comparing 2017 levels with projections for 2030. The data highlight both total usage (in metric tonnes) and intensity of use (mg per tonne of fish produced). These trends raise concerns about the continued expansion of antimicrobial inputs, particularly in countries where regulatory frameworks and surveillance systems remain limited. Adapted from Schar *et al.* 2020.

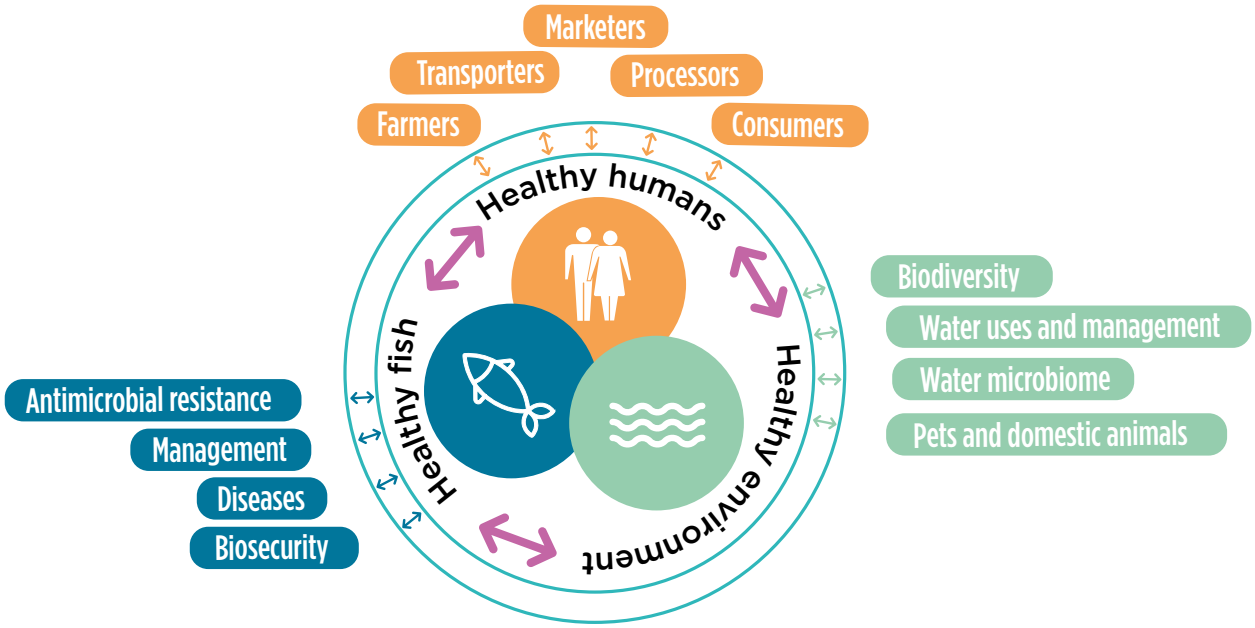

Figure 2. One Health framework for managing antimicrobial resistance risks in aquaculture.
This diagram illustrates the complex web of interactions in aquaculture systems that contribute to antimicrobial resistance (AMR). It highlights the interconnected roles of fish farmers, animal health, water quality, biodiversity, consumers, and the environment. The flow of antimicrobials and resistant bacteria across compartments—including through feed, water, and effluents—shows how AMR risks extend beyond farm boundaries, affecting human health and ecosystems. The figure advocates for integrated risk management approaches under a One Health framework to safeguard aquatic production, environmental sustainability and public health.