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The development of the Norwegian wrasse fishery and the use of wrasses as cleaner fish in the salmon aquaculture industry*
(Review Article)

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The focus of the article was to provide an overview of the recent development of a new fishery targeting coastal wrasses in Norway associated to the salmon aquaculture industry. In contrast to most fisheries, a unique feature of the wrasse fishery relies on the fact that it aims to catch and keep healthy fish alive to be later released into salmon net cages. Wrasses display symbiotic cleaning behavior that help to reduce and control the level of sea lice infestation in cultured salmon, a major cause of mortality and economic loss in the salmon aquaculture industry¹). The use of cleaner wrasses has been recommended as the most economical and environmentally friendly option against sea lice infestation²).

The fishery has developed targeting four main species, namely: corkwing *Symphodus melops*, goldsinny *Ctenolabrus rupestris*, ballan *Labrus bergylta* and rock cook wrasse *Centrolabrus exoletus*. The use of several species responds to variable performance under different environmental conditions and at different stages during the salmon production. Small goldsinny and rock cook wrasses are preferred during early stages of salmon production, while only larger corkwing and ballan wrasses are suitable for larger salmon. A major concern is temperature tolerance, as in Norway all four wrasse species are at the northern limit of their distribution ranges and their abundance and cleaning behavior appears directly correlated to mild temperatures³). Indeed, below 10°C they reduce their metabolic activity and enter a hypometabolic torpor state, while cold winter periods with seawater temperature below 4°C lead to high mortalities⁴). The better cold-water adapted lumpfish (*Cyclopterus lumpus*) appears as a more suitable cleaner fish species in northern Norway, where low temperatures are registered most of the year.

Uneven distribution of salmon farms along the strong latitudinal temperature gradient has been another major

driver shaping the uniqueness of the wrasse fishery. While the western coast of Norway is densely populated with salmon farms, their presence is very scarce in the southern Skagerrak coast of the country, a region where wrasses are abundance. The low demand of wrasses in the south has fostered intensive translocation of the excess of wrasses available to salmon farms located in northern regions, where local stocks are not large enough to support the demand from the salmon industry. Hence, the supply of wrasses in Norway presents two variants: in the west coast, wrasses are delivered directly to the salmon farms by the fishers; while wrasses caught in the southern Skagerrak coast are sold to intermediate companies who will transport fish alive in trucks and deliver them to the farms located in the west coast.

The use of wrasses as cleaner fish has contributed to mitigate the sea lice problem; yet, the large volume of fish caught with limited knowledge on the species biology and ecology, and the delay in the implementation of fisheries management policies have raised concerns regarding the sustainability of the fishery. Some of the major challenges faced include regional intraspecific differences in genetics and life-history traits, putative introgression between local and translocated escapees as well as fish health and welfare issues. Current efforts to develop breeding programs on ballan wrasse and lumpfish may contribute to alleviate the intensive fishing pressure on wild stocks, yet any risks associated with putative escapees remains unclear. In this regard, previous knowledge gained from the development of stock enhancement programs may provide important insights on possible interactions between local and non-local stocks⁵) and contribute towards the establishment of sustainable management practices for the fishery.

References

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* ノルウェーのベラ類漁業の発展とサケ養殖における駆虫魚としての利用（総説）

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