This does not mean that farming conditions are always optimal, but it does help keep biomass estimates more stable and reduce obvious feed losses. Ideas such as “intelligent fish farms” or automated production lines have become increasingly familiar, and in some cases digital twin technologies are already being used to simulate farming environments and coordinate equipment through cloud platforms. These approaches are not without limits. High upfront costs and a lack of trained personnel remain common obstacles. Still, with careful system design, wider adoption is possible, and over time such tools may contribute to both higher productivity and more environmentally responsible aquaculture practices.

4.3 Intelligent platforms and collaborative governance

An intelligent fishery platform should not be understood as nothing more than a data collection system. In real settings, it often plays a much broader role. It becomes a place where different groups are brought together. In several offshore fisheries in the Pacific, for example, monitoring systems were created through joint efforts by government agencies and local communities. Rather than dismantling existing arrangements, these systems were designed to work with local practices. Community-generated data were also incorporated, which made it easier for groups that are geographically dispersed to share experience, compare situations, and coordinate their actions. At a broader level, this type of cooperation is sometimes described using a “four-spiral” framework, which links academia, industry, government, and civil society. The emphasis is on moving innovation, financing, and training forward together, while connecting fishery management with wider concerns such as climate adaptation and food security.

Platforms built in this way rarely stay the same once they are put into use. As people interact with them, their role often shifts. Experiences from local fishery committees in Chile, as well as co-management practices in the Catalan Sea, suggest that bringing different stakeholders into the process can make a real difference. Community involvement helps preserve local autonomy, while state oversight remains in place, and tensions over how marine space is used become easier to handle. Seen from this angle, intelligent fisheries are not shaped by technology alone. Participation, mutual trust, and day-to-day cooperation matter just as much. When these elements are missing, even carefully designed systems tend to remain on paper rather than becoming part of practice. This is why future research and policy may need to spend less time on technical performance by itself, and more on how intelligent systems fit into participatory governance arrangements, with data managed in a fair and transparent way to support long-term social and ecological sustainability.

5 Application of Artificial Intelligence Video Monitoring in Fisheries

5.1 Application background, scenarios and system composition

In fishery management, the observer system has always faced a practical contradiction: when people go on board, the number is limited, and thus the coverage is naturally restricted; but if cameras are used instead and the footage is recorded and then reviewed by humans, with more videos, people will actually become even busier and unable to handle it all manually. Especially now, many long-distance and line-trawl fishing fleets have installed electronic monitoring equipment, and the amount of data is so large that it is almost impossible to fully process it manually. It was precisely under the circumstances where "there weren't enough people but there was too much data", that artificial intelligence video surveillance began to be taken seriously. Some research teams attempted to use deep learning models to directly process onboard videos, allowing the system to automatically identify fish species and judge fishing behaviors. The entire process hardly relied on manual intervention (Figure 2) (Khiem et al., 2025). Currently, such systems have been applied in various scenarios, such as nearshore resource assessment, deep-sea species observation, and even the automatic counting of crustacean catches from small fishing vessels. In the end, its key lies not in "taking videos", but in converting continuous videos into standardized data that can be used for management.

In routine use, this kind of system does not feel especially complicated to operate. Cameras mounted on fishing vessels simply record what happens during normal work, and the footage is later handled in the background rather than being reviewed manually. During processing, the models go through the video by identifying what appears