is uneven across regions, and false alarms occur often enough to remain a practical concern. In response, researchers have begun exploring a range of possible directions, including the combination of different image sources to enable more continuous, all-weather monitoring, as well as the use of blockchain-based tools to strengthen the credibility of operational records. These approaches are still being tested, but they suggest several possible paths for improving future responses to illegal, unreported, and unregulated fishing (Sharma, 2025).

4 How Intelligent Technologies Are Reshaping Fishery Management

4.1 Decision support systems and the shift away from pure experience

For a long time, fishery management followed a fairly familiar routine. Records were written by hand, figures were arrange and checked later, and decisions were usually made after the fact rather than during the fishing process itself. In some situations, by the time all the notes had been reviewed and compared, the season was already nearing its end. This way of working was not useless, but it was slow, and it rarely reflected what was actually happening at sea at that moment. The shift away from this approach happened step by step. Decision support systems were not introduced as a complete replacement from the start. Instead, they were added gradually and used alongside existing practices. As they improved, information that had once been scattered across different logbooks and reports began to appear in one place. Today, electronic logbooks, vessel position data, and catch records can be viewed together on a single platform, making it easier to follow fishing activity as it unfolds. The iFIMS system used by members of the Pacific Nauru Agreement is a typical example. With fishing volumes available almost in real time, routine assessments are now faster, and much of the repetitive manual data work has been reduced (Agmata and Guðmundsson, 2025).

These systems do not have to stop at basic data integration. In some cases, machine learning and image analysis have been added, making it possible to extract indicators like catch per unit effort automatically. This opens the door to more flexible management responses, such as temporarily closing certain fishing areas when environmental conditions change. At the same time, cloud-based deployment has made two-way communication easier. Fishers upload data, while managers send back forecasts or catch trend charts, which can help crews adjust their schedules. If vessel data and environmental information are further combined, the system may even estimate fishing probabilities, balancing quota control with ecosystem protection. That said, technology alone does not guarantee good management. Without clear governance arrangements, shared data standards, and proper privacy protection, even the most advanced system can fail to function as intended. Effective fishery management still depends on coordination across sectors and on fitting these tools into existing legal and institutional frameworks.

4.2 Moving toward more precise fishing and aquaculture practices

In recent years, fishing and aquaculture have started to look a bit more like carefully managed farming systems, although this change has not followed a single path. The underlying goal is fairly straightforward: increase output while avoiding extra pressure on natural resources. How this goal is approached, however, differs noticeably between capture fisheries and aquaculture. In capture fisheries, artificial intelligence is generally used as a point of reference rather than as a substitute for human decision-making. In routine practice, managers often look at historical catch records together with basic ocean conditions—such as variations in water temperature or salinity—to form a rough impression of where fish may be gathering. These models are not meant to remove uncertainty, and in practice they do not. What they tend to offer instead is a way to narrow down options, limit avoidable bycatch, and give managers more room to adjust quotas as conditions change (Agmata and Guðmundsson, 2025). At the same time, monitoring gaps that have existed for a long time are gradually being reduced. In many coastal areas, information on species distribution and market trends is now collected more regularly, while the combined use of remote sensing and vessel tracking has made coordination across regions more manageable, especially as marine ecosystems continue to shift at a faster pace.

Aquaculture follows a different logic. Here, the emphasis is less on prediction and more on keeping daily conditions within a manageable range. Sensors are usually installed for long-term use, continuously recording environmental indicators, while automated systems respond by fine-tuning feeding schedules and oxygen supply.