finally to the market. Once these records are uploaded, they cannot be altered at will and can be checked whenever needed. When blockchain is used together with the Internet of Things and artificial intelligence, it becomes harder to falsify records or hide inaccurate reports, and in real applications this combination has shown promising results. Similar blockchain-based IoT systems are not limited to fisheries. They have also been tested in agricultural production, where production data can be securely stored and protected from tampering. This makes certification of agricultural products more transparent, as the supporting evidence is clearer and easier to verify. In some pilot projects, such as quota trading, these systems have played an additional role by helping keep supply chains more stable and reducing the risk of disputes. For small-scale fishers in particular, this kind of transparency can translate into more predictable income and better livelihood security (Nandhini et al., 2025).

3 Innovation in Fishery Monitoring under Intelligent Technologies

3.1 Rethinking fishery resource monitoring and population assessment

For many years, estimates of fish populations were often based on broad impressions rather than solid numbers. In quite a few regions, surveys were carried out only occasionally, data accumulated at a slow pace, and by the time results were finally compiled, conditions in the water had already changed. This was especially common in small-scale fisheries, where staff numbers were limited and technical support was hard to come by. The shift away from this situation did not happen all at once. In the early stages, new monitoring tools were tested only in a small number of pilot sites and attracted little attention. Their value became clearer only over time. Today, monitoring is no longer restricted to short field surveys conducted once in a while. In some coastal fisheries, artificial intelligence–based image recognition has gradually entered routine work, making it possible to identify and count fish and invertebrates directly from images. In the Pacific region, for instance, a cloud-based platform has been developed that can recognize more than 600 coastal fish species. By handling large volumes of uploaded images, the system has sped up resource assessments and, in some cases, helped relieve pressure caused by shortages of specialists and long-term data records (Figure 1) (Kharabsheh and Bdour, 2025).

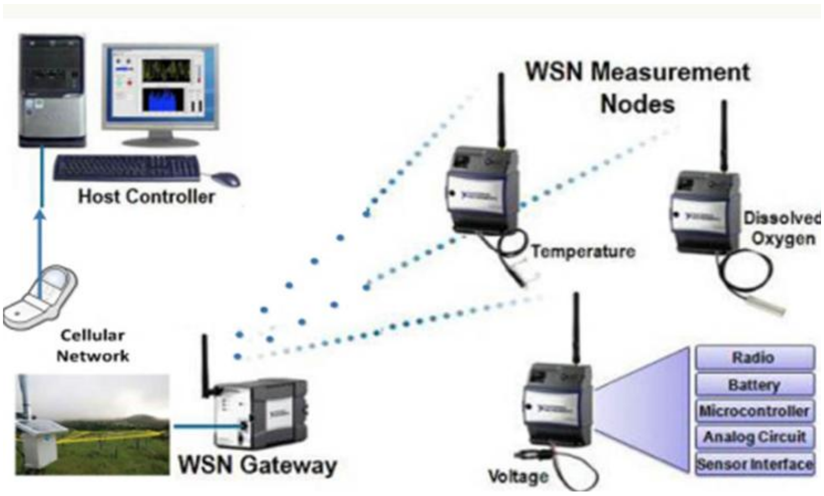

Figure 1 Illustration of the communication method embedded in the developed system (Adopted from Kharabsheh and Bdour, 2025)

These approaches are not only useful for species that are easy to spot. Evidence from Europe suggests that they also work for organisms that tend to remain hidden. Studies on Norwegian lobster populations combined underwater video, environmental DNA, and image analysis to locate individuals and their burrows directly in the field. Compared with earlier methods, this combination produced population estimates that were closer to actual conditions. At the center of these systems is not a single technology, but the ability to bring different types of information together. Images, catch records, and spatial data are uploaded to a central cloud platform, where learning algorithms extract indicators such as species composition and size structure. In many developing regions, this level of integrated analysis was previously difficult to achieve. If sensor networks and prediction models are added to the process, assessments can move closer to reflecting the condition of the wider ecosystem, rather than isolated snapshots.