

Underwater Drones: Revolutionizing Fisheries Management and Conservation

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SUMMARY

Underwater drones are emerging as game-changers in fisheries management and marine conservation. This article explores how these unmanned submersibles are transforming the way we monitor fish populations, map underwater habitats, combat illegal fishing, and assist both small-scale and commercial fishers. We delve into the technology behind these aquatic robots, their diverse applications, and the challenges and opportunities they present for the future of sustainable fisheries.

INTRODUCTION

Imagine a world where we can peer into the depths of our oceans with unprecedented clarity, track fish populations in real-time, and protect marine ecosystems with greater efficiency than ever before. As our oceans face increasing pressures from overfishing, climate change, and pollution, the need for innovative solutions in marine resource management has never been more urgent. Enter underwater drones: sophisticated, unmanned submersible vehicles equipped with advanced sensors, cameras, and sometimes even robotic arms. These aquatic robots are rapidly becoming indispensable tools in the arsenal of marine scientists, conservationists, and fisheries managers worldwide.



Fig: Underwater drone



Fig: Identifying the Coral

The Technology behind Underwater Drones:

Underwater drones, also known as Autonomous Underwater Vehicles (AUVs) or Remotely Operated Vehicles (ROVs), come in various shapes and sizes, each designed for specific tasks and environments. Some are torpedo-shaped for efficient long-distance travel, while others are more compact and maneuverable for navigating complex underwater structures.

These drones are equipped with an array of sensors and tools:

- High-definition cameras for visual surveys
- Sonar systems for mapping and detecting fish
- Water quality sensors to measure temperature, salinity, and pollutants
- GPS for precise navigation and location tracking
- In some cases, robotic arms for sample collection or manipulation of objects

The drones can be programmed to follow predetermined paths or operated in real-time by human pilots from the surface. Their ability to stay submerged for extended periods and reach depths unsafe for human divers makes them invaluable for extensive underwater exploration and monitoring.

Applications in Fisheries Management:

1. Fish Stock Assessment:

One of the most crucial applications of underwater drones is in fish stock assessment. Traditionally, this process has relied on catch data and limited sampling, which can be imprecise and time-consuming. Underwater drones offer a non-invasive, more comprehensive approach:

- Visual surveys: High-definition cameras on drones can capture detailed footage of fish populations, allowing scientists to estimate numbers, sizes, and species composition more accurately.
- Acoustic surveys: Sonar technology on drones can detect and count fish over large areas, even in murky waters where visual methods are ineffective.

2. Habitat Mapping and Conservation:

Understanding and protecting marine habitats is crucial for maintaining healthy fish populations. Underwater drones excel in this area:

- Detailed mapping: Drones can create high-resolution 3D maps of the seafloor, identifying critical habitats like coral reefs, seagrass beds, and underwater canyons.
- Monitoring changes: Regular drone surveys can track changes in habitats over time, helping to assess the impacts of climate change, pollution, or human activities.
- Conservation planning: The detailed data collected by drones aids in designing effective marine protected areas and identifying areas in need of restoration.

3. Combating Illegal Fishing:

Illegal, unreported, and unregulated (IUU) fishing is a major threat to sustainable fisheries. Underwater drones are becoming powerful tools in the fight against these practices:

- Patrol and detection: Drones can cover vast areas, using sonar and cameras to detect unauthorized fishing vessels or gear.
- Evidence gathering: High-quality video footage from drones can provide irrefutable evidence of illegal activities.

4. Assisting Fishers:

Underwater drones aren't just for scientists and enforcement agencies. They're also proving valuable for fishers themselves:

- Fish finding: Advanced sonar on drones can help locate fish schools, potentially reducing time and fuel spent searching.
- Gear inspection: Drones can check fishing gear for damage or entanglements without the need for divers.
- Sustainable practices: By providing detailed information about fish populations and habitats, drones can help fishers make more informed, sustainable decisions about where and when to fish.

Challenges and Future Prospects:

Underwater drones hold immense potential for fisheries management, but their widespread adoption faces several challenges. The high cost of advanced drones limits access for smaller organizations and developing countries. Additionally, the vast amount of data collected by these drones requires sophisticated analysis and interpretation, posing a challenge for effective utilization. Regulatory issues also arise, as the use of drones in certain waters may face legal or regulatory hurdles. Despite these challenges, the future of underwater drones in fisheries management appears promising. Technological advancements are making drones more affordable, user-friendly, and capable. We can anticipate greater integration with AI, allowing machine learning algorithms to enhance drones' ability to identify species, detect anomalies, and make real-time decisions. Future drones may also achieve improved autonomy, with the potential to operate for months without human intervention, powered by renewable energy sources. Additionally, networked systems of drone fleets could provide comprehensive, real-time monitoring of entire marine ecosystems.

CONCLUSION:

Underwater drones are not just cool gadgets; they're powerful tools reshaping our approach to fisheries management and marine conservation. By providing unprecedented access to the underwater world, they're helping us make more informed decisions about how to sustainably manage our ocean resources. As we face the

challenges of feeding a growing global population while protecting our marine ecosystems, underwater drones offer a beacon of hope. They exemplify how cutting-edge technology can be harnessed to support sustainable practices and conservation efforts. The revolution is happening beneath the waves, and underwater drones are leading the charge towards a future where our oceans are better understood, more effectively managed, and ultimately, more sustainably utilized.

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