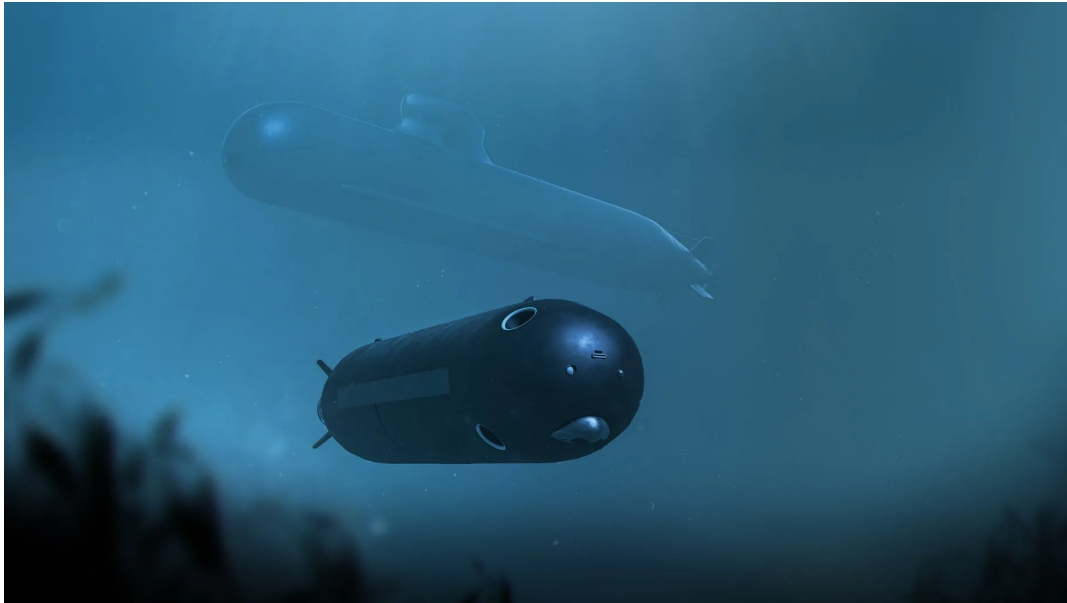




# The Integration of Unmanned Systems in the New Underwater Projection Doctrine of the Italian Navy

Published on 03/05/2026

The recent exercise in the Central Mediterranean saw **the operational deployment, for the first time integrated with a U-212A class submarine, of the new long-endurance autonomous underwater vehicles (AUV)**. This test marks a fundamental doctrinal shift, moving the focus of underwater operations from mere passive acoustic surveillance to the **active management of drone swarms** for the protection of critical underwater infrastructures. The operation validates the submarine C2 architecture developed nationally for the control of multi-domain assets.

## Specifications of AUV carriers and broadband acoustic communication protocols

Technically, the mission's pivot involved **the deployment of the new AUV "C-Hunter"**, a modular carrier capable of operating **up to 3,000 meters deep with a 72-hour endurance**. The drone is equipped with a **state-of-the-art interferometric synthetic aperture sonar (SAS)**, capable of mapping the seabed with centimeter resolution, identifying structural anomalies on pipelines and data cables. The true engineering challenge overcome concerns the **persistence of the communication link**: the integration of broadband acoustic modems on the host submarine allowed the transmission of telemetry data and portions of sonar images in real-time, overcoming traditional underwater physics limits thanks to new adaptive compression algorithms.

## Hybrid deterrence and control of bottlenecks in the Expanded Mediterranean

The integration of these unmanned assets into the submarine fleet addresses the strategic need to monitor and defend the energy and digital nodes of the Mediterranean, prime targets in modern hybrid warfare strategies. **The ability to deploy persistent underwater drones allows the Italian Navy to exercise a form of "non-kinetic" but extremely effective deterrence**, ensuring sovereignty over the seabed (Seabed Warfare). In an operational theater characterized by the aggressive presence of extra-regional actors, underwater situational awareness **becomes the essential prerequisite for the security of Exclusive Economic Zones** and vital commercial flows for the national economy.



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# Industrial developments in the underwater hub and horizons of predictive maintenance

On the industrial level, the success of the integration is the result of the coordination of the **National Underwater Dimension Hub**, which saw collaboration between major defense players and **innovative SMEs specialized in robotics**. Future prospects include the introduction of edge artificial intelligence directly on board the AUVs for autonomous threat classification, drastically reducing the data load to be transmitted. Furthermore, the development of permanent underwater charging and docking stations, powered by offshore renewable sources, will allow the creation of true automated patrol networks over the next decade, radically transforming the logistics of long-term underwater operations.