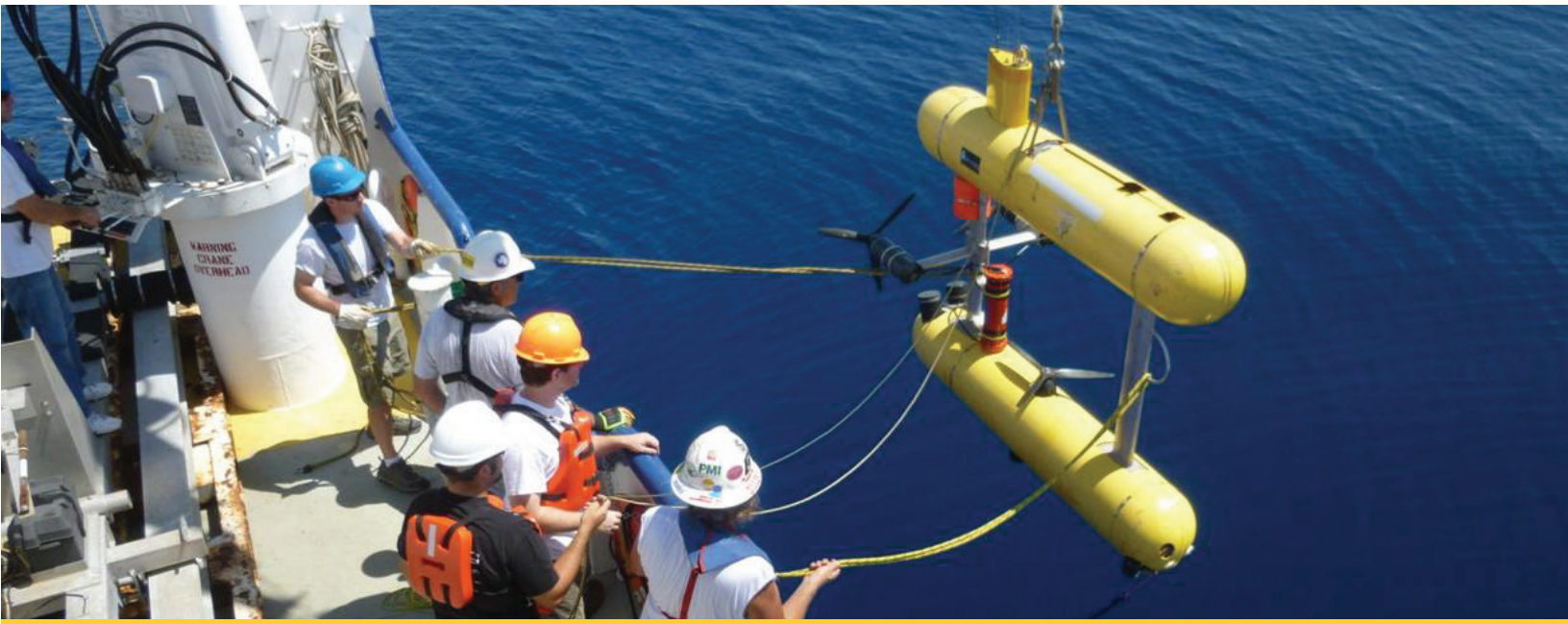
THE UNIVERSITY OF SOUTHERN MISSISSIPPI

# MOLA MOLA

## Photo Survey AUV

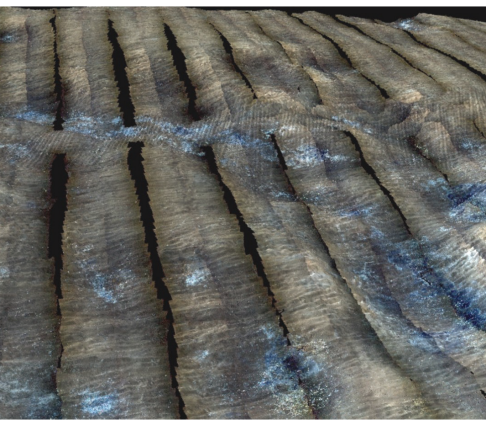


The MOLA MOLA autonomous underwater vehicle (AUV), given the scientific name of the *Ocean Sunfish*, is used to collect photos of the seafloor. It follows a pre-programmed mission plan untethered from its support ship as it conducts surveys to a depth of 2,000 meters. MOLA MOLA has been used to study corals, geological features, deep-sea biological communities, and an 1800s shipwreck in the northern Gulf of Mexico.

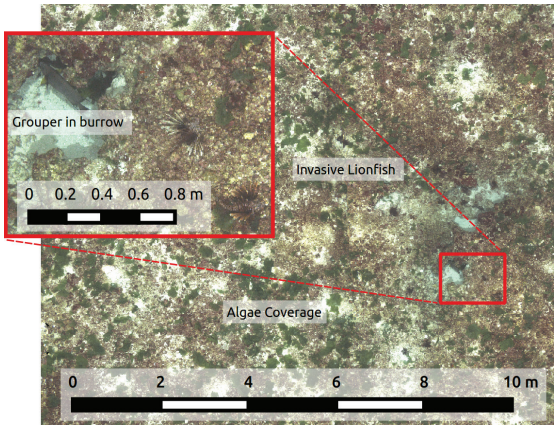
VOYIS Insight Micro

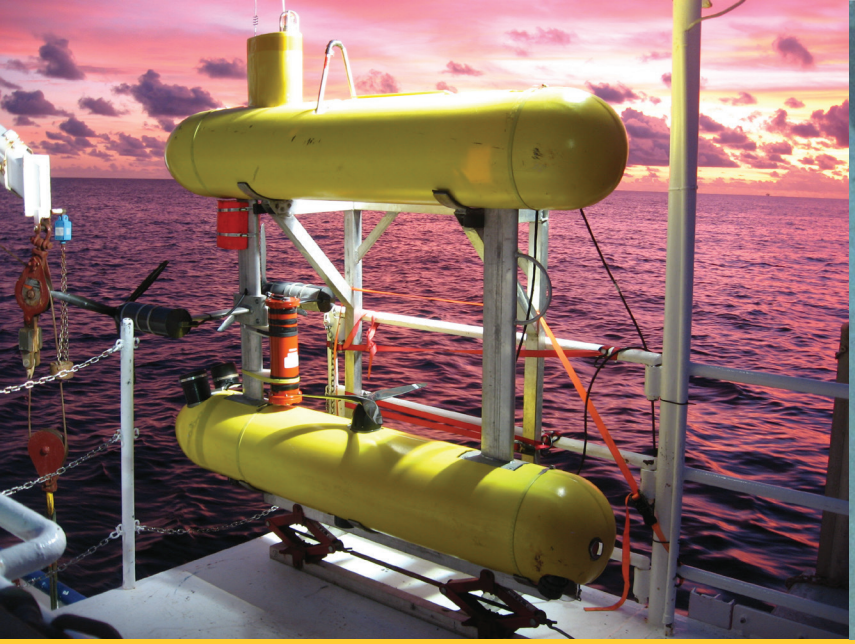
The primary sensor is the VOYIS centrally mounted color camera. Uniform illumination is provided in the pitch-black deep-sea environment by fore and aft LED arrays. A laser line projector and secondary camera are used to map the seafloor, producing complementary topographic data useful in interpreting the photo survey.

For deep dives, MOLA MOLA can be launched with an expendable drop weight. After reaching the seafloor, the vehicle travels to the area of interest and begins its low-altitude survey just 3 meters above the seafloor. At this height, the photo and bathymetry spatial resolution is below 2 mm. In a standard survey, MOLA MOLA details a 60- by 60-meter block of the seafloor.



A processing pipeline was created to combine thousands of photos per mission with vehicle navigation to form a georeferenced photomosaic map. Data products from MOLA MOLA have been used to ground truth larger acoustic surveys, plan (and confirm) seafloor instrument placement, and to collect visual data over features of geological, biological and archaeological interest.






Since taking delivery of MOLA MOLA in 2009, The University of Southern Mississippi has developed an experienced team of engineers, geophysicists and hydrographers focused on AUV operations and data processing. The University of Southern Mississippi operates the research vessel *Point Sur* and will soon operate the upcoming regional-class research vessel, *Gilbert R. Mason*, along with consortium partners. With thriving graduate and undergraduate degree programs, and specialist certificates offered in both hydrography and uncrewed maritime systems, facilities are located across the Mississippi Gulf Coast, including those at Stennis Space Center, the Gulf Park campus, the Marine Research Center at the Port of Gulfport, as well as the Gulf Coast Research Laboratory and Marine Education Center in Ocean Springs.

**Max. depth**: 2,000 m

**Size:** 2 m length, 1.5 m height

**Mass:** 225 kg

**Endurance:** up to 8 hours

**Typical survey parameters:** 3 m altitude, 1.7 m line spacing, 0.20 m/s

**Launch and recovery:** crane lift with quick-release and recovery hooks

**Scientific payload:** Voyis Insight Micro, consisting of a color still camera, fore and aft LED arrays, and a laser-line bathymetry system

**Navigation:** IXblue Phins III (inertial navigation system), Teledyne RDI 1.2 MHz DVL, Masterclock combined GNSS receiver and time server, Paroscientific depth sensor, Tritech forward-looking altimeter

**Maneuvering:** Three magnetically coupled thrusters, electromagnet-operated descent weight system, passive stability in pitch and roll for uniformity of optical data

**Communication/Tracking:** surface – Ubiquiti 2.4 GHz ethernet radio, Xeos combined Iridium tracking and strobe beacon submerged – Sonardyne AvTrak 6 combined USBL tracking transponder and acoustic modem

**Shipboard equipment:** : Vehicle operation and mission management computers, 1U-sized charger, cradle for deck storage and maintenance, Sonardyne Ranger 2 transceiver on pole or hull-mount for communications and tracking

**Safety:** Self-powered tracking hardware, Terrain/obstacle avoidance system

**Batteries:** Kraken SeaPower 50V52 pressure tolerant battery - 2.6 kWh at 52 V (nominal)

**The University of Southern Mississippi – Hydrographic Science Research Center**

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