



The R/V *Muskie* - Lake Erie

The USGS Great Lakes Science Center is dedicated to providing scientific information for restoring, enhancing, managing, and protecting living resources and their habitats in the Great Lakes region. The USGS Great Lakes Science Center is headquartered in Ann Arbor, Michigan, and has biological stations and research vessels located across the Great Lakes Basin.



MUSKIE	Specifications
	Length: 70 ft.
	Beam: 18 ft.
	Draft: 5.5 ft.
	Cruising speed: 12 kts.



The Fleet

The Great Lakes Science Center (GLSC) operates five large research vessels, ranging in length from 70 to 107 ft, with one vessel stationed on each of the Great Lakes. The vessels are equipped with wet laboratories, gear for fish, limnological, and contaminant sampling, hydroacoustical fish-detection systems, and GPS navigation systems. The GLSC also operates a fleet of small (18-25 ft) research vessels, outfitted with GPS navigation systems and equipment for fishery and limnological research, and has a side-scan sonar and remotely operated vehicle.

The Vessel

The R/V *Muskie*, stationed in Sandusky, OH, at the GLSC's Lake Erie Biological Station (LEBS), is the principal GLSC research vessel on Lake Erie. Built in 2011, the *Muskie* replaced the R/V *Musky II* when maintenance costs, safety considerations, endurance and speed limitations, and partner needs to utilize newer technologies marked the end of its service life. The new vessel is faster, safer, and provides technological capabilities for cutting-

edge scientific investigations of deepwater ecosystems in Lake Erie. The *Muskie* can be at sea eight days with sleeping accommodations for six people. There are two heads and a full galley.

The first LEBS research vessel was the 52 ft R/V *Musky I*, a modified wooden commercial gillnet vessel. This vessel was used in important fishery stock assessments which began in 1957. The *Musky I* was replaced in 1960 by the 45 ft *Musky II*, a purpose-built steel vessel which operated on Lake Erie until 2012.

The Science

LEBS provides scientific information to support the restoration, enhancement, management, and protection of fishery resources in Lake Erie. The *Muskie* is the cornerstone of this mission. The vessel is a key part of recruitment surveys and forage fish assessments coordinated with state and provincial management agencies. The *Muskie* is also used to conduct long-term ecosystem surveillance and intensive studies that provide novel insights on the effects of invasive species and environmental changes that challenge resource management.





An emerging issue in Lake Erie is the recent expanding “dead zone” - a water layer near the lake bottom that forms seasonally and is devoid of oxygen. Long-term climate change is predicted to worsen the severity and extent of the dead zone. Further, fish distributions and food webs may change dramatically within and near this area, influencing productivity of fish populations and our ability to conduct precise assessments. Scientists at LEBS rely on the *Muskie* to investigate key questions and develop novel datasets to understand impacts of the dead zone on fisheries.

On-board Equipment

The *Muskie* has state-of-the-art industrial systems to support the widest possible range of scientific sampling activities. The main winch system allows deployment of multiple towed gears (trawls, sonar devices, gliders, plankton nets, etc.) using centerline or double-warp configurations. Precision fishing at specified depths can be accomplished via an integrated net mensuration system, line counters, and tensiometers. An A-frame provides options for stern gear deployment and lifting, and a knuckle crane facilitates the transfer of large loads and specialized sampling needs. The vessel also has a hydraulic gillnet lifter, which is

a primary tool used in cooperative surveys across Lake Erie.

To survey forage fish and zooplankton biomass, the vessel is equipped with two hydroacoustic transducers (120kHz and 38kHz) that can operate simultaneously, with a through-hull design that minimizes bubble sweep and background noise. Ship propulsion is also designed for quiet operation. Twin propellers, a bow thruster, and hydraulic anchor winch provide a variety of options for complex maneuvering and stationary sampling. In addition, the scientific instrument winch has slip-ring capability that facilitates safe deployment of sensor arrays when real-time observation is necessary. Onboard sample processing and storage is supported via a stainless steel work bench in the wet laboratory, motion-compensating balance, chemical storage locker, cold and hot water supply, clean AC power supply, and large freezer capacity. Navigation, weather, and winch operation data are supplied to the dry lab area and can be integrated electronically with data from scientific sensors.

To facilitate communications while underway, the vessel is equipped with a 3G/4G cellular modem and Wi-Fi network that are operational in most U.S. waters on the lake.



R/V Muskie on Lake Erie

