

# AQUA: An Amphibious Walking & Swimming Robot

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- A product of research conducted at McGill, York, and Dalhousie universities in Canada

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## Taking BioInspired Robotics to the Next Level

By combining capabilities demonstrated by both insects and marine life, the AQUA platform is designed to be at home in both the terrestrial and aquatic environments.

### Computation

AQUA operates with a Pentium CPU on a PC/104 stack and relays command and sensor information via a fiber optic tether.

### Power

Two MIL-spec NiMH batteries allow AQUA to operate for over 5 hours underwater. Tool-less battery replacement allows quick and easy swaps for rapid redeployment.

### Shell

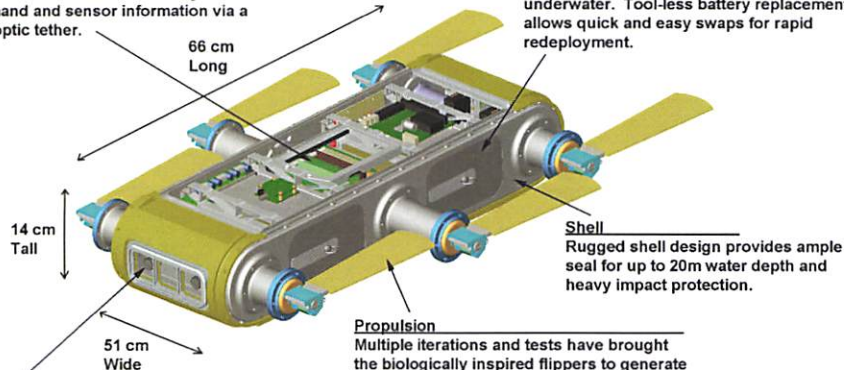
Rugged shell design provides ample seal for up to 20m water depth and heavy impact protection.

### Propulsion

Multiple iterations and tests have brought the biologically inspired flippers to generate optimal thrust. Experimentation with new swimming gaits has allowed for further improvement of AQUA's underwater performance.

### Vision

2 front board cameras and 1 rear allow for remote operation of the robot. Future work will allow for visual servoing and stereoscopic 3D terrain mapping

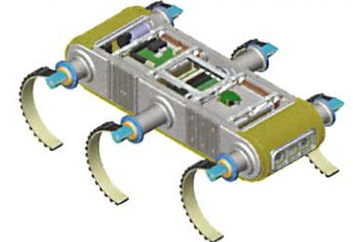


mass = 18.5kg (ballasted for salt water)

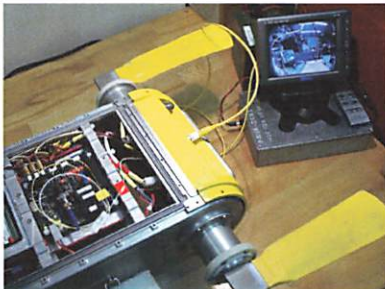
- >> Rugged design with numerous behaviours and gaits, can both walk and swim.
- >> Long-term observations enabled through low-energy station keeping by resting on the ocean floor.
- >> Provides real-time information to the surface for monitoring and / or assisting divers.
- >> Advanced image processing is being developed to allow the creation of 3D maps from AQUA's onboard stereoscopic cameras.
- >> Currently tele-operated with full autonomy under development for the near future.
- >> Can be used to explore hazardous environments where people would be at risk.



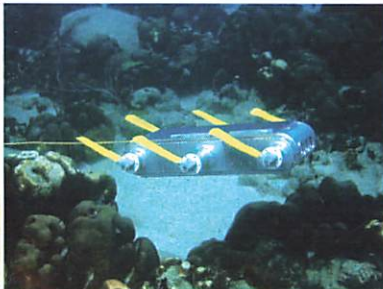
The AQUA robot is based upon the highly successful and mobile RHex platform. RHex is a small terrestrial walking robot that is capable of navigating rough terrain, climbing stairs, and running at speeds over 2.25m/s (5 mph). More information about RHex can be found at: [www.rhex.net](http://www.rhex.net)



AQUA's small mass and size mean that no special equipment is needed for deployment. AQUA can be safely operated from small boats directly over coral reefs.



Images and data from AQUA's three onboard cameras and computer and transmitted along a single fiber-optic cable. This, along with AQUA's power autonomy allows for the use of a very small tether - greatly reducing drag.



The AQUA robot is capable of navigating coral reefs and observing marine activity for extended periods of time, while the operator remains safely above water, eliminating the need for extended dives.



AQUA can also be used to observe and assist divers with their tasks by relaying images, messages, and material to and from the surface.



With terrestrial legs installed, AQUA can walk on land, and swim on the surface, allowing it to be launched from the surf zone.