

# Development of amphibious biomimetic robots

**Key words:** Amphibious robots; Biomimetic robots; Bionic technology; Intelligent robots; Robotics

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# Application of amphibious biomimetic robot

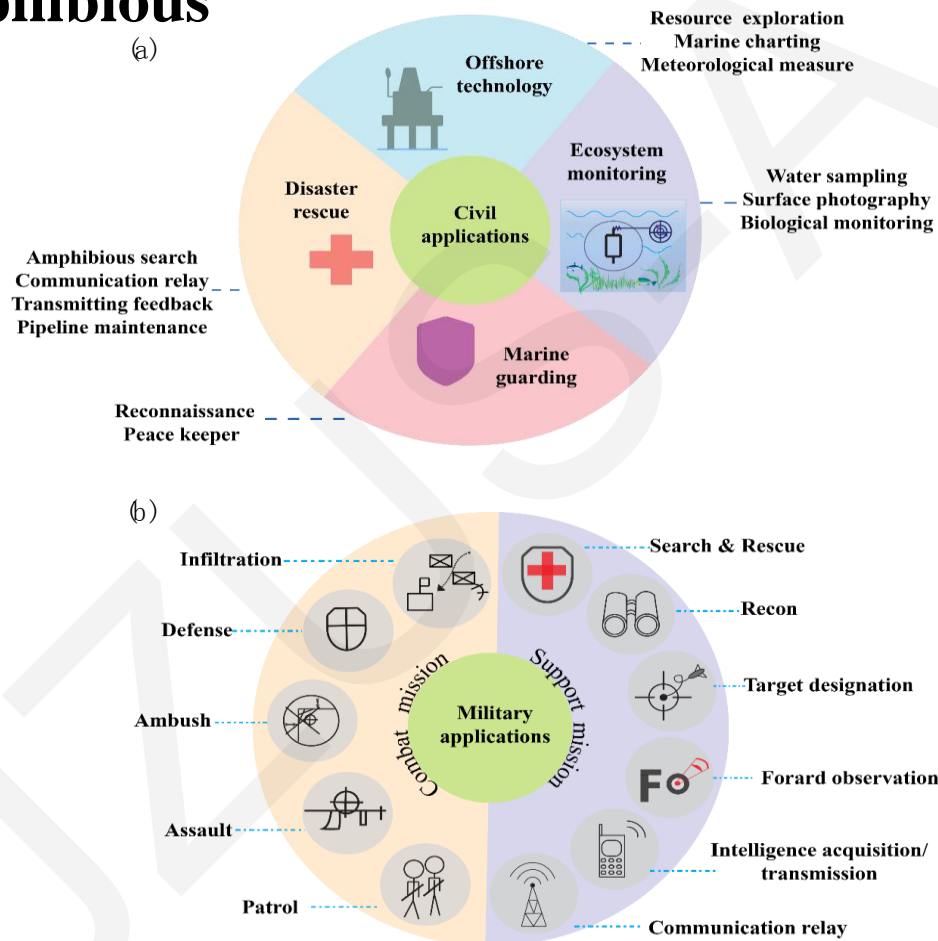



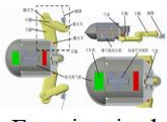



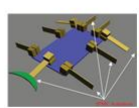








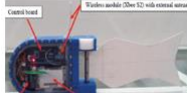

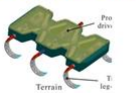


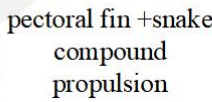







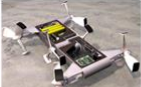
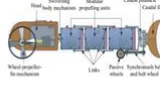


Fig. 1 Application of amphibious biomimetic robot. The application of amphibious robots is introduced from civilian and



# Different propulsion methods of amphibious

leg propulsion	 <p>①ALUV</p>	 <p>②Crabster CR200</p>	 <p>Crab-inspired robot</p>	 <p>Frog-inspired robot</p>	 <p>⑥RHex</p>	 <p>⑰Turtle-inspired robot</p>	 <p>⑭RT-I</p>	 <p>Lobster-inspired robot</p>	 <p>Machine alligator</p>
fin/flipper propulsion	 <p>③Aqua-ray</p>	 <p>④Stingray-inspired robot</p>	 <p>⑤Stingray-inspired robot</p>	 <p>Velox</p>	 <p>22,RoboTuna</p>	 <p>⑯Naro-Tartaruga</p>	 <p>21PoseiDrone,Italy</p>	 <p>25,Nguyen</p>	
fin + leg compound propulsion	 <p>⑧AQUA</p>	 <p>⑨AmphiHex</p>	 <p>⑱BUR-001</p>	 <p>⑮Mini Turtle-I</p>	 <p>pectoral fin +snake compound propulsion</p>	 <p>⑫ACM-R5</p>			
snake propulsion	 <p>⑩China_2001</p>				 <p>⑲Salamandra Robotica II.</p>	 <p>⑳Pleurobot</p>			
wheel + snake compound propulsion	 <p>⑪AmphiBot I</p>	 <p>⑬ACM-R7</p>				 <p>PoseiDRONE</p>			
wheel+ leg compound propulsion	 <p>⑦Whegs</p>					 <p>24,AmphiRobot II</p>			

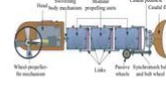


Fig. 1. The mechanism structure of the AmphiRobot II.



# Conclusions

- Amphibious robots will be widely used in daily life. They have outstanding performances and advantages in different application fields, especially in completing tasks difficult for the human. The summary and comparison of the reviewed robots from 13 different origins can guide the design and research of more complex future amphibious robots via biomimicry studies in terms of material, structure, and control mechanism. Different driving strategies can be adopted for the robots based on the moving principles of different organisms. Particularly, the summary of 10 different propulsion principles/modes reveals that the combined propulsion mode can significantly improve amphibious motion capabilities.
- However, most existing biomimetic robots merely partially imitate the origins. In all cases, biomimicry is limited. Future work might focus on deeper biomimicry of the origins, deeper multi-technology fusion, and multi-machine cooperation we have reviewed here.
- Future work may also need to tackle some concurrently bottlenecked technologies, such as cluster deployment capabilities, balance between mobility v.s. endurance, multi-sensor with omnidirectional consciousness, and the integration with modern technologies like 5G, AI, and big data.
- With the above-mentioned issues addressed, future amphibious robots can have a higher level of biomimicry, improved cooperative efficiency, increased terrain/task adaptability to better satisfy the ever-increasing demands in multiple fields.

