Leeches harnessed for mammal tracking

Jane Bradbury

Analysis of DNA harvested from the blood meals of leeches could help conservationists survey mammalian diversity in tropical forests, suggests new research published in the April 24 issue of *Current Biology* (2012; doi: 10.1016/j.cub.2012.02.058). "We found non-primate mammalian mitochondrial DNA in 21 out of 25 leech samples collected in the Central Annamite region of Vietnam", explains Thomas Gilbert (University of Copenhagen, Denmark). "Most excitingly, we identified DNA from several shy or cryptic species, including two only recently described for the first time."

Monitoring mammals in tropical forests with conventional approaches, such as tracking and camera trapping, can be laborious. Consequently, many researchers are turning to analysis of DNA in resources such as mosquito blood meals and predator feces as alternative ways of assessing mammalian biodiversity.

Gilbert and his colleagues at the Copenhagen Zoo got the idea of using leeches to screen for biodiversity after being attacked by these blood suckers while doing field work. To test the approach, they examined how long goat DNA persisted in medicinal leeches (*Hirudo* spp) fed on goat blood. "We actually ran out of leeches to test before the goat DNA had disappeared from the leeches", says Gilbert, "a result that suggested we would not have to collect leeches immediately after a blood meal to find mammalian DNA".

The researchers then looked for mammalian DNA in wild *Haemadipsa* spp leeches collected from a densely forested biotope in Vietnam. "Remarkably, although some of the leeches contained DNA from cows and pigs, we also detected DNA from forest species for which there were no confirmed local records, such as the Annamite striped rabbit and the small toothed ferret-badger", notes Gilbert.

"Leeches may be useful in some circumstances", comments George Amato of the American Museum of Natural History (New York, NY), "but I am skeptical that this approach will provide significant information on rare or shy animals". Instead, Amato favors comprehensive scat collection to recover DNA from forest mammals. Gilbert agrees that leeches are not the only way to survey mammalian diversity in forests, but, he points out, "leech sampling is simple and cheap, so we would encourage conservationists to give our approach a try". ■

Power through osmosis

Alison Gillespie

There was a point in the mid-20th century when many science-fiction writers predicted that almost everything in the future would be done via osmosis, so a press release from the American Chemical Society (ACS) last month seemed almost fictional, too. A team of ACS scientists had calculated exactly how much electrical power could be produced using osmosis near estuaries.

Generating electricity by osmosis is indeed already underway at a prototype power plant in Norway. It works like this: when fresh and salt water converge in a typical estuary, a salinity gradient is formed. If a semi-permeable membrane is placed between the two, an increase in pressure occurs that can be used to drive a turbine and generate electrical energy.

Known as pressure-retarded osmosis (PRO), this method may represent an exceptionally environmentally friendly way to produce power. In their paper, Menachem Elimelech and Ngai Yin Yip (Yale University, New Haven, CT) conclude that just one-tenth of the globe's current river water flow into the oceans could produce enough power to meet the electrical demands of 520 million people annually – without creating any greenhouse-gas (GHG) emissions (*Environ Sci Technol* 2012; doi: 10.1021/es300060m). By contrast, if coal-fired power plants were used for that same production, over one billion metric tons of GHGs would be released.

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Membranes used for osmotic power are coiled inside tubular pressure vessels.

Thus far, however, the manufacturing of the PRO membranes has not been included in these initial energy estimates. In order to work, those membranes must be incredibly clean; yet cleaning might require additional energy as well as toxic-chemical use and disposal. "This model looks at one aspect", Yip warns. A life-cycle analysis is still needed.

Questions have also been raised about possible changes to water temperature and salinity levels near PRO plants. "Everything depends on the conditions where you have your osmotic power plant", says Andre Staalstrom (Oslo, Norway), an oceanographer from the Norwegian Institute for Water Research. If the water being used is pristine, he says, then fewer chemicals may be needed for the cleaning process, but siting a new building where the water source is relatively clean might cause detrimental land-use impacts. On the other hand, locating plants adjacent to urban rivers where large industries already exist might demand more equipment cleaning.

"This whole technology is still in its infancy", admits Yip, but "in the coming years we hope more people will be paying attention to it." ■