Hot biology: investigating the thermal physiology of birds and mammals

Perhaps surprisingly many details of the thermal biology of animals are still unknown. Wildlife researchers try to fill the gaps in our knowledge of these fascinating processes. One of the organizations that push the boundaries of our knowledge in this field is the Institute of Biodiversity, Animal Health and Comparative Medicine at the University of Glasgow, Scotland.

"FLIR thermal imaging cameras have been a great help in recent research projects. Whether they were used for fieldwork or in the laboratory, these cameras give an interesting perspective into the thermal world of animals", explains Dr Dominic McCafferty, Senior Lecturer at the University of Glasgow.

One of the first research projects McCafferty was involved in as a graduate student employed thermal imaging technology. "We wanted to study the thermal distribution of a barn owl during flight and fortunately, an engineer introduced me to infrared thermography. This was in the early 1990s and thermal imaging systems were quite large and heavy, with relatively limited capabilities by today's standards. But I immediately realized the potential this technology had for research on animals."

Nowadays thermal imaging cameras are quite different, according to McCafferty. "For a biologist thermal imaging technology has really 'come of age', so to speak. The new generations of thermal imaging cameras with microbolometer detectors from FLIR Systems are compact, light and very easy to use, which is especially important if you want to use the camera in the field."

The FLIR P65 and E300 systems have most recently been used by McCafferty and colleagues at the University of St Andrews and Edinburgh Napier University.
to study the thermal physiology of marine mammals. Accurate and high spatial resolution of temperature is required for this purpose. Most species of seals need to renew their fur on a yearly basis, but skin temperature must rise in order to allow the new follicles to develop. The animals must therefore haul out onto land for longer periods of time to warm up. “With FLIR thermal imaging cameras we have been monitoring the thermal patterns and surface temperature of harbour seals throughout the process of molt. We have been able to show that the animal’s surface temperature peaks at around 30°C during this time, allowing seals to complete the molt quickly and return to the sea to feed. McCafferty believes that this data will improve our understanding of this important stage of the life cycle of the animals, and that seals may be vulnerable to human disturbance.

Animal welfare

Research on the physiology of molt is not the only way in which thermal imaging cameras have proved their worth for research on marine mammals. “We have used these cameras to examine the welfare of our study animals.” In scientific studies seals are normally marked with small plastic tags for long term identification. FLIR thermal imaging cameras were therefore used to monitor recovery from tagging in seal pups. “Within a few days after the animals were tagged the FLIR thermal imaging camera showed us that the area surrounding the tag was warmer than the rest of the flipper, indicating that tissue repair was underway. By the time the pups were weaned and ready to go to sea, there was no elevated temperature around the tags suggesting that much of the healing process was complete.”

FLIR in the lab

Although the FLIR thermal imaging camera has proven to be extremely useful in the field, it is also being used in the laboratory. “One of our students is conducting research on stress levels in captive finches. She uses the FLIR thermal imaging camera to determine the birds’ body temperature, which enables her to accurately determine how quickly the birds recover from a stressful situation.” The student in question is Hillary Anne Dalton. “The relation between stress and body temperature is well established in existing scientific literature” explains Dalton. “The FLIR thermal imaging camera is a great tool for this application. It allows me to determine the bird’s temperature from a distance, without making the bird aware of my presence.”

The zebra finch body temperature measured using the FLIR E200 thermal imaging camera is used as indicator of its level of stress.


For more information about thermal imaging cameras or about this application, please contact:

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