Creating a unique Zoological biobank with 2D barcode sample technology

Steve Knight , Commercial Director Ziath Ltd, Cambridge, UK

Using 2D barcoded sample tubes together with software and barcode scanners donated by Ziath Ltd., the Zoological Society of London (ZSL) aims to create an archive of unique specimens collected over the last 40 years that will be available for researchers worldwide.

Just a selection of the thousands of archived biological samples held by London Zoo

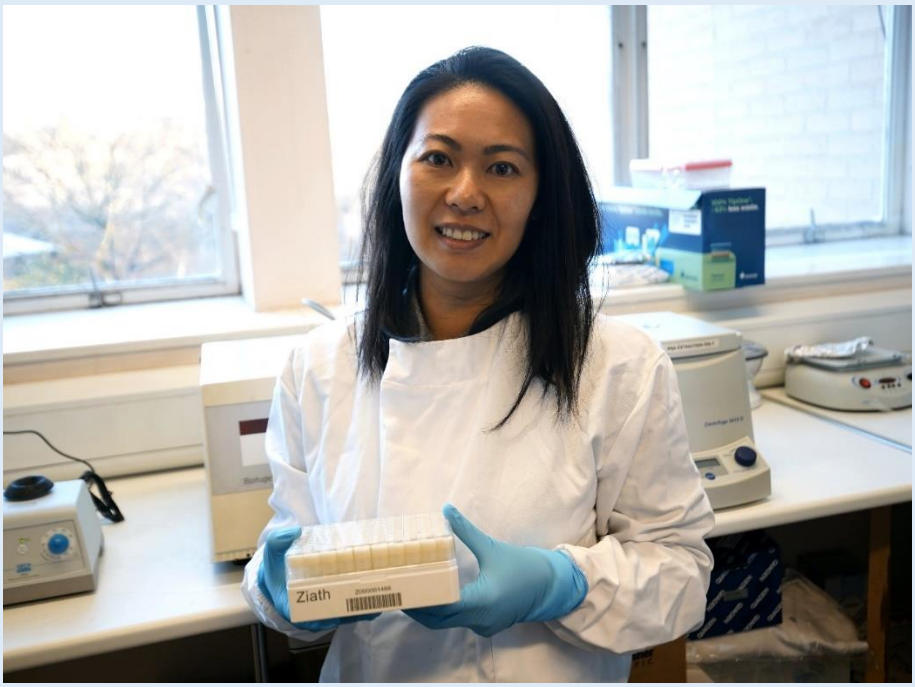
Hidden within the archives of the Zoological Society of London (ZSL) is a collection of old and rather neglected jars, boxes and plastic containers. The contents are fascinating. They include samples that have been donated from many different sources including tissue biopsies from animals with unusual diseases; objects seized by UK Border Force or the Metropolitan Police Force, who found them to be trafficked in contravention of the CITES convention; or simply specimens that some long-retired zoologist thought merited keeping. Many of the stored samples date back 40 years or more.

Aware of the value that the impressive collection has for research, staff at ZSL's Institute of Zoology recognised the need to catalogue, process and store the growing collection to

safeguard the integrity of the samples and to open the invaluable resource to researchers. However, funding for such a biobank can be hard to obtain, and cheap and efficient solutions are being developed to allow the biobanking process to move forward.

Louise Gibson, ZSL biobank manager at the Institute of Zoology in charge of this project, said: " Our aim is to sift through the accumulated specimens, identify them correctly, catalogue them and make biologically relevant samples available to researchers in other academic institutions worldwide as these samples hold immense value to researchers of zoonotic diseases which may one day become medically relevant to human health."

The importance of veterinary or zoological biobanking cannot be over-stressed. As humans continue to expand over unspoilt areas of Earth, the process brings us into closer contact with wild animals. Pandemic diseases can arise when humans and animals exist in the same physical locations without measures to prevent disease vectors transferring between the two. Covid-19 is thought to have emerged from wildlife, with pangolins and fruit bats implicated in its transmission at wildlife wet markets where bush meat and live animals are traded and there is a high risk of disease easily spreading if sanitation standards are not maintained. Disease vectors can then easily transfer from one species to another and to humans. This situation is not expected to improve in future years with increased globalization and climate change and so the risk of zoonotic disease spread is very real. Having a biobank of major wildlife species from around the globe is therefore a very useful adjunct to developing strategies and therapies for dealing with any future pandemic.



Louise Gibson in her lab at The Institute of Zoology in London, UK

So, how do you start building a zoological biobank? Louise and her team of volunteers were aware of the need for a robust sample management system to ensure the samples could be managed. They needed the system to be both cost effective and efficient due to the scale of samples within the collection.

Louise explained: “We needed a simple and robust method to store critical DNA and tissue samples from these specimens that would be easy to store, easy to retrieve and stand the test of time. In consultation with the sample management specialists at Ziath and their Managing Director, Neil Benn, in particular, we decided to use 2D-barcoded sample tubes that can be stored in racks in a deep freeze. In addition, we will use Ziath’s Samples software to track the locations of the stored samples in a more efficient manner. Some of our samples will require freezing and so we need a system in which we are confident that the labels won’t be compromised. We can’t afford the risks of having to destroy samples because labels are unreadable”

Ziath are providing ZSL with 2-D barcoded tubes and its Single Tube barcode reader which will be used in conjunction with Ziath Samples software. The technology will enable the team to quickly and easily retrieve samples from the collection when requested by researchers.

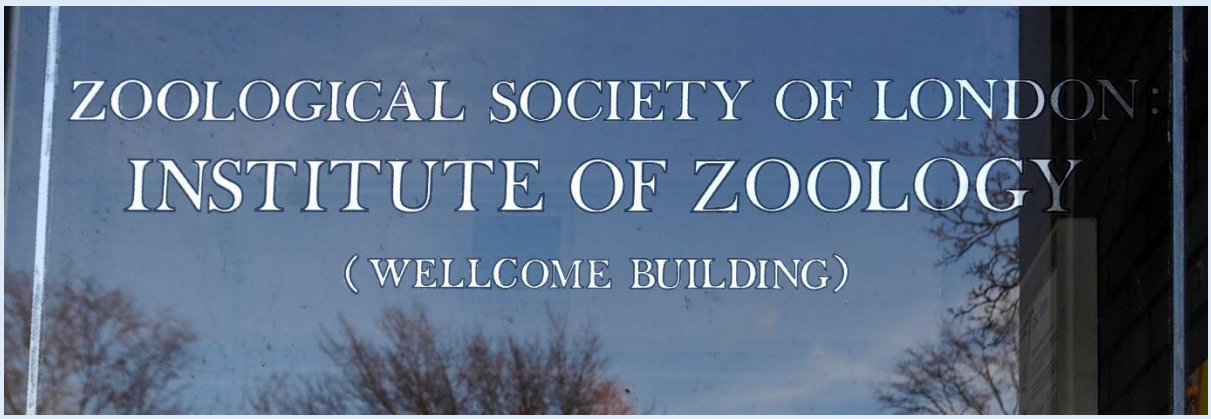
The “dry” samples at ZSL will be tagged with 2D barcode labels whilst “wet” samples will be stored in 2D barcoded tubes.

Azenta’s 2D barcoded sample tubes have the barcode laser etched onto the polypropylene base of each tube. This ensures it is secure and there is no risk of it being removed or falling off. It is chemically and mechanically resistant, giving peace of mind when handling and storing samples. This sample ID information can then be uploaded into a sample management system, and the 2D barcode data assigned to the samples. When a specific sample is required, the unique tube barcode, the barcode of the rack, and the position within the rack will all be available. Allowing the required samples to be retrieved with ease. This eliminates the need to stand at a freezer and search through hundreds of tubes to find the correct one.

Neil Benn from Ziath, which has recently joined the Azenta Life Sciences group of companies, explains: “Many available readers find it hard to read tubes covered in ice. The cold temperature can cause the window of the reader to “fog” over with a layer of condensation on the inside which is difficult to get rid of and to prevent. Ziath’s single tube reader comes with a special cryoprotection coating that effectively prevents this condensation forming.”

The samples will be catalogued using Ziath's Samples software. Many of the samples at the Institute of Zoology have not been catalogued and so the team face the enormous task of processing the thousands of specimens they hold.

"We are lucky in that we were able to recruit a team of volunteers who are supporting ZSL and the Natural History Museum with their biobanks," explains Louise. The volunteers are assessing the thousands of collected specimens and doing basic classification of the samples. Dividing them into CITES Annex A species and all others is one such classification. Annex A contains the most Critically Endangered species where illegal logging, poaching and trafficking pose the greatest risk to their survival. Further classification will look at whether a whole animal or just some part of it has been conserved.



The Institute of Zoology at London Zoo is a World-renowned centre of zoological research

For most modern biobanking applications, only a tissue sample or a small part of the animal needs to be stored. Access to DNA is the key to most modern research and this is the focus of the majority of biobanks. At the Institute of Zoology, DNA or whole tissue samples will be taken from the specimens that have been accumulated and which are correctly identified. The new sample will be housed in a 2D coded tube and details of the specimen entered into the Ziath sample management system to maintain the inventory using the Ziath Single Tube Reader to retrieve the information from the 2D barcode accurately.

Louise Gibson commented "This will be a mammoth task (no pun intended!); a slow and laborious process centred mainly on recognising and cataloguing the many thousands of specimens that ZSL has accumulated over the years. However, transferring the samples to organised, identified 2D coded tubes in 1D coded racks which can easily be stored in freezers and retrieved for further study will allow this fascinating archive of zoological specimens to be opened up for researchers worldwide for the very first time."

Louise and her colleagues are already beginning the process and hope to create a useable zoological biobank which other academic institutions will be able to access and find useful in their future epidemiological studies.

Further Information:

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