Case Study

NatureMetrics Standardizes Complex NGS Workflows That Turn Nature Into Data

Managing End-to-End Sequencing of Environmental DNA with Sapio LIMS Functionality Out-of-the-Box

NATURE METRICS

About the Project

Founded in
2014

Location
Surrey, Guildford, UK

Industry
Environmental Services

Website
www.naturemetrics.com/

Snapshot

NatureMetrics is a world leader in delivering nature data and intelligence. By leveraging cutting-edge technology that can capture and identify environmental DNA (eDNA) left by organisms in water, sediment, soil, and even air, the company generates large-scale biodiversity data to inform global sustainability and conservation efforts. With the grand mission of creating a comprehensive database of life on earth that will help humans identify how best to protect it, NatureMetrics needed more than cobbled-together spreadsheets to manage its unique and complex next-generation sequencing (NGS) workflows. The company adopted the modern, unified LIMS platform from Sapio Sciences, which has enabled NatureMetrics to:

- Adopt an end-to-end sample, material, and instrument management workflow, out-of-the-box.
- Track samples through a labyrinth of intersecting and parallel processes.
- Streamline decision-making and sample routing by automating key elements of quality control.

The Customer

NatureMetrics is a global nature intelligence technology company providing an end-to-end nature-monitoring and impact-reporting solution. The company's Nature Intelligence Platform, powered by eDNA, transforms species data at the site level into meaningful insights to manage and monitor nature and biodiversity. NatureMetrics' services, which include a robust platform for impact monitoring and reporting along with strategy development and survey capabilities, enable businesses to manage their impacts and dependencies on biodiversity at scale, converting the complexities of nature into simple insights to inform decisions about how operations affect the environment, conservation, and sustainability. The company's technology has supported biomonitoring around the world, including mining projects in West Africa, conservation projects in the Amazon rainforest, and renewable energy infrastructure projects in the UK.

The Challenge

Over time, NatureMetrics had accumulated a collection of interconnected spreadsheets and databases to manage its various sequencing workflows. "We developed somewhat clever methods of interlinking between spreadsheets and built dashboards to help manage processes," said Dr. Andrew Briscoe, Science Director at NatureMetrics. But even so, as the company scaled, this quickly became a limiting factor when as many as 40 NatureMetrics scientists needed to access data simultaneously. Plus, said Dr. Briscoe, the spreadsheets did not have the appropriate data integrity NatureMetrics required. Moreover, the inherent complexity of the existing databases spawned additional fit-for-purpose, but siloed, satellite spreadsheets that were difficult to (automatically) draw insights from.

> " We needed to mature our informatics environment to match the cutting-edge technology applied in other aspects of our business. Most of all, we needed a system that could support our complex workflows from start to finish and easily adapt as we made changes in our processes or added new types of experiments. "

Dr. Andrew Briscoe,
Science Director, NatureMetrics

The Solution

NatureMetrics initially looked at 15 different laboratory information management systems (LIMS) as it sought a modern informatics solution. Five contenders were evaluated by the NatureMetrics LIMS working group, and three finalists were put through their paces to see which would be best suited to NatureMetrics' unique needs.

NatureMetrics selected Sapio's platform, which unifies a LIMS, electronic laboratory notebook (ELN), and Jarvis scientific data management solution in the cloud. "The openness and flexibility of the Sapio solution impressed us, and the low-code/no-code system has enabled us to define standard processes and, importantly, make changes as our needs and technology evolve," said Dr. Briscoe.

Currently, the Sapio system supports around 50 scientists working in two labs located in the United Kingdom and Canada.

> " We didn't want to have to bend our processes to fit a LIMS. Rather, our goal was to find a system that could provide much of the functionality we required out of the box, with ways to perform easy configurations to the system to meet our needs without requiring massive amounts of coding. "

Dr. Andrew Briscoe,
Science Director, NatureMetrics

Results/Benefits

NatureMetrics is using the Sapio platform to standardize its complex NGS workflows and remove critical data-management bottlenecks. "It was game-changing to find one out-of-the-box workflow that could cover our entire process from start to finish, including everything from indexing of samples to sequencing and delivering results to our clients," said Dr. Briscoe.

For instance, the Sapio system has been configured to automate sample assignment on plates, accommodating the various plating requirements of the many assays and habitats in the NatureMetrics product catalog. Moreover, configuration has streamlined the parallel processing of samples from different projects and orders by automatically segregating samples as they are funneled into the Sapio Process queue.

Scientists were impressed with the platform's ability to manage pooled samples, which NatureMetrics employs to parallelize the high throughput sequencing of samples. With the Sapio platform, scientists can visualize a hierarchical, parent-child pedigree of their samples and subsamples as they progress through the NGS workflow.

The Sapio platform also helped NatureMetrics streamline decision making around quality-control metrics related to sensitivity. NatureMetrics requires extremely high sensitivity given the tiny amounts of DNA pulled from environmental sources. This means samples are susceptible to contamination by humans and more commonly occurring species, such as livestock and other domestic animals. The Sapio platform tracking of all associated materials, reagents, and instruments used in the experiments help facilitate monitoring and containment of potential contaminants.

Prior to implementing the Sapio platform, scientists at NatureMetrics required frequent meetings to review experimental metrics and determine which samples might need to be rerun after failing quality control. The Sapio platform can apply a set of preconfigured rules to make a variety of quality-control decisions automatically, rerouting samples back through sequencing when certain thresholds are reached and rejecting samples that fail to meet specific measures. "This hard set of rigorous quality control rules is enabling us to eliminate these meetings so that we can better focus resource on processing samples through the lab," said Dr. Briscoe.

NatureMetrics learned several key lessons while implementing the Sapio platform.

- **Kick-off meetings** with Sapio kept everyone aligned and specified criteria that needed to be accepted at each implementation stage.

- **Testing was essential.** "We really tried to break the system during the UAT phase to know exactly how the system would react to different scenarios," said Dr. Briscoe.

- **Having detailed documentation** of requirements and existing processes ensured that the company could move quickly in implementing the Sapio platform.

- **To take the system live,** NatureMetrics ran the Sapio platform alongside the company's old systems, which not only helped with training, but enabled NatureMetrics to catch any remaining bugs and issues during rollout.

Thinking ahead, NatureMetrics will be adding additional elements currently managed on different platforms, including ways to track stock levels and equipment maintenance. Dashboards are also being implemented for different scientific tasks. In the long term, the company plans to integrate the Sapio platform directly with instrument software and other business systems, including NatureMetrics' ERP and data warehouse.