ARTS-SCIENCE COLLABORATION – NATURAL ENGLAND

E-DNA MONITORING TEAM

1. OVERVIEW

This document details the project proposal that has emerged from collaboration between Ashish Ghadiali and Natural England's E-DNA Monitoring team as part of Natural England's Arts-Science Collaboration (July to December 2024). It consists of an approach to e-DNA monitoring that would enable Ghadiali, working through Radical Ecology CIC, to consider the technology of DNA through the prism of visual cultures and to share this exploration with a wider community, inviting reflection on the power of e-DNA technology to broaden our collective understanding of biodiversity at a local level and to develop, as a lived experience, the awareness of life and its forms even where these forms remains invisible to the human eye.

2. BACKGROUND

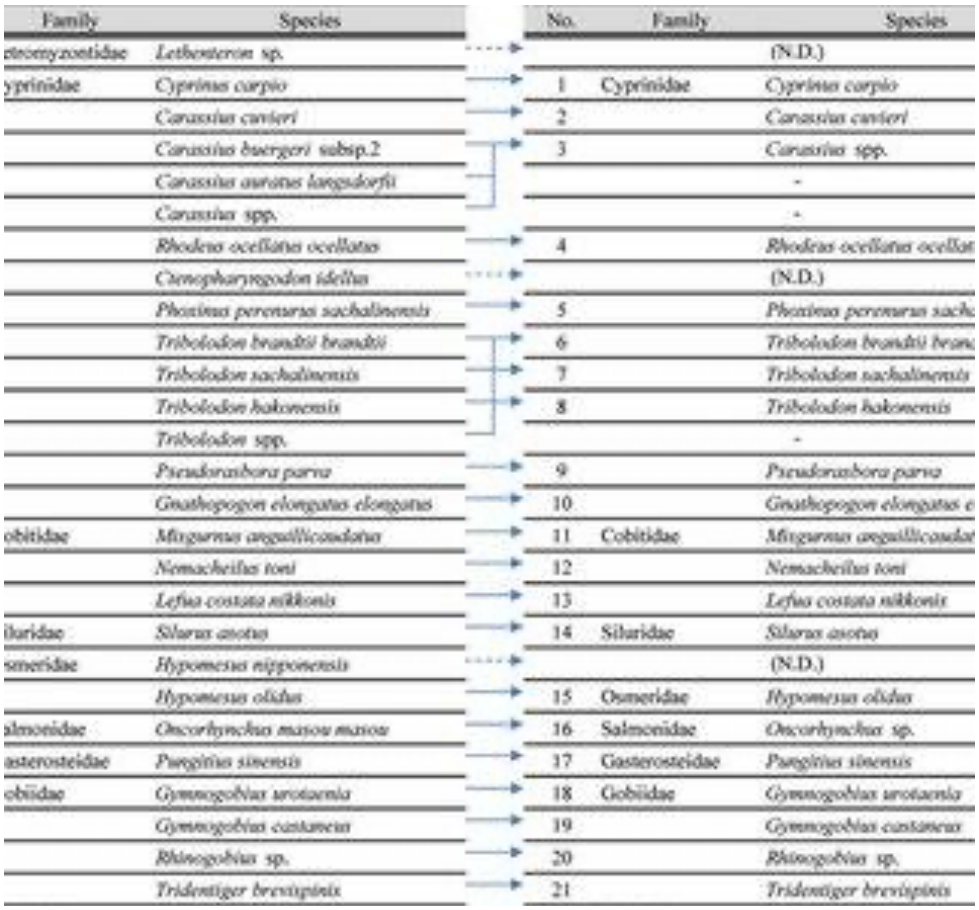
The project situates the emergence of DNA sequencing within the art historical context of the history and phenomenology of photography and acknowledges a lineage of 20th century theoretical writing including Walter Benjamin's *The Work of Art in an Age of Mechanical Reproduction*, Roland Barthes' *Camera Lucida*, John Berger's *Ways of Seeing* and Susan Sontag's *On Photography* that has responded to the cultural dominance of the photography as a medium by asking the question, in what way does photography shape our experience of reality?

At the beginning of our collaboration, the process of DNA monitoring seemed, to the artist, to challenge an active engagement with photographic/film representation in

that the activity that it monitors is largely invisible to the human eye. Investigation of the process involved in eDNA revealed, at the level of visible activity, the silent functions of a machine in a lab that resembles a photocopier (fig. 1) and that culminates in the generation of spreadsheets (fig.2). Not cinema gold!

The aim of the project is to facilitate an awareness of DNA's great value being precisely its ability to represent a world ostensibly invisible in human experience and therefore to lead inquirers to a lived sense of a reality that is broader than the primarily visual one that drives mainstream culture in the 21st century. Our method is to design and eventually deliver a process that allows non-scientists to experiment with DNA monitoring in much the same way that a novice might experiment with the art and craft of photography, and to consider how the practice of DNA monitoring, even as an amateur, might lead towards questions about biodiversity in one's own environment that in turn might enrich the practice of science by elevating marginalised perspectives.

Fig. 1



Family	Species	No.	Family	Species
eromyzontidae	*Lethenteron* sp.			(N.D.)
yprinidae	*Cyprinus carpio*	1	Cyprinidae	*Cyprinus carpio*
	Carassius cuvieri	2		*Carassius cuvieri*
	Carassius buergeri subsp.2	3		*Carassius* spp.
	Carassius auratus langsdorfii			-
	Carassius spp.			-
	Rhodeus ocellatus ocellatus	4		*Rhodeus ocellatus ocellat*
	Ctenopharyngodon idellus			(N.D.)
	Phoxinus perenurus sachalinensis	5		*Phoxinus perenurus sachi*
	Tribolodon brandtii brandtii	6		*Tribolodon brandtii bran*
	Tribolodon sachalinensis	7		*Tribolodon sachalinensis*
	Tribolodon hakonensis	8		*Tribolodon hakonensis*
	Tribolodon spp.			-
	Pseudorasbora parva	9		*Pseudorasbora parva*
	Gnathopogon elongatus elongatus	10		*Gnathopogon elongatus e*
obitidae	*Misgurnus anguillicaudatus*	11	Cobitidae	*Misgurnus anguillicaudat*
	Nemacheilus toni	12		*Nemacheilus toni*
	Lefua costata nikkonis	13		*Lefua costata nikkonis*
luridae	*Silurus asotus*	14	Siluridae	*Silurus asotus*
smeridae	*Hypomesus nipponensis*			(N.D.)
	Hypomesus olidus	15	Osmeridae	*Hypomesus olidus*
lmonidae	*Oncorhynchus masou masou*	16	Salmonidae	*Oncorhynchus* sp.
asterosteidae	*Pungitius sinensis*	17	Gasterosteidae	*Pungitius sinensis*
obiidae	*Gymnogobius urotaenia*	18	Gobiidae	*Gymnogobius urotaenia*
	Gymnogobius castaneus	19		*Gymnogobius castaneus*
	Rhinogobius sp.	20		*Rhinogobius* sp.
	Tridentiger brevispinis	21		*Tridentiger brevispinis*

Fig. 2

3. APPROACHES TO CITIZEN SCIENCE

The project reflects on advances in the technology of DNA sequencing, as exemplified by Nanopore's Minion, which has radically brought down the cost of equipment and the process as a whole. Our intention remains to establish a guerrilla DNA monitoring unit within the studio at Radical Ecology and we have discussed aspects of this workflow with contacts at Nanopore, as well as at the Life Sciences Institute at the University of Exeter. In the long-term this would enable Radical Ecology to offer engagement with DNA to its circle of participants in the south-west which includes creative practitioners, environmentalists, refugees and asylum

seekers and young people. Key risks identified include challenges around cost, accessibility of the elements of the workflow (e.g. extraction) and the difficulty inherent in obtaining a usable sample.

4. PROPOSED COLLABORATION WITH LIFE SCIENCES INSTITUTE, UNIVERSITY OF EXETER

Following discussion with colleagues at the Life Sciences Institute, University of Exeter, we agreed a plan to collect 12 samples, of which 6 would contain 16s solution which in turn provides data on bacterial life detected through the sample selection, while another would contain 18s selection, generating data about complex life. Through this process, we would generate a species list that it turn might point the local community towards new pathways of understanding biodiversity in the ecosystem under investigation.

5. ASSESSING THE ECOLOGICAL VALUE OF A POST-PLANTATION ECOSYSTEM

Fig. 3

Fig. 4

The project aims to make a comparison between biodiversity data generated in a post-plantation ecosystem and in an ancient rainforest ecosystem. The site identified are the North Wood in Dartington (fig. 3), and Wistman's Wood on Dartmoor (fig. 4) – two very different kinds of habitat located on different stretches of the same river (Dart).

6. PROCESS: SAMPLING, EXTRACTION, AMPLIFICATION, SEQUENCING, ANALYSIS

The proposed accompany film output would also describe the stages of this process from field to lab including sampling, extraction, amplification, sequencing and analysis. It's of interest that the language of this process reflects a language used both in electronic music and in the historical accounts of the practice of alchemy. The later aims of the project might be to reflect on these parallels whilst presenting potential participants with, effectively, an instructional video that would inform participation in the process.