

Freshwater species inventory by electrofishing

Protocol

Guidelines on Electrofishing procedure

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JRS Biodiversity Foundation

Project Title: Project Title: Developing a freshwater biodiversity information system for long-term conservation and management in the Seychelles

Purpose and Summary

The project is targeting to conduct baseline surveys and annual biodiversity inventories of fish, micro and macro invertebrates in 15 rivers including the collection of genetic materials through eDNA. All data collected will be integrated into the Bio database and GBIF (Global Biodiversity Information Facility).

Traditional research techniques of electrofishing are frequently the only ways to efficiently gather fish in places that are not amenable to other traditional techniques. In order to help with collecting, electrofishing temporarily stuns fish in the water by introducing an electric current. To sample smaller streams, electrofishing devices can be carried in a backpack; to sample larger rivers, they can be carried on a barge that is towed through the water; or they can be fixed to a boat to sample larger rivers and lakes. Electrofishing units consist of one or more electrodes (anodes and cathodes), a power control mechanism that adjusts the electric current to maximise efficiency and minimise potential fish damage, and a generator that generates an electric current.This protocol's goal is to reduce fish and other animal harm and death during electrofishing.

Fish have predictable reactions to electricity. Fish will avoid the electric field if they can sense it from a distance. Electric fishing is performed in wadable streams by progressing in an upstream direction; in that way the water stays clear in front of the operators. The method (non-lethal) consists in placing a fishing electrode near habitat shelters in which the animals are found; the electrode creates an electrical field, which has an attraction effect.Fish will swim towards the anode (taxis) if they are in the electric field. Electric fishing is performed in wadable streams by progressing in an upstream direction; in that way the water stays clear in front of the operators. The method (non-lethal) consists in placing a fishing electrode near habitat shelters in which the animals are found; the electrode creates an electrical field, which has an attraction effect within a radius of a one-meter zone under average conditions. When a fish comes within this field, it is stunned; it can then be caught easily with a hand net.

Snorkeling with mask and hand nets will be also used, if possible, as a complementary method to the electrofishing. Each species caught is identified on the field and released.

Personal safety and other considerations

I. Safety should be the primary concern of all personnel.

II. Individuals with a pacemaker or other cardiac issues should not assist with electrofishing.

III. At least 2 people should be CPR certified. All personnel should know the location of the nearest hospital.

IV. Personnel wading in streams and rivers during electrofishing must have nonbreathable waders with rubber soles. Personnel assisting in service of media or reporting must wear rubber soled boots.

V. Waders, boots, and gloves must be inspected regularly to ensure that there are no leaks.

VI. Insulated rubber gloves should be worn by all personnel while electrofishing**.**

VII. All electrofishing units should have maintenance and safety inspections once a year.

VIII. An electrofishing safety "pre-check" should be conducted before each use to make sure the equipment is working and that all personnel understand safety instructions.

IX. Personnel should review commands (e.g., "Power on","Power off") before electrofishing.

X. The power supply should only be connected immediately before sampling and disconnected immediately after sampling.

XI. Personnel must have proper permits to use electrofishing equipment.

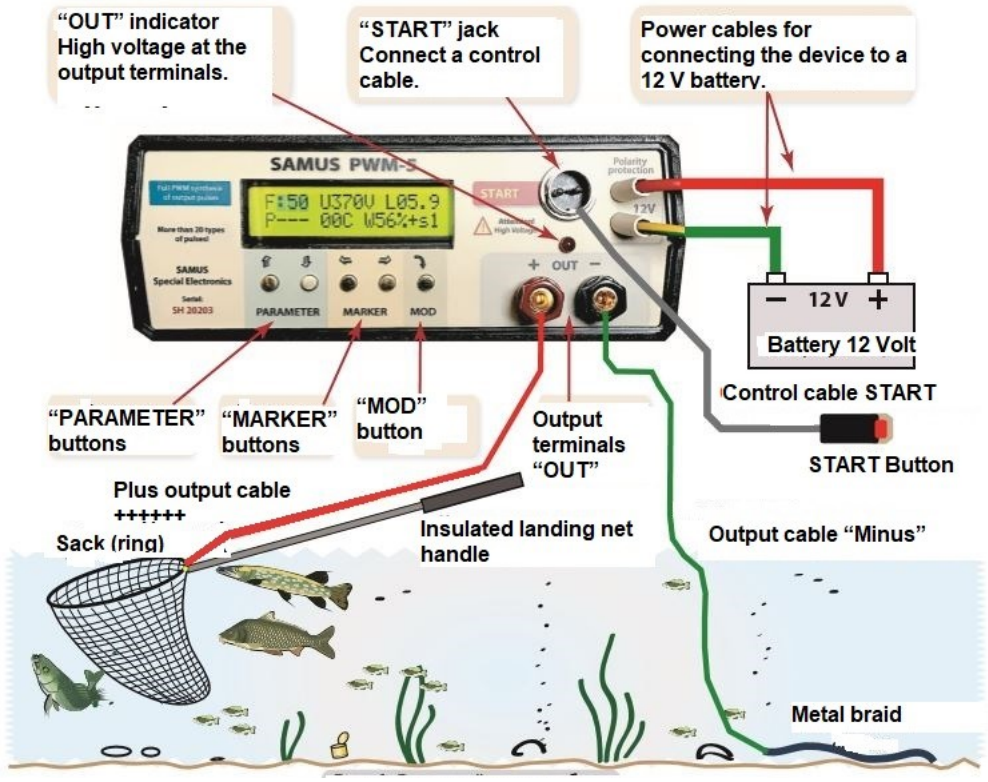
XII. All individuals on the electrofishing crew should bring with them all the items they need for a full day of fieldwork, including but not limited to:

- Wading belt when wearing waders (if sampling in deep streams or rivers).
- Polarized sunglasses (if sampling during the day), brimmed hats and sunscreen
- Water and snacks/food
- Insect repellant
- A change of dry clothes and towels
- **Appopriate field shoes**
- Any medications/medical equipment needed

Electrical fishing equipment

Electrofishing will be led by Gaea Seychelles and experts from Muséum national d'Histoire naturelle(MNHN). An electrofisher SAMUS series designed for electrofishing in freshwater) is used for the sampling of freshwater animals . The electrofisher is powered by a 6-7 Amp and 12 Volt battery with an output power of up to 350 W. The electrofisher is connected to an anode (usually a green cable) and a cathode (usually a red or brown cable) to generate the electrical field. The control cable plug is inserted into the "START" socket, at the other end of which there is a "START" button under the rubber, moisture-proof cap, through which the device is turned on / off. When the device is turned on, it sends high voltage pulses to the "OUT" output terminals, along with the red "OUT" indicator flashing and sound emitter pulses.

A password is needed to operate the electrofisher. Using the "MARKER" and "PARAMETER" buttons, you must enter the password. Use the "MARKER" buttons to select the desired number. It is highlighted by a black flashing square (marker). Use the "PARAMETER" buttons to set the required number. If the password is correct, the message 'GOOD LUCK!' appears for a few seconds, and the device display goes to the main parameters window where the following setting is used: F 30 to 50, and U 100 to 200. This completes the connection of the device and is now completely ready for use.



Procedures

1. All personnels should stay clear of the water and should not disturb the animals prior to sampling.
2. A minimum of four personnels are required for electrofishing: one person wearing the electrofishing unit (the electrofisher), two individuals with dip nets (i.e. “netters”) located on either side of the electrofisher and slightly downstream, and one individual holding a transfer bucket filled with fresh water.
3. All personels should wear waterproof wellington boots or waders prior to electrofishing to protect against electric shock. Personels without protective gears should not approach the electrofisher.
4. Electrofishing settings should be set at the lowest voltage and frequencies possible. For the purpose or electrofishing in the rivers of Seychelles, the following setting is used: F 30 to 50, and U 100 to 200.
5. Only trained and authorized individuals may operate the electrofishing equipment while abiding by the Gaea Seychelles field safety guidelines (Annex 1). Inexperienced personnel must be accompanied by trained individuals to learn how to use the gear.
6. A bucket should be filled with water prior to fishing.
7. Colored buckets are preferred over transparent ones due to avoid stress inducement by elevated cortisol values which may affect fish welfare and survival for long duration.
8. Sampling is performed by moving upstream shocking habitats of targeted fish species. The animal may experience narcosis—a state of immobility in which its muscles are relaxed. Netters will collect the stunned animals using nets and transfer them to the bucket.
9. Should small fish species be stung and presents with muscle shock, gently massage them until they relax and restore normal movement. If Incidental animal mortality associated with the survey methods occurs, the species data should be recorded to the site location together with voltage on the electro fisher used and electrical conductivity of water at that point at the site. The animal can be kept as specimens.
10. The individual holding the transfer bucket will monitor the animals as sampling progresses.
11. Animals should be processed as soon as possible (Identification or fin clips). Refer to **section 3** for specimen collection procedures.
12. catch them and place them in the bucket of water.

Data recording

Field data records are taken with field forms Annex.1

Field Data Records are recorded in Arena Open Foris Annex.2 by using Bio-Eplo Survey Annex.2

Section 3

Specimen collection

Why?

To constitute DNA barcoding reference libraries a piece of fin will be taken while the fish will be anaesthetised (the fish is awakened in clear water before it is released). Fin clips will be stored and preserved in 95% ethanol for molecular analysis (partial COI gene). Specimens are also collected for educational purposes.

How?

- For agile species such as eels, they should be placed in a bucket with two or three drops of clove oil for numbing and calming. Tis will allow for fin clips to be taken.
- Clove oil is also used for collection of whole specimens instead of using pure alcohol. This is done as the best human way as it only reduces the oxygen levels in the fish whereas direct alcohol shocks and stresses the species more.
- Sampling tube should be labelled with date, site location, species name in field, using a pencil.
- Sample should be stored in a cool, dry place (if possible, in the fridge)

Annex.1

Date:	Observer:	Island:	Lat:
Time:	Survey:	River:	Long:

Anguillidae
Anguilla bicolor
Anguilla marmorata

Moringuidae
Moringua microchir

Aplocheilidae
*Pachypanchax playfairii**

Cyprinidae
Carassius auratus (int)

Poeciliidae
Poecilia reticulata (int)

Mugilidae
Crenimugil crenilabis
Planiliza macrolepis
Crenimugil buchanani
Crenimugil seheli

Ambassidae
Ambassis urotaenia

Kuhliidae
Kuhlia mugil
Kuhlia rupestris

Cichlidae
Oreochromis mossambicus (int)

Belontiidae
Trichogaster trichopterus(int)

Osphronemidae
Osphronemus goramy (int)

Gobiidae
Bathygobius meggitti
Glossogobius callidus
Glossogobius giuris
Psammogobius cf biocellatus
Mugilogobius fuscus
Mugilogobius mertoni
Redigobius bikolanus

Atyidae
Atyoida serrata
Caridina typus
Caridina natalensis
Caridina cf serratirostris nsp*
*Caridina similis**
Palaemon concinnus
Palaemon debilis

Palaemonidae
Macrobrachium idae
Macrobrachium equidens
Macrobrachium lar
Macrobrachium grosses pinces to be verif

Gecarcinucidae
*Seychellum alluaudi**

Grapsidae
Varuna litterata
Sesarmops impressum

Sesarmidae
*Scandarma nsp**
Parasesarma plicatum

Tide:
Cloud Cover (%):

Kraemeridae
*Kraemeria cf samoensis Steindachner (*OOI)*

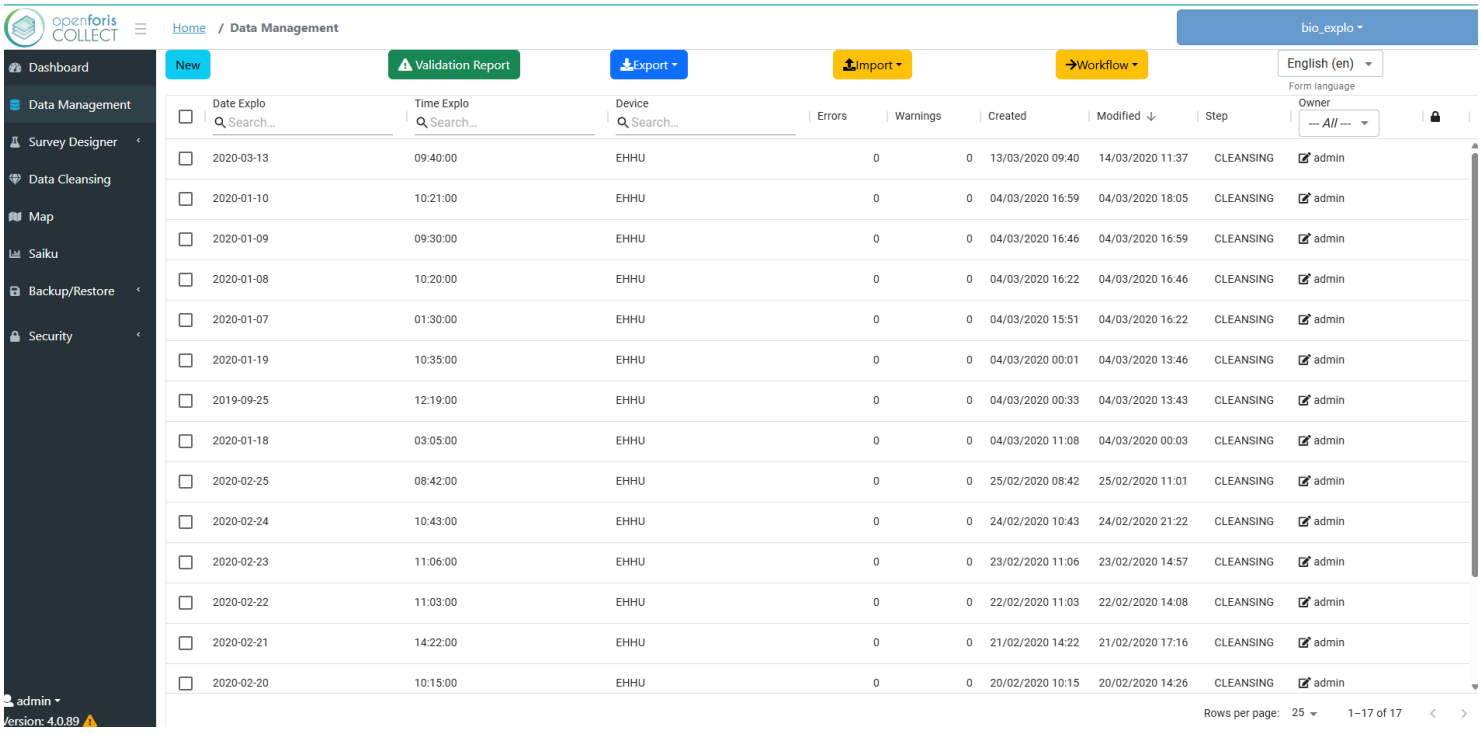
Microdesmidae
Parioglossus taeniatus
Parioglossus multiradiatus Keith*

Eleotridae
Eleotris fusca
Eleotris acanthopoma B
*Eleotris klunzingerii (*OOI)*
*Eleotris pellegrini (*OOI)*
*Eleotris valadei 2020*OOI*
Eleotris nsp (Praslin 2020) to be verified
*Ophiocara porocephala *OOI*

Canopy Cover(%):
River Micro Habitat desciption:
River bank:
Species observation:
Contaminants:
Possible threats:

Field collection form for fish and crustaceans inventory (Derived from form used by Paris Natural History Museum)

Annex.2



Interface of Arena Collect dashboard and data management system.