

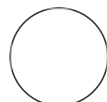


APR 17, 2023

Sakata et al. Fish SedDNA Extraction Protocol

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ABSTRACT

Variations of this standardised protocol have been used by Masayuki K. Sakata and colleagues to successfully extract fish eDNA from modern and historic Japanese lake and river sediments.

The method has been used to recover fish species composition data from modern surface sediments from a lake (Sakata et al., 2020) and a small, natural river (Sakata et al., 2021). It has also been applied to detect target fish species in lake sediments up to 100 years old (Sakata et al., 2022).

This extraction method represents a consolidation of the methods applied in the following publications:

- Sakata, M. K., Yamamoto, S., Gotoh, R. O., Miya, M., Yamanaka, H., & Minamoto, T. (2020). Sedimentary eDNA provides different information on timescale and fish species composition compared with aqueous eDNA. *Environmental DNA*, 2(4), 505– 518. <https://doi.org/10.1002/edn3.75>
- Sakata, M. K., Watanabe, T., Maki, N., Ikeda, K., Kosuge, T., Okada, H., ... Minamoto, T. (2021). Determining an effective sampling method for eDNA metabarcoding: a case study for fish biodiversity monitoring in a small, natural river. *Limnology*, 22(2), 221–235. <https://doi.org/10.1007/s10201-020-00645-9>
- Sakata, M.K., Tsugeki, N., Kuwae, M., Ochi, N., Hayami, K., Osawa, R., Morimoto, T., Yasashimoto, T., Takeshita, D., Doi, H., & Minamoto, T. (2022). Fish environmental DNA in lake sediment overcomes the gap of reconstructing past fauna in lake ecosystems. *bioRxiv*, <https://doi.org/10.1101/2022.06.16.496507>

OPEN  ACCESS

DOI:

dx.doi.org/10.17504/protocols.io.6qpvr4n8ogmk/v1

Protocol Citation: Masayuki K. Sakata 2023. Sakata et al. Fish SedDNA Extraction Protocol. **protocols.io** <https://dx.doi.org/10.17504/protocols.io.6qpvr4n8ogmk/v1>

MANUSCRIPT CITATION:

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Protocol status: Working
We use this protocol and it's working

Created: Apr 10, 2023

Last Modified: Apr 17, 2023

MATERIALS**Reagents:**

- NaOH (0.33M)
- TE buffer (pH 6.7) (Prepared with Tris-HCl buffer: 10 mM, EDTA: 1 mM)
- Tris-HCl (1M, pH 6.7)
- NaAc (3M, pH 5.2),
- Ethanol (99.5%),
- G2 enhancer (AMPLIQON, liquid type)


Kit: DNeasy PowerSoil Kit (QIAGEN)


Required equipment:

- Thermostatic bath
- Centrifuge (capable of centrifuging 50mL, 15mL, 1.5mL tubes)
- Vortex
- Vortex adapter (adapter to fix tube)
- Lo-Bind tubes for storage (recommended)

Alkaline extraction

50m

1 **PLACE**  9.0 g of sediment sample into a 50 mL tube

ADD  6 mL NaOH

ADD  3 mL TE buffer

ADD  500 μ L G2 enhancer


Note

Sediment volume can be adjusted but reagent volumes should remain the same

2 **VORTEX** samples to mix


50m

INCUBATE samples at  94 °C for  00:50:00

3 **ALLOW** samples to cool to  Room temperature

30s

CENTRIFUGE at  5000 x g for  00:00:30

4 **TRANSFER**  7.5 mL of supernatant to a new 50 mL tube

NEUTRALIZE by adding  7.5 mL Tris-HCL (1M)

Ethanol precipitation



1h 20m

5 **ADD**  1.5 mL sodium acetate

VORTEX well to mix

6 **ADD**  30 mL of ethanol

VORTEX well to mix

7 **INCUBATE** at  -20 °C for at least  01:00:00



1h

Note

Incubation at  -20 °C  Overnight is recommended

8 **WIPE** off condensation from around the 50 mL tube and centrifuge at 5,350xG for 20 min

20m

CENTRIFUGE at  5350 x g for  00:20:00

9 **DISCARD** supernatant and leave the tube mouth down for a few minutes

TRANSFER the precipitate to a PowerBead Tube (Qiagen Kit)

DISSOLVE the remaining precipitate with  100 µL of DW then transfer to the PowerBead Tube


DNeasy PowerSoil extraction

22m

10 **ADD**  60 µL of Solution C1

10m 30s

VORTEX at max speed for  00:10:00

CENTRIFUGE at  10000 x g for  00:00:30


















Note



Vortex for 15-20 minutes if you have more than 12 samples

11 **TRANSFER** supernatant to a new 2 mL tube

Note

Expect ~700ul of supernatant, but the more supernatant transferred, the better


- 12** **ADD**  250 µL of Solution C2 6m
- VORTEX** briefly to mix
- INCUBATE** at  4 °C for  00:05:00
- CENTRIFUGE** at  10000 x g  00:01:00
- 13** **TRANSFER**  600 µL of supernatant to a new 2 mL tube 6m
- ADD**  200 µL of Solution C3
- VORTEX** briefly to mix
- INCUBATE** at  4 °C for  00:05:00
- CENTRIFUGE** at  10000 x g for  00:01:00
- 14** **TRANSFER**  750 µL of supernatant to a new 2 mL tube 6m
- ADD**  1.2 mL of Solution C4
- VORTEX** well to mix
- 15** **TRANSFER**  675 µL to a Spin Filter 1m
- CENTRIFUGE** at  10000 x g for  00:01:00
- DISCARD** the liquid filtrate
- 16** **REPEAT** the above step until all liquid has passed through the Spin Filter
- 17** **ADD**  500 µL of Solution C5 to the Spin Filter 30s

CENTRIFUGE at  10000 x g for  00:00:30



DISCARD the liquid filtrate

18 **TRANSFER** the Spin Filter to a new 1.5 mL tube

1m 30s

ADD  100 μ L of Solution C6 to the Spin Filter

LET stand for  00:01:00

CENTRIFUGE at  10000 x g for  00:00:30

19 **DISCARD** the Spin Filter

DNA is now ready for downstream applications