



New

Scientific Research

Period of operation: from 0001-01-01 to 0001-01-01

Loïc Sanchez
Université de Montpellier, MARBEC
Pl. Eugène Bataillon
Montpellier Occitanie 34090
France
D⁵6C D⁰C: +33635305609, 7b4⁵d^C:

$\epsilon_b \Delta^c \dot{\bar{N}}_0 \sigma^b \wedge c_n d\epsilon^f b^g d n d^q l^a \sigma^b$

Who? I am a PhD student at the MARINE Biodiversity Exploitation and Conservation (MARBEC) laboratory, in the Université de Montpellier. We are working in collaboration with Louis Bernatchez at the Université Laval. We will also collaborate with two groups of explorers, "La Voie Arctique" and "Le Vagabond", who will sail on the arctic seas this summer. Both boats were designed to reduce all pollution and greenhouse gas emissions. What? Our goal is to sample environmental DNA (eDNA) in the Arctic regions of Canada, with a protocol completely carried out offshore (2 different boats). One boat will host 3 persons, the other one will host 4 persons. No facilities will be constructed. The analysis of eDNA will be carried out in France, and results will be shared with local communities and published in an open access journal. Sampling eDNA only requires to filter surface seawater: indeed, it has no impact on wildlife, it doesn't affect the species behavior and provides better results than most conventional survey methods. Why? We hope to survey marine fish communities in coastal waters, in order to detect early species arrivals due to climate change. This region is one of the less surveyed on the globe, but also the region where climate change will have the strongest effects, and thus we expect strong changes in the fish communities. We believe it is of great importance to study the area to know which marine fish species are present in the local communities. Where? One of the boats will sail from Sachs Harbour (Inuvialuit), to Greenland, thus passing through Nunavut in its northernmost parts, and the second boat will sail in the Baffin Sea, from Grise Fiord to Saint Pierre & Miquelon. The Vagabond will pass near 6 local communities: Iqaluit, Pangnirtung, Qikiqtarjuaq, Clyde River, Pond Inlet, and Grise Fiord. When? The Vagabond boat will start from Grise Fiord in early September, while La Voie Arctique will start from Sachs Harbour in June, and get to Nunavut as soon as the weather and the winds allow.

▷ΔΛΠΔ: Qui ? Je suis un étudiant en doctorat à au laboratoire MARBEC (MARine Biodiversity Exploitation and Conservation) à l'Université de Montpellier, et je travaille en collaboration avec Louis Bernatchez à l'Université de Laval. Ce travail se fera aussi en collaboration avec deux groupes d'explorateurs, « La voie arctique » et « Le Vagabond », qui navigueront à la voile dans les eaux arctiques cet été. Les deux bateaux sont optimisés pour réduire toute pollution et émissions de carbone. Quoi ? Notre but est d'échantillonner de l'ADN environnemental (ADNe) dans la région arctique du Canada, avec un protocole mené à bien en totalité au large, sur 2 différents bateaux. Il y aura 3 personnes à bord de l'un des bateaux, et 4 personnes à bord du second. Aucune construction d'infrastructure n'aura lieu durant l'expédition. L'analyse de l'ADNe sera réalisée en France, et les résultats seront partagés avec les communautés locales, puis publiés dans un journal en accès libre. L'échantillonnage de l'ADNe requiert seulement une filtration de l'eau de mer en surface : ainsi, elle n'a aucun impact sur la biodiversité locale, et n'affecte pas le comportement des espèces. Aussi, elle fournit de meilleurs résultats que les méthodes conventionnellement utilisées. Pourquoi ? Nous aimerions inventorier les espèces de poissons marins des eaux côtières afin de pouvoir détecter de potentielles arrivées d'espèces à cause du changement climatique. En effet, l'Arctique est une région des moins bien connues sur le globe, mais c'est aussi la région dans laquelle le changement climatique aura les effets les plus forts. Ainsi, on peut s'attendre à de fortes variations des assemblages d'espèces dans cette région, et c'est pour cela que nous pensons qu'il est d'importance capitale d'étudier cette zone. Où ? L'un des bateaux partira de Sachs Harbour (Inuvialuit) et naviguera jusqu'au Groenland, et passera donc au Nord du Nunavut. Le second bateau naviguera sur la Mer de Baffin, de Grise Fiord jusqu'à Saint-Pierre et Miquelon. En passant par ce trajet, le bateau sera amené à passer proche de 6 communautés locales : Iqualuit, Pangnirtung, Qikiqtarjuaq, Clyde River, Pond Inlet et Grise Fiord. Quand ? Le Vagabond démarrera de Grise Fiord début Septembre, tandis que La Voie Arctique partira de Sachs Harbour début Juin, rejoignant ainsi les eaux du Nunavut aussi tôt que les vents et la météo le permettront.

[illegible]

Post-Closure Phase: from to

$$\Lambda \subset \mathbb{N} \triangleleft \mathbb{N} \xrightarrow{\sigma} \mathbb{N} \xrightarrow{\sigma^6} \mathbb{N}^c$$

ᐱᓯ	ᖃᓄᐃᑦᑐᒥᑦ ᐱᑕᓚᐳᖃᑦᓂᐳᖅ	ᑭᐃᑦ ᓄᐱᑦᐃᑦᑕᓂ	ᑐᕋᐃᒪᓴᖅ ᓄᐱᐅᑦ ᖃᓄᖃ ᐳᑐᒪᐅᑕᐅᖃᑦ ᑭᒪᓴᓇᐳᖅᓴᓂᖅ	ᐃᑦᕋᓂᑕᖃᑦᐱᐅᑕᑕᐅᖅ ᐃᓄᖃᓄᑦ ᐱᑦᕋᖃᑕᐅᖃᑦᑕᑦᓂᐳᑕᑦᑐ ᑕᐃᑦᑭᒪᓂᑐᖃᐅᑕᖅᑐᖅ	ᖃᓂᓴᓂᖅᑕᖅ ᓄᐱᑕᒥᓴᐅᑦᕋᖅ ᐳᖅᒪᑐ ᕋᑦᑦᒥᖅᑭᐱᐅᑕᑦ ᑭᓄᓄᑦ
Sample 1 - Lady Ann Strait	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 2 - Sirmilik	Scientific/International Polar Year Research	Marine	N/A	N/A	Sirmilik National ParkPond Inlet
Sample 3 - Paterson Inlet	Scientific/International Polar Year Research	Marine	N/A	N/A	Pond Inlet
Sample 4 - Isabella Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Clyde River
Sample 5 - Home Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Qikiktarjuaq
Sample 6 - Exeter Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Qikiktarjuaq
Sample 7 - Hoare Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Pangnirtung
Sample 8 - Outer Cumberland Sound	Scientific/International Polar Year Research	Marine	N/A	N/A	Pangnirtung
Sample 9 - Cyrus Field	Scientific/International Polar Year Research	Marine	N/A	N/A	Iqaluit
Sample 10 - Hudson Strait	Scientific/International Polar Year Research	Marine	N/A	N/A	Iqaluit
Sample 11 - Hospital Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 12 - Sverdrup Channel	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 13 - Aurland Fiord	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 14 - Henson Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 15 - Yelverton Bay	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord
Sample 16 - Ayles Fiord	Scientific/International Polar Year Research	Marine	N/A	N/A	Grise Fiord / Quttinirpaaq National Park

ᓄᓇᓕᓯᓪᓗ ᓄᓇᓕᓯᓪᓗ ᓄᓇᓕᓯᓪᓗ ᓄᓇᓕᓯᓪᓗ ᓄᓇᓕᓯᓪᓗ ᓄᓇᓕᓯᓪᓗ

ᓄᓇᓕᓯᓪᓗ	ᓄᓇᓕᓯᓪᓗ	ᓄᓇᓕᓯᓪᓗ	ᓄᓇᓕᓯᓪᓗ
Clyde River	Joshua	Nangmautaq HTA	2022-01-19
ᓄᓇᓕᓯᓪᓗ	Jennifer	Mittimalik HTO	2022-01-19
ᓄᓇᓕᓯᓪᓗ	amaruq@baffinhto.ca	Amaruq Hunters & Trappers Association	2022-01-19
ᓄᓇᓕᓯᓪᓗ	gfiviq_hta@qiniq.com	Iviq Hunters & Trappers Association	2022-01-19
ᓄᓇᓕᓯᓪᓗ	pang@baffinhto.ca	Pangnirtung Hunters & Trappers Organization	2022-01-19
ᓄᓇᓕᓯᓪᓗ	nattivak_hta@qiniq.com	Nattivak Hunters & Trappers Association	2022-01-19

[illegible]

$a^{\dagger}r_4^ab r^a\sigma^b \wedge c_n n_4 n^c \delta D\sigma_4^{fb}D^c$ $\partial\partial f^f_{g} \omega^g_r:$

North Baffin

South Baffin

$\epsilon \Delta^{\frac{1}{2}} j^c$ $\Lambda J^a e D \dot{0}$ $\nabla^a r^b c D r L \dot{\nu}^c$

ᐱᓕᓴᓂᓄᓇ ᑲᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ/ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ
Hunters and Trappers Associations/Organizations	I have contacted all concerned HTAs/HTOs and asked to consult with them. For now, I have received an answer from the Nangmautaq HTA, who said the board would review the project.	Applied, Decision Pending	2022-01-19	
ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	I have contacted both Transport Canada and Global Affairs, I am still waiting to see if I need a licence.	Not Yet Applied	2022-01-21	
ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ ᐱᓕᓴᓂᓄᓇ	I have contacted the Department of Fisheries and Oceans, who indicated we did not need a licence because we only filter seawater, we do not sample fish or fish parts.	Not Yet Applied	2022-01-05	

Project transportation types

Transportation Type	ᐱᓇᑦᑐᑦ ᐸᑕᑲᑯᐅᓂᐳᐱᖃᑦ	Length of Use
Water	We will use a boat to go from Grise Fiord to Saint Pierre & Miquelon	

Project accomodation types

△ ۲۰۰۶،

◀▷↳◀⁹⁶▷⁹⁶

Λ⁹d^c d^ab^rz^{9b} d^{9b}c^dσ^dγ^z^{9b} Δ^c_εb^rdⁿω^r^c ΔjCΔ^c, Γ^cωd^pñ^c, γ^b_εLC^j^{9b}, με^rd^c d^r_ε^br^cω

ᐃᓕᑦᑲ ᐱᓐᑯᓐ ᐃᐅᐅᓂᐳᓐᑯᓐ ᓖᓂᐃᓐᑯᓐ	ᓖᓂᓐᑯᓐ	ᐃᓕᑦᑲ - ᐃᓂᓐᑯᓐ	ᓐᑯᓐ ᐃᐅᐅᓂᐳᓐᑯᓐ
Sailing Boat	1	15.3x4.2m	The sailing boat will be used to transport our team from Grise Fiord to the southern parts of Nunavut.
Athena Peristaltic Pump	2	22x33x17 cm	The peristaltic pump is a pump used to filter DNA in surface waters, without any contamination.

በበፍጥረቱ ምሳሌ ለፍጥነቱ ምሳሌ ለፍጥነቱ ምሳሌ

[illegible]
$$\Delta L^{\epsilon_b} \quad \triangleleft \triangleright^{\epsilon_b} C \triangleright \triangleleft \dot{L}^{\epsilon_b} \triangleright^{\epsilon_b}$$

ᐃᑦᑭᑦ ᑕᑭᑦ ᐃᑦᑭᑦᐃᑦᑭᑦᐃᑦᑭᑦ	ᑦᑭᑦᑭ ᐃᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦ	ᐃᑦᑭᑦ ᐃᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦᑭᑦ
0	We will stop once during the expedition in a village in order to retrieve water. In the case there is no possibility to stop at such moment, we may have to retrieve this freshwater from a river.	We cannot yet predict in which village we would stop.

$\triangleleft^b C d^c$
$$\Delta^b C d_c \sim \sigma \Delta^a \sigma^b$$

ᐱᑦᓕᓂᔭᓚᖃᒃᓴᓄᖅ	ᖃᓇᐃᑐᖅ ᐊᖃᑩᖅ	ᖃᓇᓂᓯ ᐊᖃᑩᖅ ᖃᖃᓶᑦᓸᐊᖅᑐᓂᙵᑐᖅ	ᖃᓇᓇᖅ ᐊᖃᑦᓈᑦᓸᐊᖅᑐᖅ	ᖃᓄᓄᖅ ᖃᓇᓇᖅᓴᓄᓂᖅ ᐊᖅᑐᖅ
Waste disposal	ᐊᖃᑩᖅ ᐃᑦᑲᑦᓴᑦᓴᓄᖅᑐᖅ	4 people / 1 month	All domestic waste will be disposed in the municipal dustbins, in the villages where we can stop.	Possibility to keep the domestic waste onboard until getting to Saint Pierre et Miquelon.
Waste disposal	ᖃᓄᖅᓴᓂᓇᓇᖅ	4 people / 1 month	Can be disposed either in the water or burned on land	-

4907D0^cD^c 4^bD^{5b}CD⁷L²

Our protocol only requires to filter seawater, and thus produce no environmental impacts

Additional Information

SECTION A1: Project Info

SECTION A2: Allweather Road

SECTION A3: Winter Road

SECTION B1: Project Info

SECTION B2: Exploration Activity

SECTION B3: Geosciences

SECTION B4: Drilling

SECTION B5: Stripping

SECTION B6: Underground Activity

SECTION B7: Waste Rock

SECTION B8: Stockpiles

SECTION B9: Mine Development

SECTION B10: Geology

SECTION B11: Mine

SECTION B12: Mill

SECTION C1: Pits

SECTION D1: Facility

SECTION D2: Facility Construction

SECTION D3: Facility Operation

SECTION D4: Vessel Use

SECTION E1: Offshore Survey

SECTION E2: Nearshore Survey

SECTION E3: Vessel Use

SECTION F1: Site Cleanup

SECTION G1: Well Authorization

SECTION G2: Onland Exploration

SECTION G3: Offshore Exploration

SECTION G4: Rig

SECTION H1: Vessel Use

SECTION H2: Disposal At Sea

SECTION 11: Municipal Development

ᐱᓪᑲ ᐃᓚᐅᕐ ᖃᓄᐃᕐᑐᓪᓇᓂᐅᓂᖅ: ᓄᓇᐅᕐ ᖃᓄᐃᕐᑐᓂᖅ

ᐱᓪᓇ ᐱᑦᐅᐅᑦ ᑭᓪᓂᐱᑦᐅᑦ ᑕᓪᓂᐅᑦᓂᑦ: ᐅᐱᑭᓪᓂᑦᓂᑦ

ᐱᓪᑦ ᐃᑦᐅᐅᑦ ᖃᓄᐃᑦᑐᑦ ᑕᐅᐅᓂᖅ: ᐃᓄᑕᐅᓂᖅᐱᓪᑦᐳᑦ-ᐱᑦᑕᐃᑦᑕᐅᓂᖅᐱᓪᑦ

Miscellaneous Project Information

Description of both vessels : Vagabond is a boat owned by Éric Brossier, which hosted over 12 research programs supported by the French Polar Institute Paul-Emile Victor, but has also hosted sportive or cinematographic expeditions. It was the first vessel to succeed in the Northeast Passage without wintering. Since 1999, Eric Brossier and his family have undertaken collaborative expeditions to support research in the Arctic waters. In 2022, the boat will start from Grise Fiord, on Ellesmere Island, and will sail through Baffin Sea, towards Saint-Pierre et Miquelon. Vagabond is an expedition yacht designed for polar expeditions, able to sail in ice and to provide a moving base camp to scientists. It is 15.3 meters long and 4.2 meters wide. It can carry up to 10 people onboard. More information and photos at:

<https://vagabond.fr/eric/>-----Sébastien Roubinet is a passionate skipper who has been sailing for more than 30 years on many seas, frozen or not, aboard many boats. Sébastien and his crewmates have already sailed on the Arctic Seas many times. On his last adventures, his boat was used as a scientific platform, performing different protocols such as sampling water and ice, taking aerial photographs, all of this with a zero greenhouse gas emission policy. These areas are difficult to access for scientists and thus complicated to study, hence their strong implication to bring back the maximum amount of essential data to our studies, with eDNA sampling. This small sailing boat that resembles to a kayak will start from Sachs Harbour, in the Northwest Territories of Canada, and will sail towards the northern parts of Groenland, as long as the ice cap allows it. Babouch'Ty is a very small sailing boat, only 7 meters long and 2.4 meters wide. When emptied, it weighs only 200 kilograms, and has a capacity of 500 kilograms onboard. It uses solar panels to produce electricity, and can be hauled on ice if necessary. More information nad photos at: <https://www.sebroubinet.eu/>

[illegible]

Cumulative Effects

Impacts

$\mathcal{L}(\mathcal{A}) \subseteq \mathcal{L}(\mathcal{B})$

[illegible]
$$(P = \langle \text{b d} \underline{\text{a p n r}} \underline{\text{a}}^{\text{b}} \rangle^{\text{c}}, N = \langle \text{b d}^{\text{b}} \text{r}^{\text{r}} \text{r} \langle \text{d r}^{\text{a}} \underline{\text{a}}^{\text{b}} \rangle^{\text{c}} \langle \text{c d} \text{r}^{\text{r}} \text{r}^{\text{b}} \rangle^{\text{b}} \langle \text{d r}^{\text{a}} \underline{\text{a}}^{\text{b}} \text{r}^{\text{c}} \rangle^{\text{c}} \rangle, M = \langle \text{b d}^{\text{b}} \text{r}^{\text{r}} \text{r} \langle \text{d r}^{\text{a}} \underline{\text{a}}^{\text{b}} \rangle^{\text{c}} \langle \text{c d} \text{r}^{\text{r}} \text{r}^{\text{b}} \rangle^{\text{b}} \langle \text{d r}^{\text{a}} \underline{\text{a}}^{\text{b}} \rangle^{\text{c}} \rangle, U = \text{r}^{\text{b}} \text{d} \text{r} \text{r}^{\text{a}} \underline{\text{a}}^{\text{b}} \text{r}^{\text{c}} \rangle^{\text{b}})$$



List of Project Geometries

1	point	Sample 1 - Lady Ann Strait
2	point	Sample 2 - Sirmilik
3	point	Sample 3 - Paterson Inlet
4	point	Sample 4 - Isabella Bay
5	point	Sample 5 - Home Bay
6	point	Sample 6 - Exeter Bay
7	point	Sample 7 - Hoare Bay
8	point	Sample 8 - Outer Cumberland Sound
9	point	Sample 9 - Cyrus Field
10	point	Sample 10 - Hudson Strait
11	point	Sample 11 - Hospital Bay
12	point	Sample 12 - Sverdrup Channel
13	point	Sample 13 - Aurland Fiord

14	point	Sample 14 - Henson Bay
15	point	Sample 15 - Yelverton Bay
16	point	Sample 16 - Ayles Fiord