

TotalEnergies E&P North Sea UK Ltd

# Culzean - Floating Offshore Wind Turbine Pilot Project

## Appendix E: Environmental DNA Report

ASSIGNMENT      A100811-S02  
DOCUMENT        GB-CZN-00-XODUS-000026



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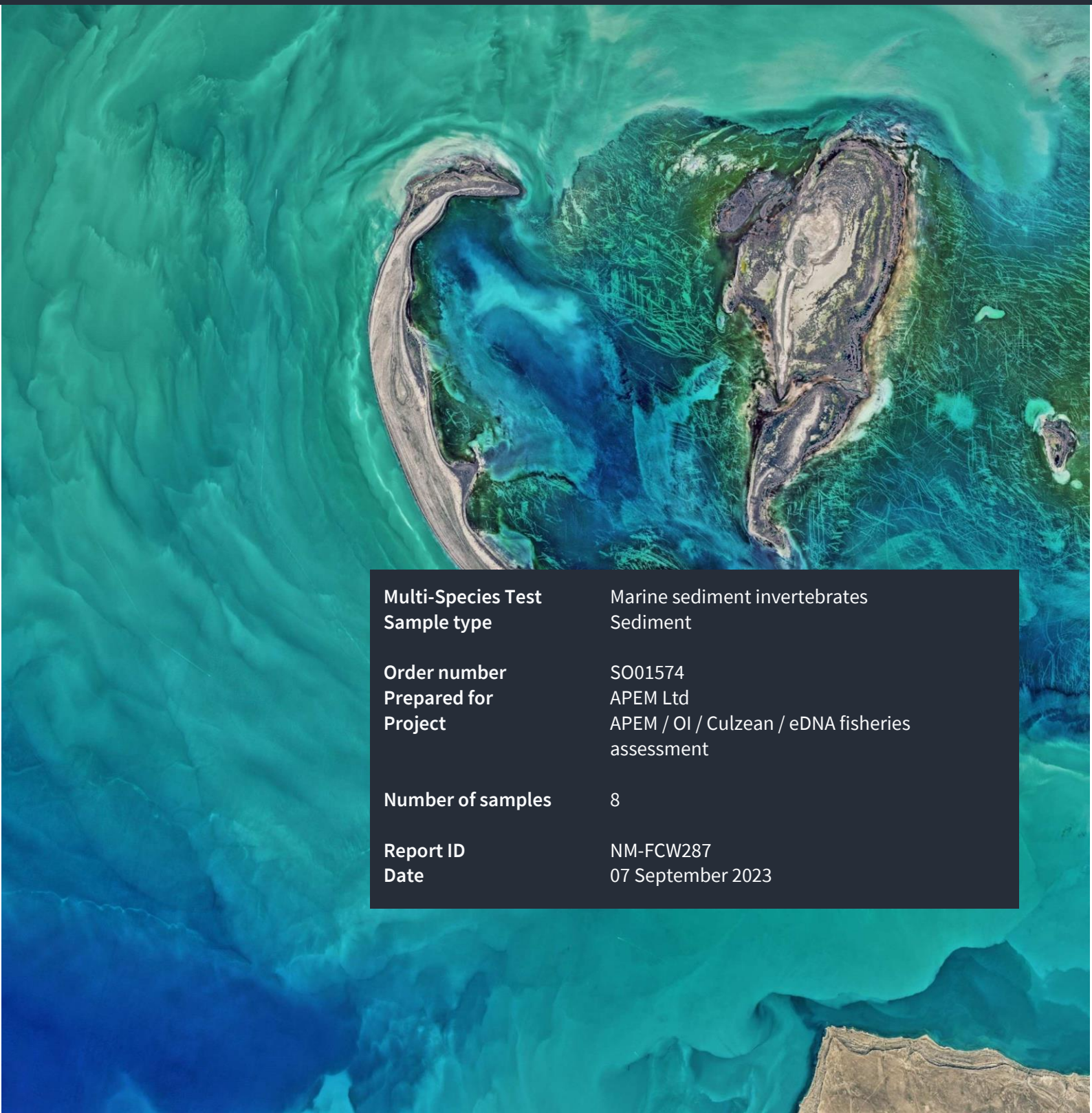
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# Environmental DNA Report

## Marine sediment invertebrates



<b>Multi-Species Test</b>	Marine sediment invertebrates
<b>Sample type</b>	Sediment
<b>Order number</b>	SO01574
<b>Prepared for</b>	APEM Ltd
<b>Project</b>	APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	8
<b>Report ID</b>	NM-FCW287
<b>Date</b>	07 September 2023



## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

Welcome to your report

Marine sediment invertebrates (COI gene): this provides a broad test for invertebrates. Groups typically detected include crustaceans, tunicates, jellyfish, cnidarians, annelids, molluscs, echinoderms, and sponges. While there is some overlap with the Marine sediment eukaryotes test, in terms of groups detected, the Marine sediment invertebrates test provides more identifications to species level.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM-FCW287.S001574.Invertebrates.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	8
<b>Field Samples reported:</b>	8
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	33
<b>Average Species Richness per sample:</b>	10
<b>Total number of IUCN Red List Species:</b>	0
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

Please be careful when sharing this report, it contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. Please share responsibly. If the report is shared, we kindly ask that the report is shared in its entirety - to limit the possibility of any information being taken out of context.

New to our reports? Our [Report Interpretation Guide](http://www.naturemetrics.co.uk/report-interpretation-guide) is here to help:  
[www.naturemetrics.co.uk/report-interpretation-guide](http://www.naturemetrics.co.uk/report-interpretation-guide)

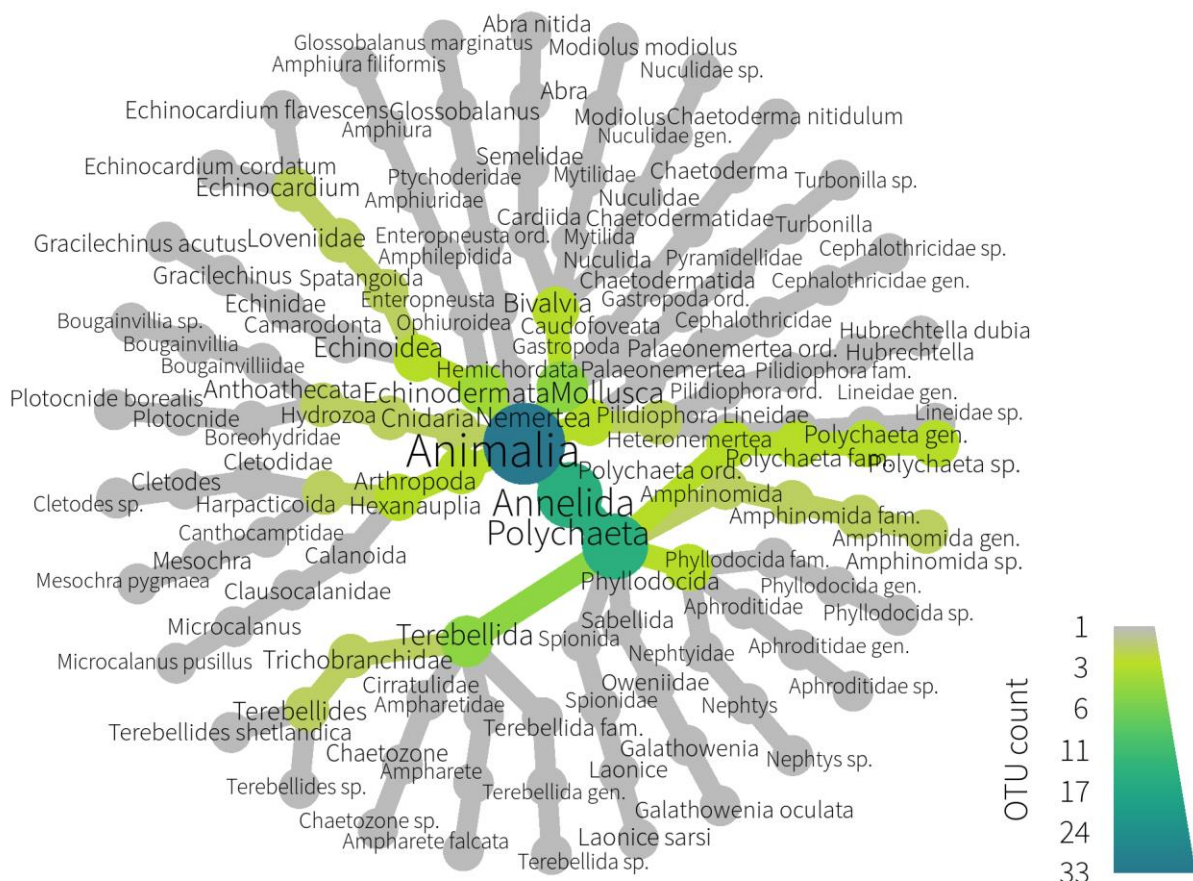
Something exciting or unexpected that you'd like to discuss further, our team of experts are looking forward to speaking with you: [www.naturemetrics.com/contact](http://www.naturemetrics.com/contact)



## REPORT

### Taxonomic Composition

This chart provides a view of the species detected in your samples and their taxonomic relationship, (names on the same branch are more similar than those on different branches). The chart is structured with the highest taxonomic rank at the centre (e.g., kingdom, phylum, class), moving through the ranks of order, family, genus, species as you move to the outer edge. Note that the centre and outer ranks will change depending on the **test** applied and the number of species detected. The legend in the bottom right of the chart indicates how to relate the colour in the branches to the number of species. The colour scale goes from grey - indicating very few species, to blue - indicating a lot of species. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.





## Taxonomic Resolution

This table provides the number of **OTUs** detected and the percentage of OTUs identified to each taxonomic level.

Depending on completeness of **reference databases** for the region where you sampled, some OTUs may not match to a reference at species level. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied. Coverage is expected to improve over time and data tables can be updated to include new information at a future date.

Number of OTUs	Phylum	Class	Order	Family	Genus	Species
33	100%	100%	90.91%	78.79%	66.67%	48.48%

Want to increase the number of species named to species level? If you have specimens of species you have identified, we can sequence the DNA and add the species to our reference databases. We will then be able to enhance the reference library and report if the species is detected. Please contact us about this service and we can send you our barcoding kits, but note that we only offer these kits for fish and amphibians.

## IUCN Red List Species

These are the IUCN (International Union for Conservation of Nature) Red List species detected in your samples. These are detected species that are designated as one of the IUCN Red List Threatened Categories (Vulnerable, Endangered and Critically Endangered). An increase in the number of threatened species is generally associated with a positive trend in **biodiversity** or habitat condition. Note that both **Target Species** and Non-Target Species are listed in this section.

No species designated Vulnerable, Endangered or Critically Endangered were detected in the samples.

The Data Tables contain further information for all species, including their designations as Least Concern or Near Threatened status.

## Invasive Species

These are **Invasive species** detected in your samples. These species are invasive according to the Global Register of Introduced and Invasive Species (GRIIS) in the country where sampling occurred. GRIIS is an IUCN Invasive Species Specialist Group initiative. The Convention on Biological Diversity defines an invasive species as one whose introduction and/or spread threatens biological diversity. An increase in the number of invasive species is generally associated with enhanced pressures at your site and reduced resilience of the native community. Please note: this label is only available for animals; and GRIIS lists marine species as invasive for a country, even if the species is known to be invasive in only one marine area bordering the country. Note that both **Target Species** and Non-Target Species are listed in this section.

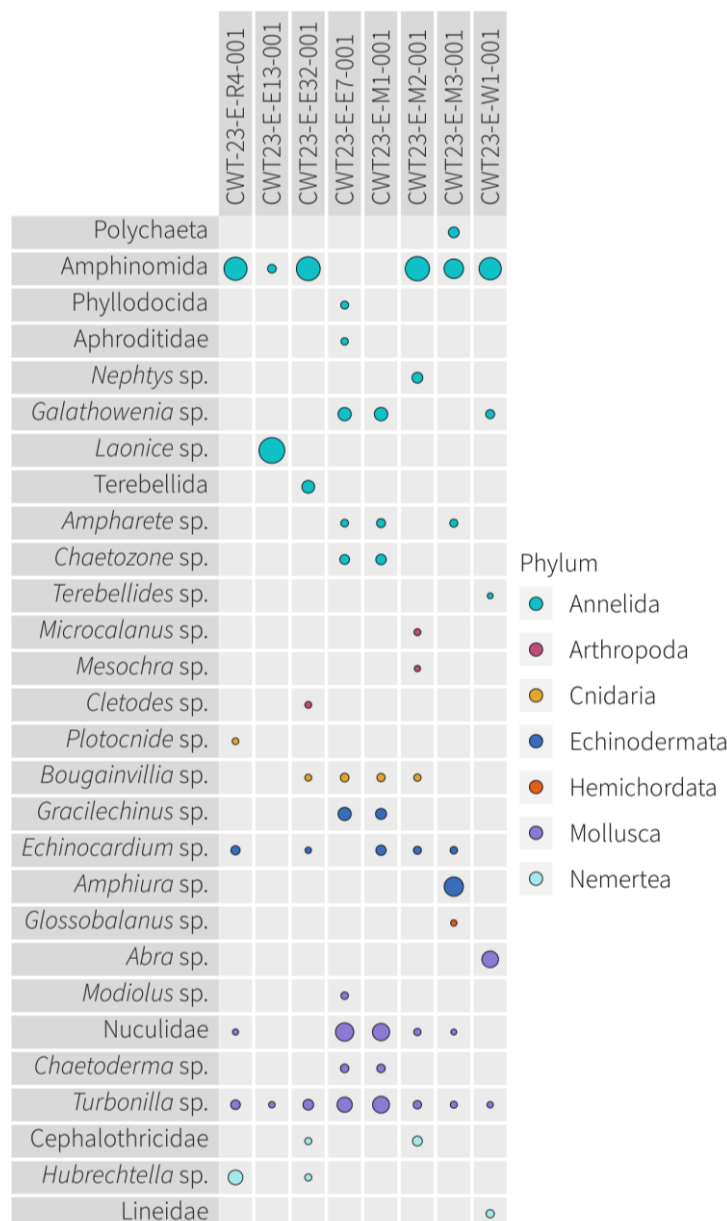
No invasive species were detected in the samples.



## Community Composition

This chart lists the species found in each sample. A bubble means a species was detected in that sample. Note that where multiple OTUs were matched to the same species (or the same higher taxonomic level), the data has been summarised into a single row on the chart. The chart displays at species level, unless the number of species is too great to display clearly in the document. In this case, the chart displays at a higher taxonomic level and the full species level chart is provided as an appendix. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

The size of the bubbles represents the proportion of **DNA sequences** within a sample. A larger bubble size can indicate a stronger **eDNA** signal. This signal may be linked to abundance of species in the environment but should be interpreted only as a coarse measure because the signal is also impacted by biological (e.g., biomass, life stage, activity, body condition), environmental (e.g., temperature, pH, salinity, conductivity), and technical factors (e.g., **primer bias**, **PCR** stochasticity).





Looking for something more?

We also offer comparative reporting. This includes statistical comparison of metrics and communities according to categories that you define. For instance, these might include waterbody, Site, Management Regime, or anything else that is a focus of your project. Please contact us for further details.

## **END OF REPORT**

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Thank you for choosing NatureMetrics

Please read the following information to help you understand the data in this file. For more information on how to interpret your results please see our Report Interpretation Guide. This file contains four tables: Species Data Table Percentages, Species Data Table Read Counts, Metrics by Sample Table, Quality Control Table

#### Species Data Table Percentages

This table provides a list of all the species detected in each of your samples. Where a species was detected in a sample, the percentage of DNA sequences assigned to that species is provided. A dash indicates that the species was not detected in the sample. Additionally, for each species the following is included:

- The OTU DNA sequence
- The taxonomic identification: Kingdom, Phylum, Class, Order, Family, Genus, Species
- The Common Name\*
- IUCN Threat Status^
- Invasive status: A Yes/No status indicating whether the species is listed as invasive in the country the sample was taken from\*
- Target Status: Our tests are targeted to detect certain groups of species, but species outside these targeted groups are sometimes detected incidentally. We call these Non-Targets. Non-Targets can provide useful additional information from your samples and for your project. These are reported in this table but do not contribute to calculation of metrics or charts in the main report. For IUCN Threat Status and Invasive status, Non-Targets are listed in the main report.
- Number of samples in which the species occurs

\* Only available for species named at the species level

^ Only available for species named at the species level and not applicable for Bacteria

### Species Data Table Read Counts

This table is very similar to the Species Data Table Percentages table, but Read Counts (the number of DNA sequences assigned to a species) are reported for each species in each sample rather than the percentage of DNA sequences. This is useful if you intend to publish results or intend to run further analyses on the data. A dash indicates that the species was not detected in the sample.

### Metrics by Sample Table

This table provides the metric values for each sample for each applicable metric. More information on how each metric is calculated is provided in the Report Interpretation Guide. The available metrics are:

- Species Richness
- Evolutionary Diversity
- IUCN Threatened Species (Not applicable to: Bacteria)
- Invasive Species (Not applicable to: Bacteria, Soil Fungi, Marine Sediment Eukaryotes, Marine Aquatic Eukaryotes)
- Bacterial Functional Diversity (Applicable only to: Bacteria)
- Fungal Functional Diversity (Applicable only to: Soil Fungi)
- Fungal:Bacterial Ratio (Applicable only to: soil samples)
- Fish Food-Chain Integrity (Applicable only to: Fish (excl sharks & rays), Vertebrates, marine samples)
- Fish: Commercial Value (Applicable only to: Fish (excl sharks & rays), Vertebrates, marine samples)
- Fish: Prevalence of Sensitive Species (Applicable only to: Fish (excl sharks & rays), Vertebrates, marine samples)
- Marine Sediment Pollution Index (Applicable only to: Marine Sediment Invertebrates)

## Quality Control Table

This table provides information on each sample, an overview of how each sample progressed through each of our quality control steps and shows the outcome of what is reported. More information on each Quality Control step is provided in the Report Interpretation Guide. The table is comprised of four sections

### Sample Information

- Kit ID
- Client Label: The name you gave to your sample
- Sample Type: This will be either 'Field sample' or 'Field blank'
- Volume Filtered (Applicable only to aquatic kits)
- Date Received – This is the date the sample was received at NM labs

### Quality Control

- DNA Amplified (Yes/No): This shows if target DNA was amplified and sequenced
- Passed Data QC (Yes/No): This shows if a sequenced sample contained high quality data
- Target OTUs Detected (Yes/No): This shows if target species were detected. Our tests are targeted to detect certain groups of species

### Percentage Reads

- % Target: The percentage of target species DNA sequences that were identified in the sample
- % Non-Target: The percentage of reads belonging to non- target species DNA sequences that were identified in the sample

### Result

- Reported (Yes/No): If samples passed all QC steps and contained either target or non-target species then it is classed as reported
- Outcome (Yes/No): A statement on whether a sample was reported, if it had target species or only non-target species, and, if applicable, whether any contamination was found in Field blanks



Species Data Table Percentages

Table with 20 columns: NMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, Number of samples in which OTU occurs, CWT23-E-R4-001, CWT23-E-E13-001, CWT23-E-E32-001, CWT23-E-E7-001, CWT23-E-M1-001, CWT23-E-M2-001, CWT23-E-M3-001, CWT23-E-W1-001. Rows include species like TCTTTCTAGTA, TCTTCTAGAA, etc.

Species Data Table Read Counts

Table with 20 columns: NMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, Number of samples in which OTU occurs, CWT23-E-R4-001, CWT23-E-E13-001, CWT23-E-E32-001, CWT23-E-E7-001, CWT23-E-M1-001, CWT23-E-M2-001, CWT23-E-M3-001, CWT23-E-W1-001. Rows include species like TCTTTCTAGTA, TCTTCTAGAA, etc.



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## Metrics by Sample Table

Sample ID	Sample Type	Species Richness (number of OTUs)	Number of OTUs named at species level	Evolutionary Diversity
CWT-23-E-R4-001	Client sample	9	4	1.55
CWT23-E-E13-001	Client sample	4	1	0.67
CWT23-E-E32-001	Client sample	10	2	1.98
CWT23-E-E7-001	Client sample	13	5	2.75
CWT23-E-M1-001	Client sample	12	6	2.34
CWT23-E-M2-001	Client sample	12	4	2.26
CWT23-E-M3-001	Client sample	9	4	1.59
CWT23-E-W1-001	Client sample	8	2	1.67



Quality Control Table

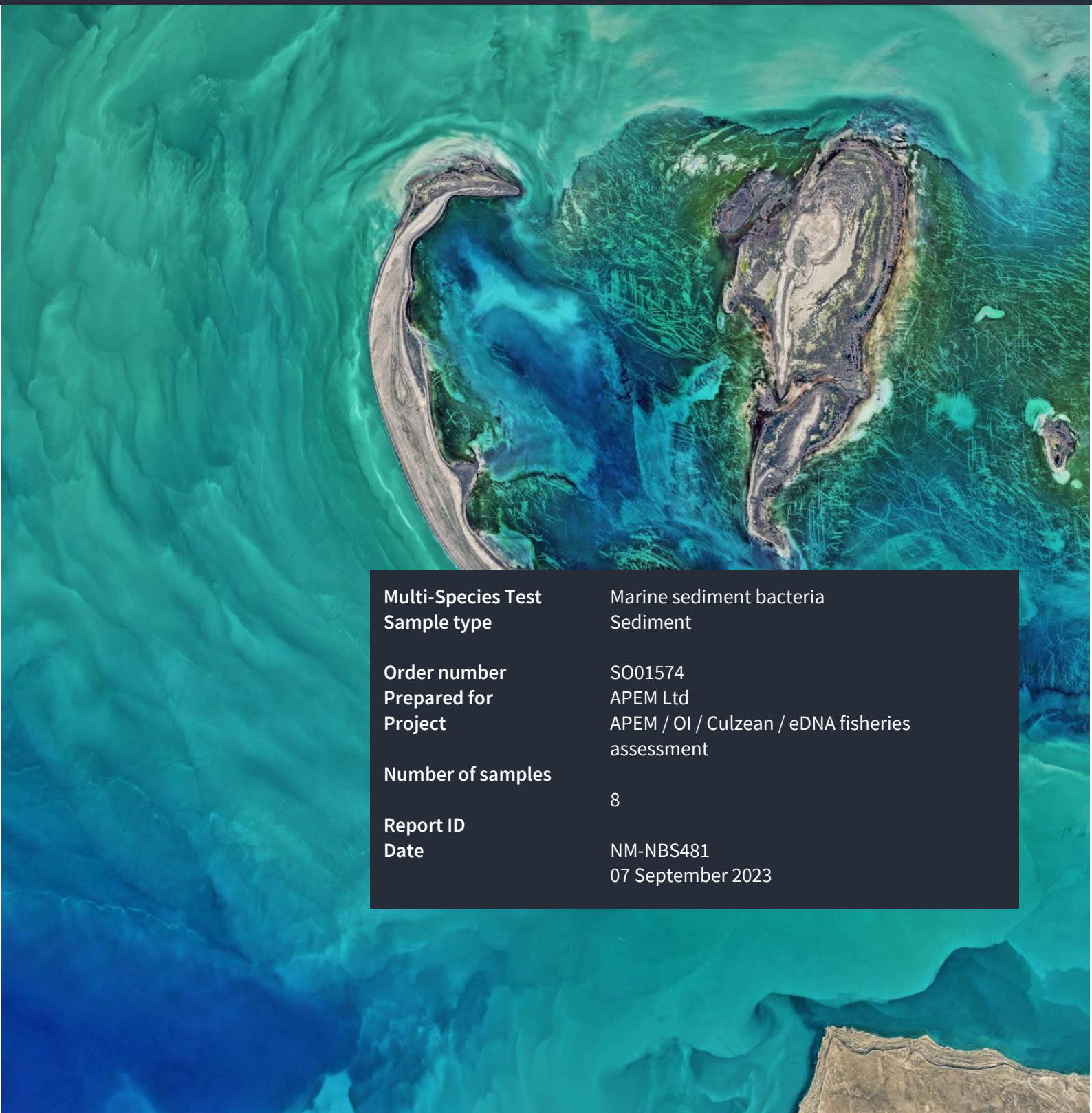
Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
MSC-01-00199	31706	CWT-23-E-R4-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00187	31700	CWT23-E-E13-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00189	31701	CWT23-E-E32-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00194	31702	CWT23-E-E7-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00190	31703	CWT23-E-M1-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00195	31704	CWT23-E-M2-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00193	31705	CWT23-E-M3-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
MSC-01-00192	31707	CWT23-E-W1-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported



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# Environmental DNA Report

## Marine sediment bacteria



<b>Multi-Species Test</b>	Marine sediment bacteria
<b>Sample type</b>	Sediment
<b>Order number</b>	SO01574
<b>Prepared for</b>	APEM Ltd
<b>Project</b>	APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	8
<b>Report ID</b>	
<b>Date</b>	NM-NBS481 07 September 2023



## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

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Marine sediment bacteria (16S gene): this provides a broad test for bacteria. It is used to identify whole bacterial communities and is well suited for detecting environmental changes. Generally, identifications are to family level or higher, with few being resolved to genus or species level. Bacterial communities will often show a stronger relationship to sediment physicochemical parameters than invertebrates, either from morphology or DNA-based analyses.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM- NBS481.SO01574.Bacteria.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	8
<b>Field Samples reported:</b>	8
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	413
<b>Average Species Richness per sample:</b>	300
<b>Total number of IUCN Red List Species:</b>	0
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

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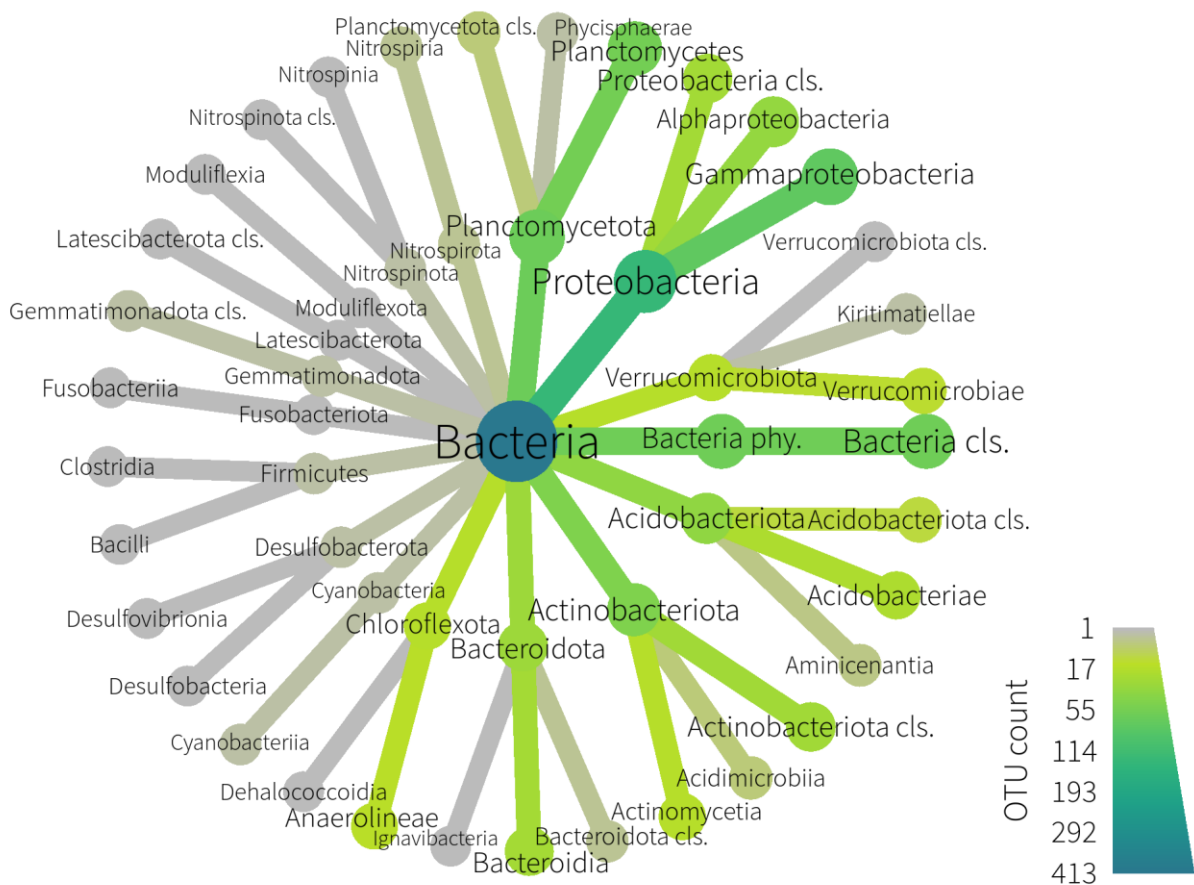




# REPORT

## Taxonomic Composition

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## Taxonomic Resolution

This table provides the number of **OTUs** detected and the percentage of OTUs identified to each taxonomic level.

Depending on completeness of **reference databases** for the region where you sampled, some OTUs may not match to a reference at species level. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied. Coverage is expected to improve over time and data tables can be updated to include new information at a future date.

Number of OTUs	Phylum	Class	Order	Family	Genus	Species
413	85.47%	67.31%	38.98%	25.91%	5.08%	0.48%

Want to increase the number of species named to species level? If you have specimens of species you have identified, we can sequence the DNA and add the species to our reference databases. We will then be able to enhance the reference library and report if the species is detected. Please contact us about this service and we can send you our barcoding kits, but note that we only offer these kits for fish and amphibians.

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No species designated Vulnerable, Endangered or Critically Endangered were detected in the samples.

The Data Tables contain further information for all species, including their designations as Least Concern or Near Threatened status.

## Invasive Species

These are **Invasive species** detected in your samples. These species are invasive according to the Global Register of Introduced and Invasive Species (GRIIS) in the country where sampling occurred. GRIIS is an IUCN Invasive Species Specialist Group initiative. The Convention on Biological Diversity defines an invasive species as one whose introduction and/or spread threatens biological diversity. An increase in the number of invasive species is generally associated with enhanced pressures at your site and reduced resilience of the native community. Please note: this label is only available for animals; and GRIIS lists marine species as invasive for a country, even if the species is known to be invasive in only one marine area bordering the country. Note that both **Target Species** and Non-Target Species are listed in this section.

No invasive species were detected in the samples.



## Community Composition

This chart lists the species found in each sample. A bubble means a species was detected in that sample. Note that where multiple OTUs were matched to the same species (or the same higher taxonomic level), the data has been summarised into a single row on the chart. The chart displays at species level, unless the number of species is too great to display clearly in the document. In this case, the chart displays at a higher taxonomic level and the full species level chart is provided as an appendix. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

The size of the bubbles represents the proportion of **DNA sequences** within a sample. A larger bubble size can indicate a stronger **eDNA** signal. This signal may be linked to abundance of species in the environment but should be interpreted only as a coarse measure because the signal is also impacted by biological (e.g., biomass, life stage, activity, body condition), environmental (e.g., temperature, pH, salinity, conductivity), and technical factors (e.g., **primer bias**, **PCR** stochasticity).

Chart attached separately.

### Looking for something more?

We also offer comparative reporting. This includes statistical comparison of metrics and communities according to categories that you define. For instance, these might include waterbody, Site, Management Regime, or anything else that is a focus of your project. Please contact us for further details.

### END OF REPORT

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	CWT-23-E-R4-001	CWT23-E-E13-001	CWT23-E-E32-001	CWT23-E-E7-001	CWT23-E-M1-001	CWT23-E-M2-001	CWT23-E-M3-001	CWT23-E-W1-001	
Bacteria sp.	●	●	●	●	●	●	●	●	
Acidobacteriota sp.	●	●	●	●	●	●	●	●	
Acidobacteriae sp.	·	·	·	·		·			
Acidobacteriales sp.	·	●	●	●	·	●	●	●	
Acidobacteriaceae sp.	●	●	●	●	●	●	●	●	
<i>Acidobacterium</i> sp.	●	●	●	●	●	●	●	●	
Aminicenantales sp.	·	·		·	·	·	·	·	
Actinobacteriota sp.	●	●	●	●	●	●	●	●	
Acidimicrobiia sp.	·	·	·	·	·	·	·	·	
Acidimicrobiales sp.	·	·	·						
Ilumatobacteraceae sp.	·	·	·	·	·	·	·	·	
<i>Ilumatobacter nonamiensis</i>	·	·	·	·	·	·	·	·	
Microtrichaceae sp.		·							
Actinomycetia sp.	●	●	●	●	●	●	●	●	
Mycobacteriaceae sp.		·			·	·		·	
Bacteroidota sp.	·	·	·	·	·	·	·	·	
Bacteroidia sp.	·	·		·					
Bacteroidales sp.	●	●	●	●	●	●	●	●	
Marinilabiliaceae sp.	·	·		·	·	·	·	·	
Saprosiraceae sp.	·		·	·		·			
Cytophagales sp.	●	●	●	●	●	●	●	●	
<i>Fulvivirga</i> sp.	·								
Cytophagaceae sp.			·						
Flavobacteriaceae sp.	●	●	●	●	●	●	●	●	
<i>Lutibacter</i> sp.		·	·	·		·			
Melioribacteraceae sp.	·								
Anaerolineae sp.	·	·	·	·	·	·	·	·	
Anaerolineaceae sp.	●	●	●	●	●	●	●	●	
Caldilineaceae sp.	·	·	·	·	·	·	·	·	
Dehalococcoidaceae sp.	·						·		
Cyanobacteriia sp.		·							
<i>Synechococcus</i> sp.	·	·	·	·	·	·	·	·	
Desulfobacterales sp.	○	○	○	○	○	○	○	○	
Desulfovibrionaceae sp.					·				
Lactobacillales sp.	·	·		·	·	·	·	·	
Clostridiaceae sp.		·			·	·			
Fusobacteriaceae sp.			·		·				
Gemmatimonadota sp.	·	·	·	·	·	·	·	·	
Latescibacterota sp.	·	·	·	·	·	·	·	·	
Moduliflexaceae sp.	·			·	·				
Nitrospinota sp.	○	○	○	○	○	○	○	○	
Nitrospinaceae sp.	·	·	·	·					
Nitrospiraceae sp.	·		·	·	·	·	·	·	
Planctomycetota sp.	○	○	○	○	○	○	○	○	
Phycisphaeraceae sp.	·	·	·	·	·	·	·	·	
Planctomycetes sp.	○	○	○	○	○	○	○	○	
Pirellulaceae sp.	·	○	○	○	○	○	○	○	
Planctomycetales sp.	○	○	○	○	○	○	○	○	
Planctomycetaceae sp.	·	·	·	·	·	·	·	·	
<i>Planctomyces</i> sp.	·	·	·			·	·	·	
Proteobacteria sp.	●	●	●	●	●	●	●	●	
Alphaproteobacteria sp.	●	●	●	●	●	●	●	●	
Kiloniellaceae sp.	·	·	·	·	·	·	·	·	
Rhizobiales sp.	●	●	●	●	●	●	●	●	
Anderseniellaceae sp.	·	·	·	·	·	·	·	·	
Hyphomicrobiaceae sp.	·	·	·	·	·	·	·	·	
<i>Filomicrobium</i> sp.	·	·	·	·	·	·	·	·	
<i>Hyphomicrobium</i> sp.	●	●	●	●	●	●	●	●	
<i>Methyloceanibacter stevinii</i>	·	·	·	·	·	·	·	·	
Rhizobiaceae sp.		·				·		·	
Rhodobiaceae sp.		·			·	·	·	·	
Rhodobacterales sp.	·	·	·	·	·	·	·	·	
Rhodobacteraceae sp.	●	●	●	●	●	●	●	●	
Rhodospirillaceae sp.			·						
<i>Pelagibius</i> sp.	·	·	·	·	·	·	·	·	
Gammaaproteobacteria sp.	●	●	●	●	●	●	●	●	
<i>Sulfuriflexus</i> sp.	·		·	·	·	·	·	·	
Nitrosomonadaceae sp.	●	●	●	●	●	●	●	●	
<i>Denitratisona</i> sp.	·	·	·						
<i>Thioflavicoccus</i> sp.	·	·	·	·	·	·	·	·	
<i>Thioalkalivibrio</i> sp.	·	·	·	·	·	·	·	·	
<i>Moritella</i> sp.			·						
Vibrionaceae sp.			·						
Nitrosococcaceae sp.	·	●	·	·	·	·	·		
Pseudomonadales sp.	·	·	·	·	·	·	·	·	
Alcanivoracaceae sp.	·	·		·					
Haliaceae sp.	●	●	●	●	●	●	●	●	
Spongiibacteraceae sp.	·	·	·	·	·	·	·	·	
<i>Woeseia</i> sp.	●	●	●	●	·	·	·	·	
Verrucomicrobiota sp.	·	·							
Kiritimatiellae sp.	·	·	·	·	·	·	·	·	
Verrucomicrobiales sp.		·	·	·	·	·	·	·	
Akkermansiaceae sp.	·		·			·			
<i>Haloferula</i> sp.		·							
<i>Rubritalea</i> sp.		·	·	·		·	○	·	
Verrucomicrobiaceae sp.	○	○	○	○	○	○	○	○	

Phylum

- Acidobacteriota
- Actinobacteriota
- Bacteroidota
- Chloroflexota
- Cyanobacteria
- Desulfobacterota
- Firmicutes
- Fusobacteriota
- Gemmatimonadota
- Latescibacterota
- Moduliflexota
- Nitrospinota
- Nitrospirota
- Planctomycetota
- Proteobacteria
- Verrucomicrobiota











IM-8AFC89	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales		Target	7	-	0.09	0.07	0.05	0.08	0.10	0.11	0.10
IM-18Q585	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Akkermansiaceae	Target	3	0.06	-	0.05	-	-	0.10	-	-
IM-WU0019	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Akkermansiaceae	Target	1	-	0.05	-	-	-	-	-	-
IM-V65BE1	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Akkermansiaceae	Target	6	-	0.05	0.12	0.04	-	0.07	0.32	0.07
IM-R2A011	TACAGAGGTCT	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	8	0.05	0.11	0.05	0.07	0.11	0.09	0.10	0.10
IM-1MM9Y3	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	8	0.12	0.13	0.17	0.18	0.12	0.20	0.15	0.21
IM-H71KN6	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	5	-	0.07	0.08	-	-	0.08	0.13	0.11
IM-ND516Z	TACAGAGGTCT	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	5	0.05	0.08	-	-	0.10	0.05	-	0.10
IM-U53L3W	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	3	-	0.05	-	-	-	0.06	-	0.05
IM-P4DD88	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	4	-	0.06	-	-	-	0.05	0.06	0.06
IM-FR165L	TACGAAGGTCC	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	1	-	-	-	-	0.05	-	-	-
IM-Y5F3D4	TACAGAGGTCT	Bacteria	Verrucomicrobiota	Verrucomicrobiae	Verrucomicrobiales	Verrucomicrobiaceae	Target	8	0.09	0.08	0.09	0.07	0.10	0.10	0.11	0.11



Species Data Table Read Counts

Table with 19 columns: NMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, Number of samples in which OTU occurs, CWT23-E-R4-001, CWT23-E-E13-001, CWT23-E-E32-001, CWT23-E-E7-001, CWT23-E-M1-001, CWT23-E-M2-001, CWT23-E-M3-001, CWT23-E-W1-001. Rows list various bacterial species and their associated data points across different metrics.









## Metrics by Sample Table

Sample ID	Sample Type	Species Richness (number of OTUs)	Number of OTUs named at species level	Evolutionary Diversity	Bacterial Functional Diversity
CWT-23-E-R4-001	Client sample	313	2	16.54	2.4
CWT23-E-E13-001	Client sample	329	2	16.68	2.43
CWT23-E-E32-001	Client sample	303	2	15.85	2.35
CWT23-E-E7-001	Client sample	289	2	15.46	2.25
CWT23-E-M1-001	Client sample	278	2	14.83	2.23
CWT23-E-M2-001	Client sample	298	2	15.68	2.34
CWT23-E-M3-001	Client sample	299	2	15.59	2.19
CWT23-E-W1-001	Client sample	290	2	15.26	2.27



Quality Control Table

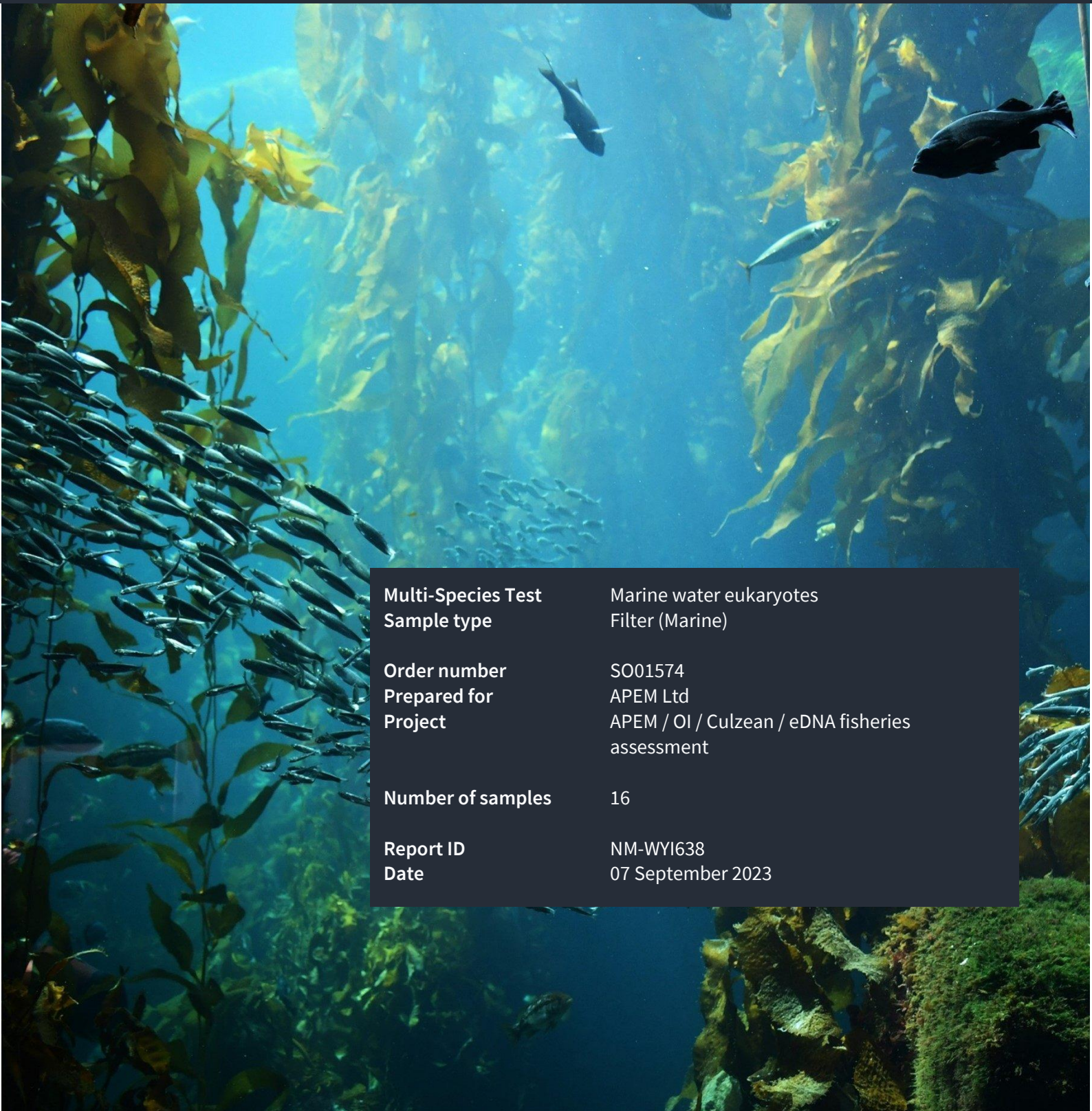
Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
MSC-01-00199	31706	CWT-23-E-R4-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	98.5	1.5	Yes	Sample reported
MSC-01-00187	31700	CWT23-E-E13-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	99.2	0.8	Yes	Sample reported
MSC-01-00189	31701	CWT23-E-E32-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	98.4	1.6	Yes	Sample reported
MSC-01-00194	31702	CWT23-E-E7-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	98.8	1.2	Yes	Sample reported
MSC-01-00190	31703	CWT23-E-M1-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	99.6	0.4	Yes	Sample reported
MSC-01-00195	31704	CWT23-E-M2-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	99.4	0.6	Yes	Sample reported
MSC-01-00193	31705	CWT23-E-M3-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	99.6	0.4	Yes	Sample reported
MSC-01-00192	31707	CWT23-E-W1-001	Client Sample	NA	23/5/23	Yes	Yes	Yes	99.7	0.3	Yes	Sample reported



**NATURE  
METRICS**  
DNA-BASED MONITORING

# Environmental DNA Report

## Marine water eukaryotes



<b>Multi-Species Test</b>	Marine water eukaryotes
<b>Sample type</b>	Filter (Marine)
<b>Order number</b>	SO01574
<b>Prepared for</b>	APEM Ltd
<b>Project</b>	APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	16
<b>Report ID</b>	NM-WYI638
<b>Date</b>	07 September 2023





## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

Welcome to your report

Marine water eukaryotes (18S gene): this provides a broad test for protist and invertebrate groups, including zooplankton, phytoplankton and macroalgae species (chlorophyta, phaeophyceae, rhodophyta), as well as annelids, jellyfish, molluscs, arthropods. While there is some overlap with the Marine water invertebrates test, in terms of groups detected, the Marine water eukaryotes test covers a far broader array of species, but provides fewer identifications to species level.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM-WYI638.SO01574.Eukaryotes.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	16
<b>Field Samples reported:</b>	16
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	220
<b>Average Species Richness per sample:</b>	137
<b>Total number of IUCN Red List Species:</b>	0
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

Please be careful when sharing this report, it contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. Please share responsibly. If the report is shared, we kindly ask that the report is shared in its entirety - to limit the possibility of any information being taken out of context.

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[www.naturemetrics.co.uk/report-interpretation-guide](http://www.naturemetrics.co.uk/report-interpretation-guide)

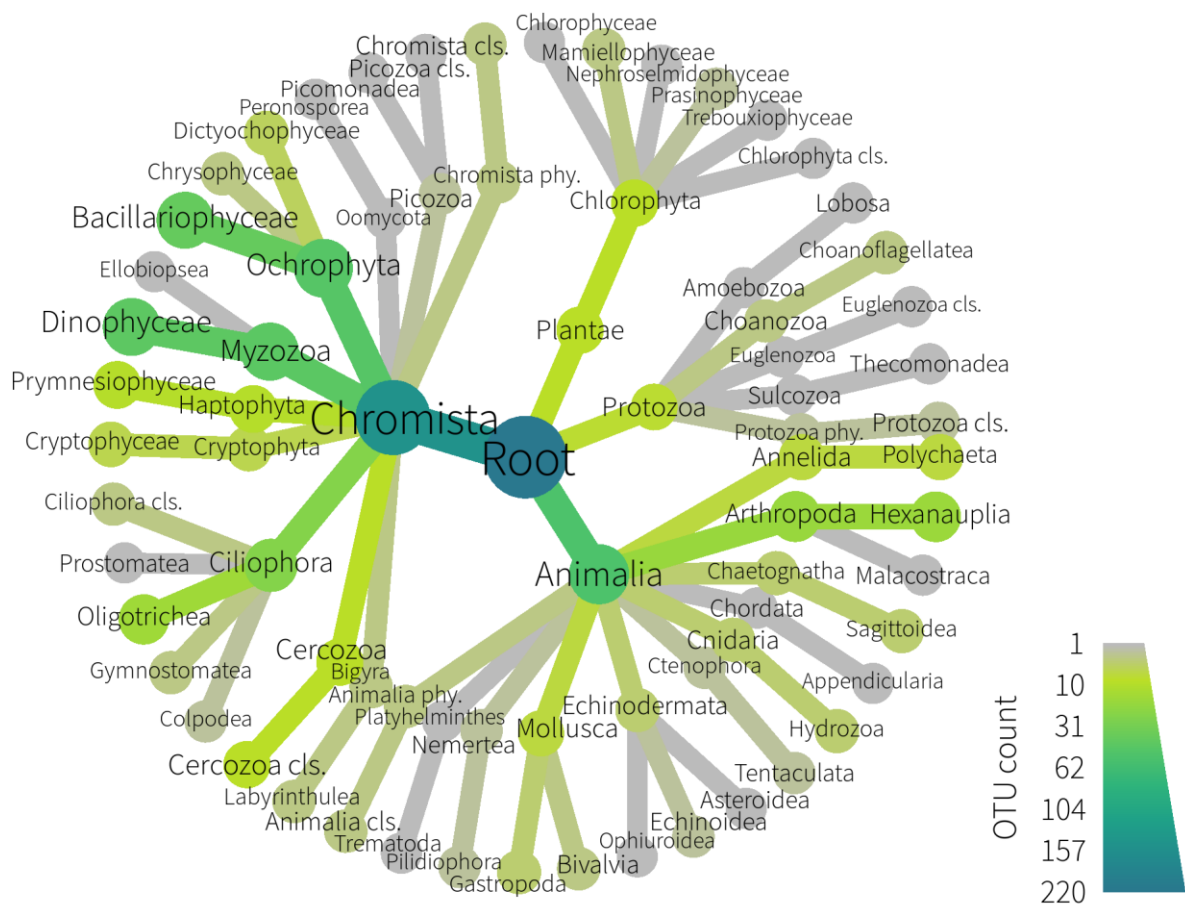
Something exciting or unexpected that you'd like to discuss further, our team of experts are looking forward to speaking with you: [www.naturemetrics.com/contact](http://www.naturemetrics.com/contact)



# REPORT

## Taxonomic Composition

This chart provides a view of the species detected in your samples and their taxonomic relationship, (names on the same branch are more similar than those on different branches). The chart is structured with the highest taxonomic rank at the centre (e.g., kingdom, phylum, class), moving through the ranks of order, family, genus, species as you move to the outer edge. Note that the centre and outer ranks will change depending on the **test** applied and the number of species detected. The legend in the bottom right of the chart indicates how to relate the colour in the branches to the number of species. The colour scale goes from grey - indicating very few species, to blue - indicating a lot of species. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.





## Taxonomic Resolution

This table provides the number of **OTUs** detected and the percentage of OTUs identified to each taxonomic level.

Depending on completeness of **reference databases** for the region where you sampled, some OTUs may not match to a reference at species level. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied. Coverage is expected to improve over time and data tables can be updated to include new information at a future date.

Number of OTUs	Phylum	Class	Order	Family	Genus	Species
220	97.27%	91.36%	76.82%	66.82%	45%	21.82%

Want to increase the number of species named to species level? If you have specimens of species you have identified, we can sequence the DNA and add the species to our reference databases. We will then be able to enhance the reference library and report if the species is detected. Please contact us about this service and we can send you our barcoding kits, but note that we only offer these kits for fish and amphibians.

## IUCN Red List Species

These are the IUCN (International Union for Conservation of Nature) Red List species detected in your samples. These are detected species that are designated as one of the IUCN Red List Threatened Categories (Vulnerable, Endangered and Critically Endangered). An increase in the number of threatened species is generally associated with a positive trend in **biodiversity** or habitat condition. Note that both **Target Species** and Non-Target Species are listed in this section.

No species designated Vulnerable, Endangered or Critically Endangered were detected in the samples.

The Data Tables contain further information for all species, including their designations as Least Concern or Near Threatened status.

## Invasive Species

These are **Invasive species** detected in your samples. These species are invasive according to the Global Register of Introduced and Invasive Species (GRIIS) in the country where sampling occurred. GRIIS is an IUCN Invasive Species Specialist Group initiative. The Convention on Biological Diversity defines an invasive species as one whose introduction and/or spread threatens biological diversity. An increase in the number of invasive species is generally associated with enhanced pressures at your site and reduced resilience of the native community. Please note: this label is only available for animals; and GRIIS lists marine species as invasive for a country, even if the species is known to be invasive in only one marine area bordering the country. Note that both **Target Species** and Non-Target Species are listed in this section.

No invasive species were detected in the samples.



## Community Composition

This chart lists the species found in each sample. A bubble means a species was detected in that sample. Note that where multiple OTUs were matched to the same species (or the same higher taxonomic level), the data has been summarised into a single row on the chart. The chart displays at species level, unless the number of species is too great to display clearly in the document. In this case, the chart displays at a higher taxonomic level and the full species level chart is provided as an appendix. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

The size of the bubbles represents the proportion of **DNA sequences** within a sample. A larger bubble size can indicate a stronger **eDNA** signal. This signal may be linked to abundance of species in the environment but should be interpreted only as a coarse measure because the signal is also impacted by biological (e.g., biomass, life stage, activity, body condition), environmental (e.g., temperature, pH, salinity, conductivity), and technical factors (e.g., **primer bias**, **PCR** stochasticity).

Chart is attached separately.



Looking for something more?

We also offer comparative reporting. This includes statistical comparison of metrics and communities according to categories that you define. For instance, these might include waterbody, Site, Management Regime, or anything else that is a focus of your project. Please contact us for further details.

## **END OF REPORT**

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Species Data Table Percentages

Table with columns: HMSSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, and 20 columns of CWT23-E-... percentages. The table lists various species and their corresponding data points across multiple columns.







Species Data Table Read Counts

Table with columns: NMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, and 24 columns of read counts (CWT23-E-R4 to CWT23-E-W1).





## Metrics by Sample Table

Sample ID	Sample Type	Species Richness (number of OTUs)	Number of OTUs named at species level	Evolutionary Diversity
CWT23-E- R4-001 Bot	Client sample	159	37	13.38
CWT23-E-E13-001 Bot	Client sample	156	36	13.34
CWT23-E-E13-001 Top	Client sample	159	38	13.42
CWT23-E-E32-001-Bot	Client sample	132	26	11.28
CWT23-E-E32-001-Top	Client sample	156	36	13.59
CWT23-E-E7-001-Bot	Client sample	151	34	12.76
CWT23-E-E7-001-Top	Client sample	127	30	10.62
CWT23-E-M1-001-Bot	Client sample	141	31	11.84
CWT23-E-M1-001-Top	Client sample	123	29	10.31
CWT23-E-M2-001 Bot	Client sample	118	29	10.22
CWT23-E-M2-001 Top	Client sample	121	31	10.51
CWT23-E-M3-001-Bottom	Client sample	119	26	10.17
CWT23-E-M3-001-Top	Client sample	141	33	11.56
CWT23-E-R4-001-Top	Client sample	136	29	11.67
CWT23-E-W1-001-Bottom	Client sample	122	26	10.44
CWT23-E-W1-001-Top	Client sample	128	30	10.92



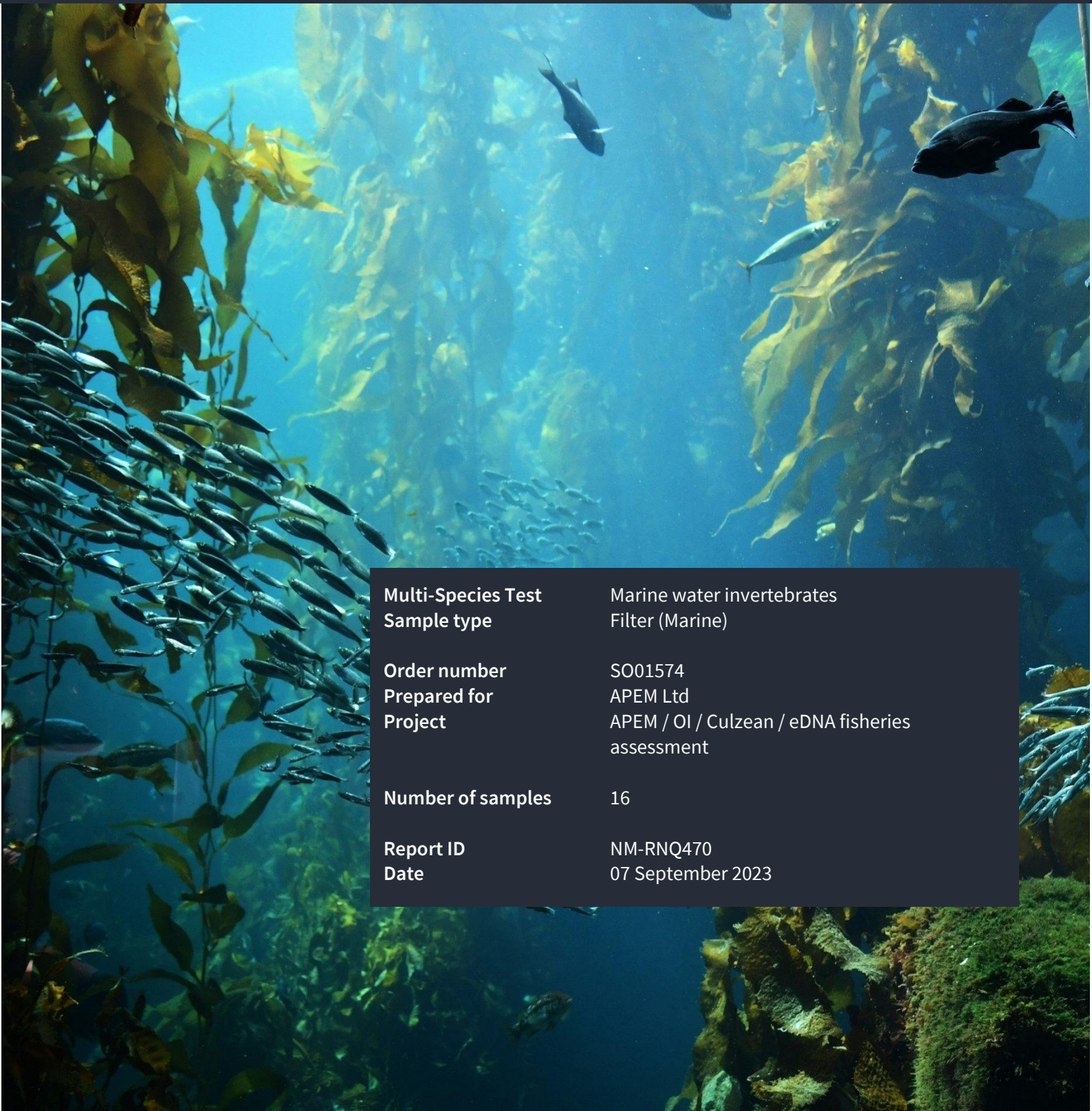
Quality Control Table

Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
PSI-01-01743	31727	CWT23-E-R4-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01756	31723	CWT23-E-E13-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01757	31726	CWT23-E-E13-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01750	31725	CWT23-E-E32-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01744	31724	CWT23-E-E32-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01748	31729	CWT23-E-E7-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01749	31722	CWT23-E-E7-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01751	31719	CWT23-E-M1-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01753	31717	CWT23-E-M1-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01746	31718	CWT23-E-M2-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01759	31720	CWT23-E-M2-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01761	31714	CWT23-E-M3-001-Bottom	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01762	31721	CWT23-E-M3-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01742	31728	CWT23-E-R4-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01758	31716	CWT23-E-W1-001-Bottom	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01755	31715	CWT23-E-W1-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported



# Environmental DNA Report

## Marine water invertebrates



<b>Multi-Species Test</b>	Marine water invertebrates
<b>Sample type</b>	Filter (Marine)
<b>Order number</b>	SO01574
<b>Prepared for</b>	APEM Ltd
<b>Project</b>	APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	16
<b>Report ID</b>	NM-RNQ470
<b>Date</b>	07 September 2023



## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

Welcome to your report

Marine water invertebrates (COI gene): this provides a broad test for invertebrates. Groups typically detected include crustaceans, tunicates, jellyfish, cnidarians, annelids, molluscs, echinoderms, and sponges. While there is some overlap with the Marine water eukaryotes test, in terms of groups detected, the Marine water invertebrates test provides more identifications to species level.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM-RNQ470.SO01574.Invertebrates.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	16
<b>Field Samples reported:</b>	15
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	33
<b>Average Species Richness per sample:</b>	12
<b>Total number of IUCN Red List Species:</b>	0
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

Please be careful when sharing this report, it contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. Please share responsibly. If the report is shared, we kindly ask that the report is shared in its entirety - to limit the possibility of any information being taken out of context.

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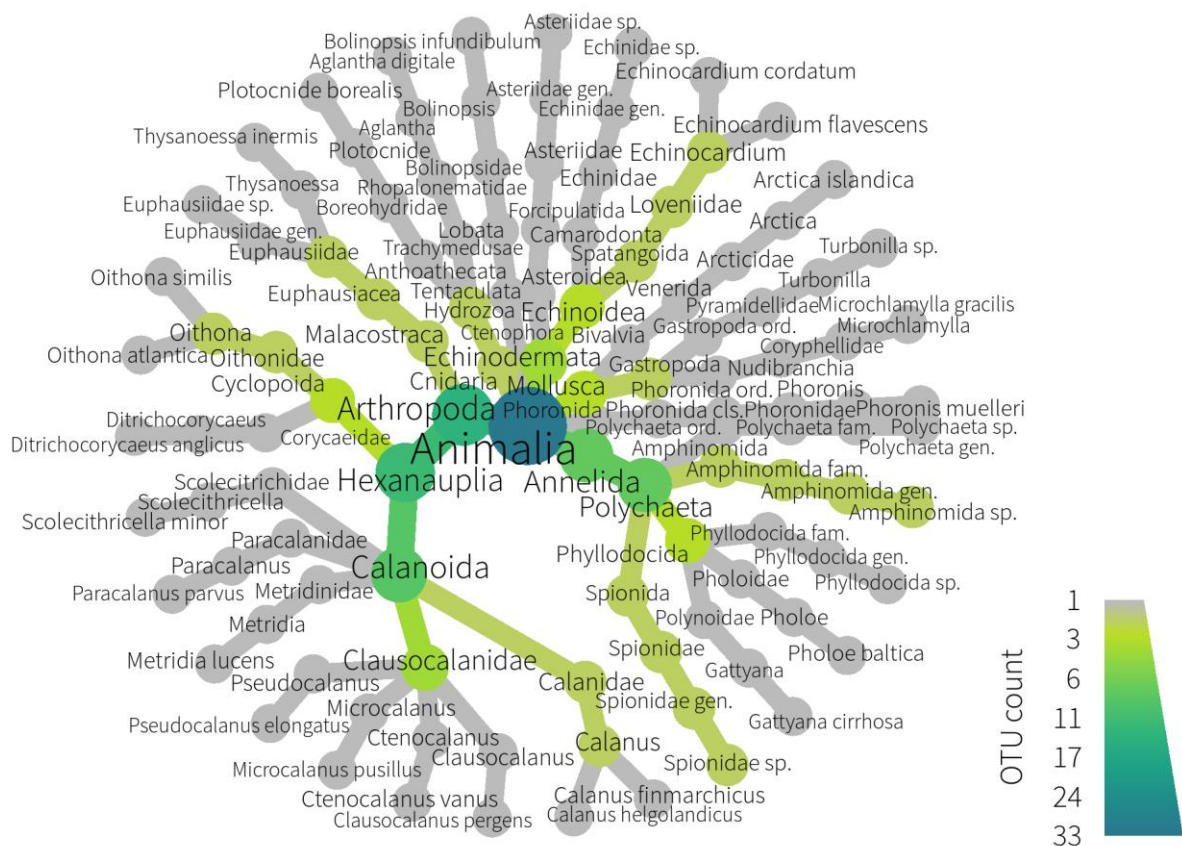
Something exciting or unexpected that you'd like to discuss further, our team of experts are looking forward to speaking with you: [www.naturemetrics.com/contact](http://www.naturemetrics.com/contact)



# REPORT

## Taxonomic Composition

This chart provides a view of the species detected in your samples and their taxonomic relationship, (names on the same branch are more similar than those on different branches). The chart is structured with the highest taxonomic rank at the centre (e.g., kingdom, phylum, class), moving through the ranks of order, family, genus, species as you move to the outer edge. Note that the centre and outer ranks will change depending on the **test** applied and the number of species detected. The legend in the bottom right of the chart indicates how to relate the colour in the branches to the number of species. The colour scale goes from grey - indicating very few species, to blue - indicating a lot of species. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.





## Taxonomic Resolution

This table provides the number of **OTUs** detected and the percentage of OTUs identified to each taxonomic level.

Depending on completeness of **reference databases** for the region where you sampled, some OTUs may not match to a reference at species level. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied. Coverage is expected to improve over time and data tables can be updated to include new information at a future date.

Number of OTUs	Phylum	Class	Order	Family	Genus	Species
33	100%	100%	96.97%	87.88%	72.73%	69.70%

Want to increase the number of species named to species level? If you have specimens of species you have identified, we can sequence the DNA and add the species to our reference databases. We will then be able to enhance the reference library and report if the species is detected. Please contact us about this service and we can send you our barcoding kits, but note that we only offer these kits for fish and amphibians.

## IUCN Red List Species

These are the IUCN (International Union for Conservation of Nature) Red List species detected in your samples. These are detected species that are designated as one of the IUCN Red List Threatened Categories (Vulnerable, Endangered and Critically Endangered). An increase in the number of threatened species is generally associated with a positive trend in **biodiversity** or habitat condition. Note that both **Target Species** and Non-Target Species are listed in this section.

No species designated Vulnerable, Endangered or Critically Endangered were detected in the samples.

The Data Tables contain further information for all species, including their designations as Least Concern or Near Threatened status.

## Invasive Species

These are **Invasive species** detected in your samples. These species are invasive according to the Global Register of Introduced and Invasive Species (GRIIS) in the country where sampling occurred. GRIIS is an IUCN Invasive Species Specialist Group initiative. The Convention on Biological Diversity defines an invasive species as one whose introduction and/or spread threatens biological diversity. An increase in the number of invasive species is generally associated with enhanced pressures at your site and reduced resilience of the native community. Please note: this label is only available for animals; and GRIIS lists marine species as invasive for a country, even if the species is known to be invasive in only one marine area bordering the country. Note that both **Target Species** and Non-Target Species are listed in this section.

No invasive species were detected in the samples.

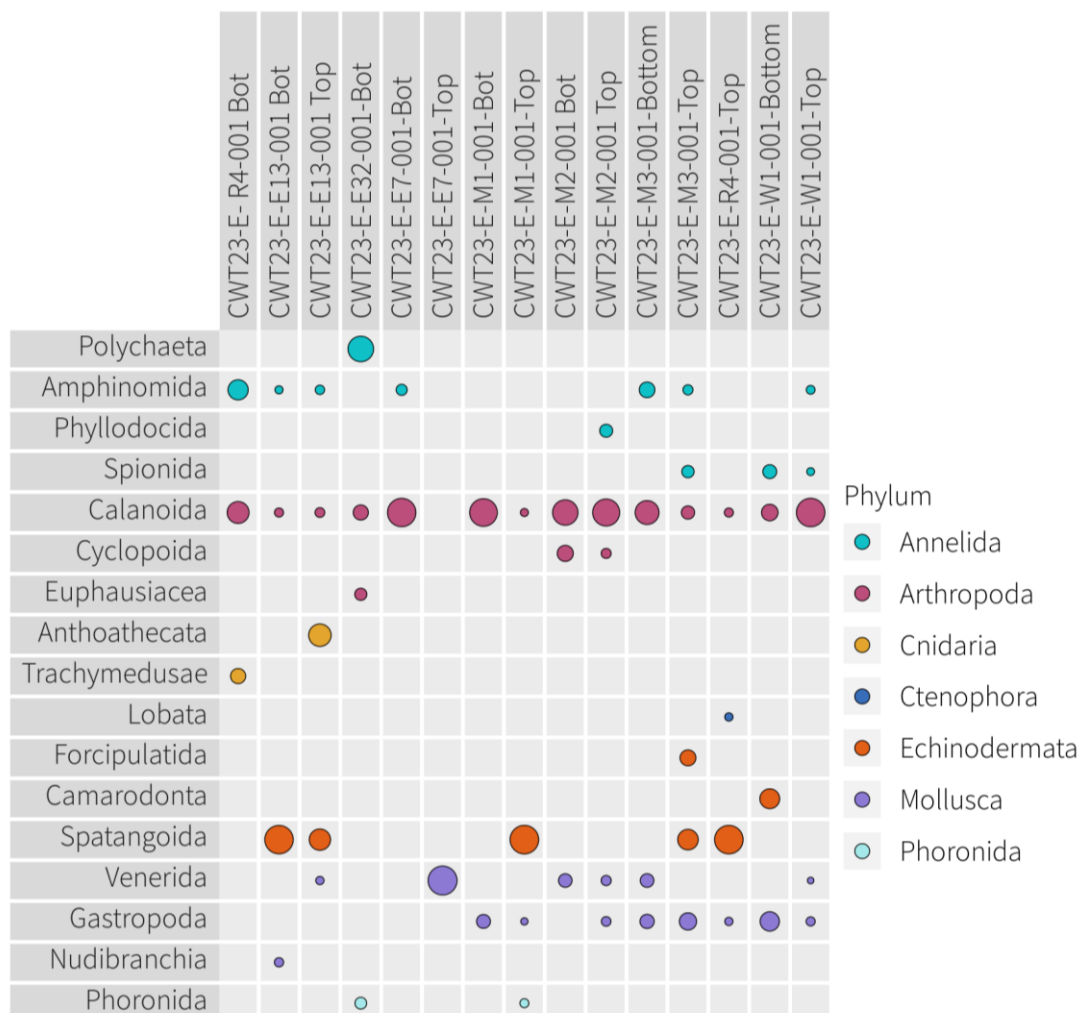




## Community Composition

This chart lists the species found in each sample. A bubble means a species was detected in that sample. Note that where multiple OTUs were matched to the same species (or the same higher taxonomic level), the data has been summarised into a single row on the chart. The chart displays at species level, unless the number of species is too great to display clearly in the document. In this case, the chart displays at a higher taxonomic level and the full species level chart is provided as an appendix. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

The size of the bubbles represents the proportion of **DNA sequences** within a sample. A larger bubble size can indicate a stronger **eDNA** signal. This signal may be linked to abundance of species in the environment but should be interpreted only as a coarse measure because the signal is also impacted by biological (e.g., biomass, life stage, activity, body condition), environmental (e.g., temperature, pH, salinity, conductivity), and technical factors (e.g., **primer bias**, **PCR** stochasticity).





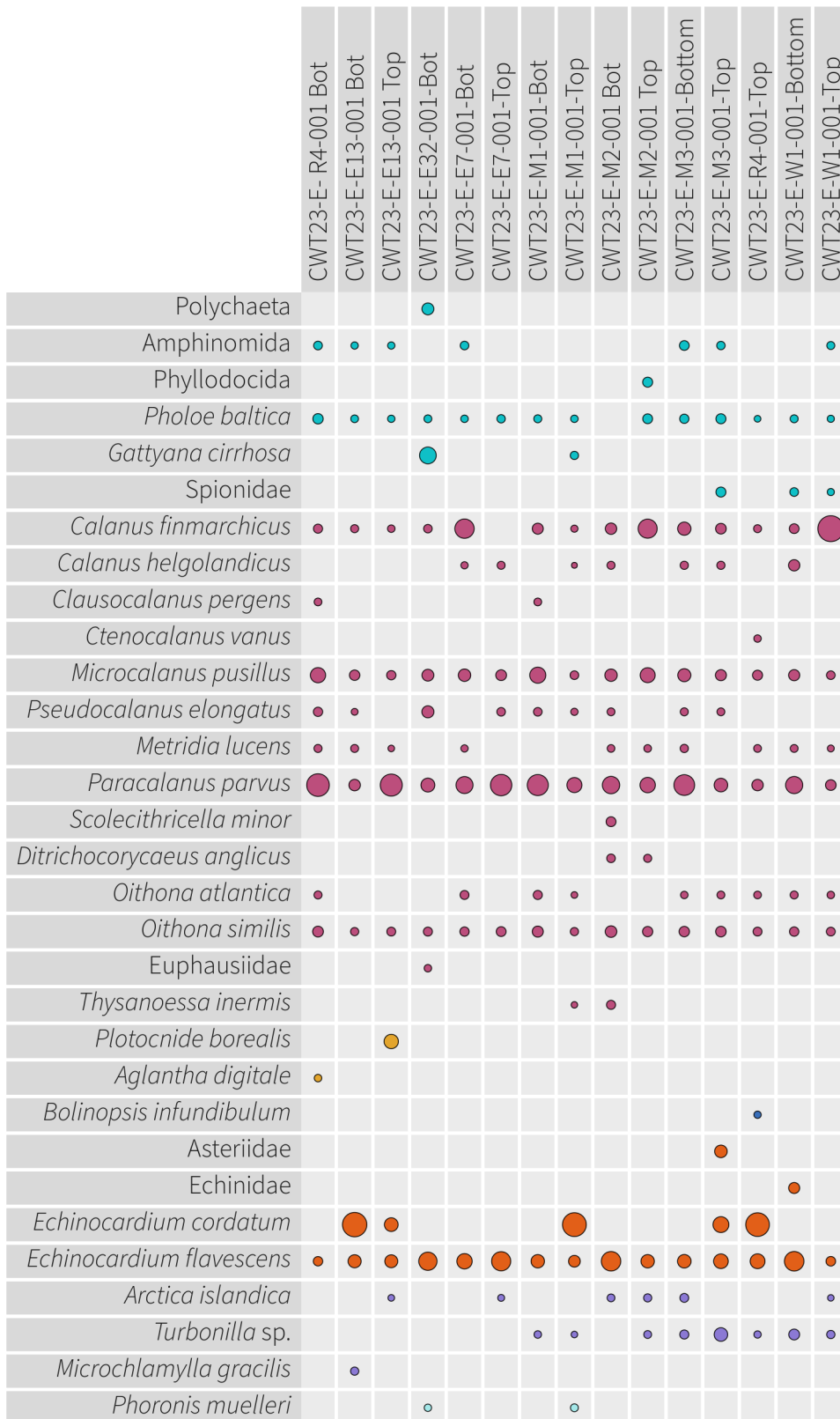
Looking for something more?

We also offer comparative reporting. This includes statistical comparison of metrics and communities according to categories that you define. For instance, these might include waterbody, Site, Management Regime, or anything else that is a focus of your project. Please contact us for further details.

## **END OF REPORT**

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Phylum

- Annelida
- Arthropoda
- Cnidaria
- Ctenophora
- Echinodermata
- Mollusca
- Phoronida



Species Data Table Percentages

Table with 25 columns: MMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, and 16 columns for CW23-E-R4 to CW23-E-W1. Rows include species like TOTTCCAGAF, ATTTCCAGAF, OTTTCAGAF, etc.

Species Data Table Read Counts

Table with 25 columns: MMSeqID, Sequence, Kingdom, Phylum, Class, Order, Family, Genus, Species, Common Name, IUCN Threat Status, Target Status, Invasive, Comments, and 16 columns for CW23-E-R4 to CW23-E-W1. Rows include species like TOTTCCAGAF, ATTTCCAGAF, OTTTCAGAF, etc.



## Metrics by Sample Table

Sample ID	Sample Type	Species Richness (number of OTUs)	Number of OTUs named at species level	Evolutionary Diversity
CWT23-E-R4-001 Bot	Client sample	13	11	2.21
CWT23-E-E13-001 Bot	Client sample	11	10	1.96
CWT23-E-E13-001 Top	Client sample	11	10	2.15
CWT23-E-E32-001-Bot	Client sample	12	9	2.26
CWT23-E-E7-001-Bot	Client sample	10	9	1.8
CWT23-E-E7-001-Top	Client sample	8	8	1.64
CWT23-E-M1-001-Bot	Client sample	11	9	1.95
CWT23-E-M1-001-Top	Client sample	15	13	2.58
CWT23-E-M2-001 Bot	Client sample	12	12	2.22
CWT23-E-M2-001 Top	Client sample	11	9	2.18
CWT23-E-M3-001-Bottom	Client sample	13	11	2.46
CWT23-E-M3-001-Top	Client sample	14	10	2.29
CWT23-E-R4-001-Top	Client sample	12	11	2.38
CWT23-E-W1-001-Bottom	Client sample	12	9	2.01
CWT23-E-W1-001-Top	Client sample	12	9	2.28

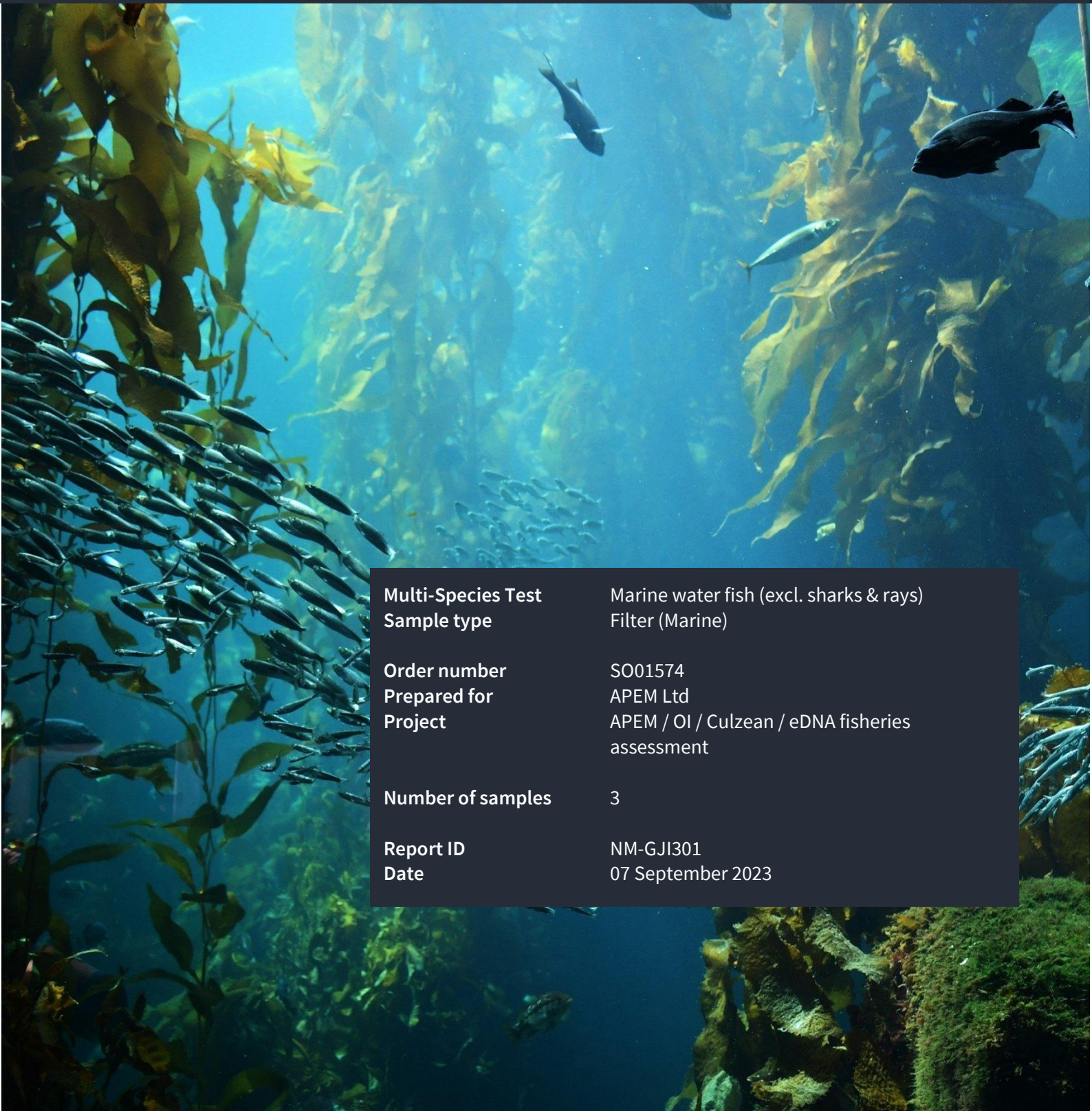
## Quality Control Table

Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
PSI-01-01743	31727	CWT23-E-R4-001 Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01756	31723	CWT23-E-E13-001 Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01757	31726	CWT23-E-E13-001 Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01750	31725	CWT23-E-E32-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01748	31729	CWT23-E-E7-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01749	31722	CWT23-E-E7-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01751	31719	CWT23-E-M1-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01753	31717	CWT23-E-M1-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01746	31718	CWT23-E-M2-001 Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01759	31720	CWT23-E-M2-001 Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01761	31714	CWT23-E-M3-001-Bottom	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01762	31721	CWT23-E-M3-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01742	31728	CWT23-E-R4-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01758	31716	CWT23-E-W1-001-Bottom	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01755	31715	CWT23-E-W1-001-Top	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01744	31724	CWT23-E-E32-001-Top	Client Sample	5000ml	23/5/23	Yes	No	N/A	N/A	N/A	No	Data QC failed, no species reported



# Environmental DNA Report

## Marine water fish (excl. sharks & rays)



<b>Multi-Species Test Sample type</b>	Marine water fish (excl. sharks & rays) Filter (Marine)
<b>Order number Prepared for Project</b>	SO01574 APEM Ltd APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	3
<b>Report ID Date</b>	NM-GJI301 07 September 2023



## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

Welcome to your report

Marine water fish (excl. sharks and rays) (12S gene): this provides a targeted test for fish. It is the best test for ray-finned fishes (Actinopterygii) such as tuna, seahorses, gobies, cichlids, flatfish, wrasse, perch, anglerfish and pufferfish. It does not perform as well for detecting sharks and rays.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM-GJI301.SO01574.Fish.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	3
<b>Field Samples reported:</b>	3
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	5
<b>Average Species Richness per sample:</b>	3
<b>Total number of IUCN Red List Species:</b>	1
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

Please be careful when sharing this report, it contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. Please share responsibly. If the report is shared, we kindly ask that the report is shared in its entirety - to limit the possibility of any information being taken out of context.

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[www.naturemetrics.co.uk/report-interpretation-guide](http://www.naturemetrics.co.uk/report-interpretation-guide)

Something exciting or unexpected that you'd like to discuss further, our team of experts are looking forward to speaking with you: [www.naturemetrics.com/contact](http://www.naturemetrics.com/contact)



## REPORT

### Taxonomic Composition

This chart provides a view of the species detected in your samples and their taxonomic relationship, (names on the same branch are more similar than those on different branches). The chart is structured with the highest taxonomic rank at the centre (e.g., kingdom, phylum, class), moving through the ranks of order, family, genus, species as you move to the outer edge. Note that the centre and outer ranks will change depending on the **test** applied and the number of species detected. The legend in the bottom right of the chart indicates how to relate the colour in the branches to the number of species. The colour scale goes from grey - indicating very few species, to blue - indicating a lot of species. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

This chart is not shown for this dataset as there were fewer than 10 **target OTUs** detected that had unique taxonomic lineages.





## Taxonomic Resolution

This table provides the number of **OTUs** detected and the percentage of OTUs identified to each taxonomic level.

Depending on completeness of **reference databases** for the region where you sampled, some OTUs may not match to a reference at species level. Global DNA reference databases contain millions of barcodes, but gaps remain, particularly in regions and taxonomic groups that are more diverse and less studied. Coverage is expected to improve over time and data tables can be updated to include new information at a future date.

Number of OTUs	Phylum	Class	Order	Family	Genus	Species
5	100%	100%	100%	100%	80%	80%

Want to increase the number of species named to species level? If you have specimens of species you have identified, we can sequence the DNA and add the species to our reference databases. We will then be able to enhance the reference library and report if the species is detected. Please contact us about this service and we can send you our barcoding kits, but note that we only offer these kits for fish and amphibians.

## IUCN Red List Species

These are the IUCN (International Union for Conservation of Nature) Red List species detected in your samples. These are detected species that are designated as one of the IUCN Red List Threatened Categories (Vulnerable, Endangered and Critically Endangered). An increase in the number of threatened species is generally associated with a positive trend in **biodiversity** or habitat condition. Note that both **Target Species** and Non-Target Species are listed in this section.

Species	Common name	Threat Status
<i>Melanogrammus aeglefinus</i>	Haddock	Vulnerable
Number of species		1

The Data Tables contain further information for all species, including their designations as Least Concern or Near Threatened status.



## Invasive Species

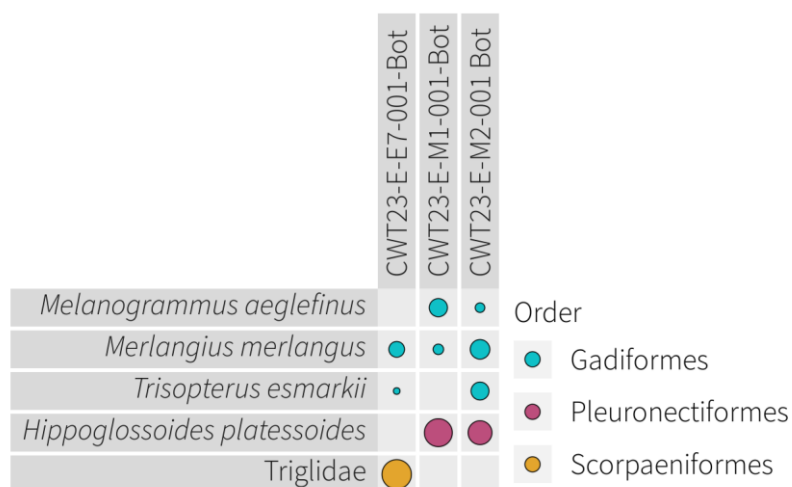
These are **Invasive species** detected in your samples. These species are invasive according to the Global Register of Introduced and Invasive Species (GRIIS) in the country where sampling occurred. GRIIS is an IUCN Invasive Species Specialist Group initiative. The Convention on Biological Diversity defines an invasive species as one whose introduction and/or spread threatens biological diversity. An increase in the number of invasive species is generally associated with enhanced pressures at your site and reduced resilience of the native community. Please note: this label is only available for animals; and GRIIS lists marine species as invasive for a country, even if the species is known to be invasive in only one marine area bordering the country. Note that both **Target Species** and Non-Target Species are listed in this section.

No invasive species were detected in the samples.

## Community Composition

This chart lists the species found in each sample. A bubble means a species was detected in that sample. Note that where multiple OTUs were matched to the same species (or the same higher taxonomic level), the data has been summarised into a single row on the chart. The chart displays at species level, unless the number of species is too great to display clearly in the document. In this case, the chart displays at a higher taxonomic level and the full species level chart is provided as an appendix. Abbreviations: “sp.” = species, “gen.” = genus, “fam.” = family, “ord.” = order “cls.” = class, “phy.” = phylum.

The size of the bubbles represents the proportion of **DNA sequences** within a sample. A larger bubble size can indicate a stronger **eDNA** signal. This signal may be linked to abundance of species in the environment but should be interpreted only as a coarse measure because the signal is also impacted by biological (e.g., biomass, life stage, activity, body condition), environmental (e.g., temperature, pH, salinity, conductivity), and technical factors (e.g., **primer bias**, **PCR** stochasticity).





Looking for something more?

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## END OF REPORT

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### Species Data Table Percentages

NMSeqID	Sequence	Kingdom	Phylum	Class	Order	Family	Genus	Species	Common Name	IUCN Threat Status	Target Status	Invasive	Comments	Number of samples in which OTU occurs	CWT23-E-E7-001-Bot	CWT23-E-M1-001-Bot	CWT23-E-M2-001 Bot
IM-F25B05	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Melanogrammus</i>	<i>Melanogrammus aeglefinus</i>	Haddock	VU	Target			2	-	22.27	1.58
IM-Y439L8	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Merlangius</i>	<i>Merlangius merlangus</i>	Whiting	LC	Target			3	13.77	2.55	27.76
IM-A3326P	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Trisopterus</i>	<i>Trisopterus esmarkii</i>	Norway Pout	LC	Target		There is lower support for this t	2	0.10	-	21.27
IM-GN7780	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Pleuronectiformes	Pleuronectidae	<i>Hippoglossoides</i>	<i>Hippoglossoides platessoides</i>	American Plaice	Not found	Target			2	-	75.18	49.39
IM-70H057	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Scorpaeniformes	Triglidae					Target			1	86.13	-	-

### Species Data Table Read Counts

NMSeqID	Sequence	Kingdom	Phylum	Class	Order	Family	Genus	Species	Common Name	IUCN Threat Status	Target Status	Invasive	Comments	Number of samples in which OTU occurs	CWT23-E-E7-001-Bot	CWT23-E-M1-001-Bot	CWT23-E-M2-001 Bot
IM-F25B05	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Melanogrammus</i>	<i>Melanogrammus aeglefinus</i>	Haddock	VU	Target			2	-	28863	1688
IM-Y439L8	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Merlangius</i>	<i>Merlangius merlangus</i>	Whiting	LC	Target			3	12096	3304	29724
IM-A3326P	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Gadiformes	Gadidae	<i>Trisopterus</i>	<i>Trisopterus esmarkii</i>	Norway Pout	LC	Target		There is lower support for this t	2	88	-	22769
IM-GN7780	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Pleuronectiformes	Pleuronectidae	<i>Hippoglossoides</i>	<i>Hippoglossoides platessoides</i>	American Plaice	Not found	Target			2	-	97423	52881
IM-70H057	CACCGCGGTTA	Animalia	Chordata	Actinopterygii	Scorpaeniformes	Triglidae					Target			1	75677	-	-

### Quality Control Table

Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
PSI-01-01748	31729	CWT23-E-E7-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01751	31719	CWT23-E-M1-001-Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported
PSI-01-01746	31718	CWT23-E-M2-001 Bot	Client Sample	5000ml	23/5/23	Yes	Yes	Yes	100	0	Yes	Sample reported

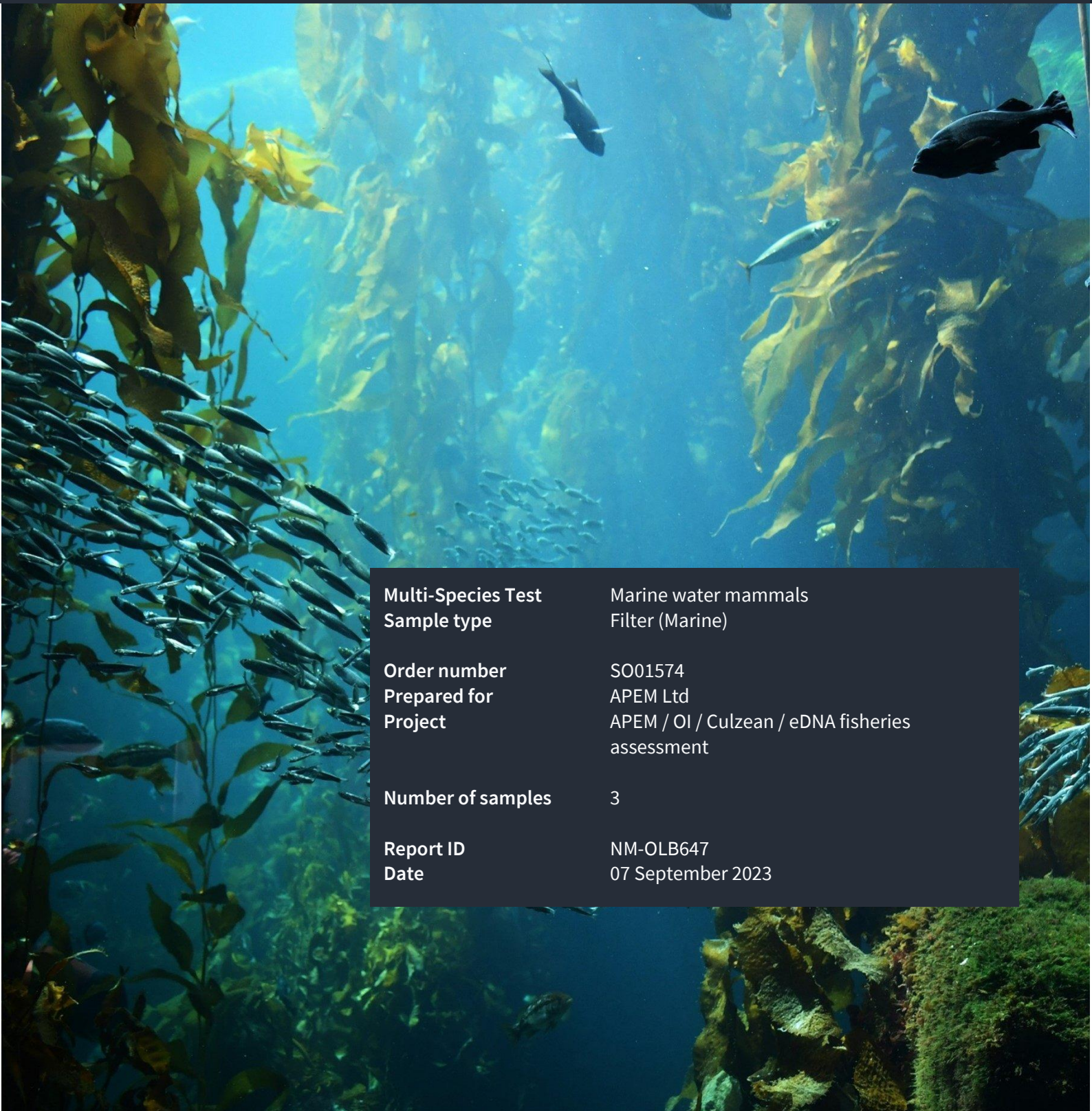
### Metrics by Sample Table

Sample ID	Sample Type	Species Richness (number of OTUs)	Number of OTUs named at species level	Evolutionary Diversity
CWT23-E-E7-001-Bot	Client sample	3	2	0.41
CWT23-E-M1-001-Bot	Client sample	3	3	0.36
CWT23-E-M2-001 Bot	Client sample	4	4	0.42



# Environmental DNA Report

## Marine water mammals



<b>Multi-Species Test Sample type</b>	Marine water mammals Filter (Marine)
<b>Order number Prepared for Project</b>	SO01574 APEM Ltd APEM / OI / Culzean / eDNA fisheries assessment
<b>Number of samples</b>	3
<b>Report ID Date</b>	NM-OLB647 07 September 2023

## Thank you for choosing NatureMetrics

### Your Nature Intelligence Partner

Welcome to your report

Marine water mammals (16S gene): this provides a targeted test for aquatic and semi-aquatic mammals. Results can also include detections of terrestrial mammals from nearby land masses. The use of this test reduces the risk of mammal eDNA detection being obscured by an abundance of fish eDNA. This can occur in marine environments when using the Marine water vertebrate test.

Your report consists of:

**This document:** Providing you with our world class insights and metrics.

**Data Tables:** Accompanying spreadsheet with results at the individual sample level: species detected, metrics and quality control: NM-OLB647.SO01574.Mammals.Results.xlsx

- Data Description
- Species Data Table: Percentages
- Species Data Table: Read Counts
- Metrics by Sample Table
- Quality Control Table

Throughout the report you'll see reference to 'OTU'. This stands for Operational Taxonomic Unit; an OTU is broadly equivalent to a species in most cases.

### Executive Summary

<b>Field Samples submitted:</b>	3
<b>Field Samples reported:</b>	0
<b>Field Blanks submitted:</b>	0
<b>Species Richness:</b>	0
<b>Average Species Richness per sample:</b>	0
<b>Total number of IUCN Red List Species:</b>	0
<b>Total number of Invasive Species:</b>	0

Reported samples are those that passed Quality Control and are included in the Species Data Table

Please be careful when sharing this report, it contains biodiversity information that may be sensitive, particularly with respect to endangered or protected species. Please share responsibly. If the report is shared, we kindly ask that the report is shared in its entirety - to limit the possibility of any information being taken out of context.

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Something exciting or unexpected that you'd like to discuss further, our team of experts are looking forward to speaking with you: [www.naturemetrics.com/contact](http://www.naturemetrics.com/contact)

Occasionally data from samples can be inconclusive. Unfortunately, on this occasion, all samples returned inconclusive results due to the following reasons:

- Target species were not detected in any of the samples.

Inconclusive results may occur because target DNA was not detected, DNA was degraded, or PCR (a crucial part of the lab process) was inhibited. Common reasons for inconclusive results include samples being stored in suboptimal conditions for too long prior to transit, such as excess exposure to sunlight or excessive heat. For more information on how to avoid inconclusive results, please visit our guidance at: [www.naturemetrics.co.uk/protocols/avoid-inconclusive-results](http://www.naturemetrics.co.uk/protocols/avoid-inconclusive-results) If you would like to discuss further, please contact us: [www.naturemetrics.co.uk/contact](http://www.naturemetrics.co.uk/contact)

The accompanying [Data Tables](#) spreadsheet provides results at the individual sample level, including a QC table which indicates at which step the samples were deemed inconclusive: NM-OLB647.SO01574.Mammals.Results.xlsx

### Looking for something more?

We also offer comparative reporting. This includes statistical comparison of metrics and communities according to categories that you define. For instance, these might include waterbody, Site, Management Regime, or anything else that is a focus of your project. Please contact us for further details.

### END OF REPORT

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### Quality Control Table

Kit ID	NMID	Sample ID	Sample Type	Volume Filtered	Date Received	DNA Amplified	Sequencing QC	Target OTUs Detected	% Target	% Non-Target	Reported	Comment
PSI-01-01753	31717	CWT23-E-M1-001-Top	Field Sample	5000ml	23/05/23	Yes	No	N/A	N/A	N/A	No	Data QC failed, no species reported
PSI-01-01759	31720	CWT23-E-M2-001 Top	Field Sample	5000ml	23/05/23	Yes	No	N/A	N/A	N/A	No	Data QC failed, no species reported
PSI-01-01749	31722	CWT23-E-E7-001-Top	Field Sample	5000ml	23/05/23	Yes	No	N/A	N/A	N/A	No	Data QC failed, no species reported