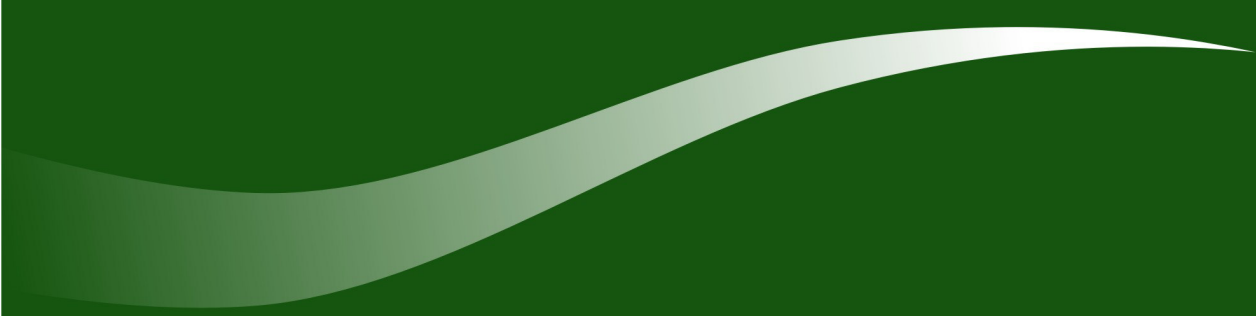


SANDPIPER PROJECT

Verification Programme Report:
Mining Licence Area No. 170

Glossary



GLOSSARY

Term	Definition
16S rRNA gene	A gene which is found in all bacteria. As it plays a role in formation of proteins it is essential and is used in phylogenetic analysis.
A260/A280	The ratio of absorbance at 260 nm and 280 nm used to assess the purity of DNA and RNA. A ratio of ~1.8 is accepted as “pure” for DNA and ~2.0 is generally accepted as “pure” for RNA.
Absolute quantification	An analysis method which determines how many copies of a gene are present. As samples are quantified compared with a known standard the actual number of copies can be determined.
Amplicon	A piece of DNA (i.e the amplified gene of interest – for this study it was a segment of the 16S rRNA gene) generated by PCR.
Amplification cycles	The conditions used to amplify DNA by PCR. It is a three step process involving the <i>denaturation</i> of the DNA (separating the molecule), <i>annealing</i> of the primer to the DNA and <i>elongation</i> in which the target gene is copied. This process is repeated 35-40 times to allow for the exponential amplification of the target gene.
Anoxia	Anoxic conditions describe an environment deprived of oxygen, i.e. zero dissolved oxygen
Anoxia/anoxic	Containing no dissolved oxygen.
Authigenic	Authigenic minerals form <i>in situ</i> within the depositional site in response to geochemical processes.
AVS analysis	Acid volatile sulphide fraction measured when sulphide is liberated from a sediment sample after acidification
Benthic	Referring to organisms living in or on the sediments of aquatic marine habitats.
Benthic organisms	Organisms living in or on sediments of aquatic marine habitats.
Benthos	The sum total of organisms living in, or on, the sediments of aquatic marine habitats.
Biodiversity	The variety of life forms, including the plants, animals and micro-organisms, the genes they contain and the ecosystems and ecological processes of which they are a part.
Biomass	The living weight of a plant or animal population, usually expressed on a unit area basis.
Biota	The sum total of the living organisms of any designated area.
cDNA conversion	The process of converting RNA to cDNA. As RNA is relatively unstable and readily degrades once extracted from a cell, RNA is converted into cDNA which is stable and can be used for later analysis and quantification.
Centrifugation	Use of centrifugal force for the sedimentation/separation of heterogeneous mixtures with a centrifuge.
Clay	Sediments containing particles smaller than 4 microns ESD
Community	An assemblage of organisms characterised by a distinctive combination of species occupying a common environment and interacting with one another.
Copy number	The number of copies of a gene.
Dissolved oxygen (DO)	Oxygen dissolved in a liquid, the solubility depending upon temperature, partial

Term	Definition
	pressure and salinity, expressed in milligrams/litre or millilitres/litre.
DNA amplification/PCR	Technique used to synthesize large quantities of specific DNA sequences/genes from a small amount of starting material.
DNA/RNA extraction	Extracting the nucleic acids (DNA/RNA) from the bacterial cells present in the sediment samples.
Ebullition	the action of bubbling or boiling
Epifauna	Organisms which live at, or on, the sediment surface being either attached (sessile) or capable of movement.
Equimolar ratios	Equal number of molecules from each sample were combined to ensure even representation.
Gel electrophoresis	The separation of DNA molecules according to size and charge in a gel matrix subject to an electrical field. It used to determine the size of DNA fragment.
Gravel	Gravel is the coarse sediment fraction containing particles larger than 2 mm in size.
Habitat	The place where a population (e.g. animal, plant, micro-organism) lives and its surroundings, both living and non-living.
Hypoxia	Hypoxic conditions describe an environment where dissolved oxygen concentrations are less than 2.8 mg/l (2 ml/l) and greater than zero.
Hypoxia/hypoxic	Low dissolved oxygen conditions (<0.5 ml/l dissolved O ₂) that are physiologically stressful to marine organisms.
Infauna	Animals of any size living within the sediment. They move freely through interstitial spaces between sedimentary particles or they build burrows or tubes.
LOI	Loss on ignition is a gravimetric technique which determines the organic matter of a solid sample lost after ignition at 450°C
Lysis	Breaking down the cell wall (the membrane which surrounds a microorganism) to release its nucleic acids.
Macrofauna	Benthic invertebrate animals >500 microns in size, or >300 microns in deeper water.
MATLAB	Software that allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages.
Meiofauna	Benthic invertebrate animals > 0.042 mm or > 0.032 (previously >0.063 mm).
Metagenomic – Also called environmental or community genomics.	It is the study of all the genomes recovered from an environmental sample without isolating/culturing them. Can be used to identify all the microorganisms present in a sample.
Microbial taxa	A term used to refer to a group of microbial organisms. It can refer to very closely related microorganisms (strains, species and genera) or to larger groupings (family and phylum).
Milli Q water	Milli-Q is a trademark created by Millipore Corporation to describe “ultrapure” water of “Type 1”, as defined by various authorities (e.g. ISO 3696), as well as their devices for producing such water
Mud	Based on the Wentworth scale, mud collectively describes the texture of the size fraction of sediment samples that is smaller than 62.5 microns ESD.
Normoxic	Oxygen concentrations > hypoxic threshold of 2.8 mg/litre to saturation (~8 mg /litre) in surface waters
Nucleic acid	Polymeric biological macromolecules, essential for all forms of life. Includes DNA and RNA. Nucleic acids function in encoding, transmitting and expressing genetic information.
ORP (Redox potential)	Oxidation reduction potential or “Redox Potential” is a measure of the tendency of a chemical species to acquire electrons and thereby be reduced
Oxic	Describes oxygenated conditions, where dissolved oxygen levels are above

Term	Definition
	2 mg/l (1.4 ml/l)
Oxygen minimum zone (OMZ)	Zone in the ocean where oxygen saturation is perennially at hypoxic (<0.5ml/l) conditions.
PCR	Polymerase chain reaction
PCR inhibitor	Impurities/chemicals which inhibit the enzymes used in PCR.
Phylogenetic analysis	Using genetic information to investigate evolutionary relationships (akin to a 'family tree').
Phylum	The major taxonomic group of animals and plants; contains classes
Phylum Delta Proteobacteria	A group of bacteria which include the strictly anaerobic sulphate-reducing bacteria (including <i>Desulfovibrio</i> , <i>Desulfobacter</i> , <i>Desulfococcus</i> and <i>Desulfonema</i>) and sulphur-reducing bacteria (e.g. <i>Desulfuromonas</i> species). Ferric iron-reducing <i>Geobacter</i> species, and syntrophic <i>Pelobacter</i> and <i>Syntrophus</i> species are also included in this phylum.
Phylum Firmicutes	Diverse group of Gram positive bacteria, which are found in a wide range of habitats. The phylum includes several genera of anaerobic, sulphate reducing organisms.
Population	Population is defined as the total number of individuals of the species or taxon.
Primer efficiency	A measure of how well a primer set amplifies a target gene by PCR. For qPCR a primer efficiency of 2 is considered ideal as this means that the number of copies are doubled every amplification cycle. Primers with a lower efficiency will result in less amplification which may lead to incorrect quantification.
Primers	Short pieces of DNA (oligonucleotides) which are used in PCR. They are specific for the gene of interest and ensure that only this gene is amplified.
QC standard	Quality control standard is a solid or liquid standard prepared from an independent external source to monitor the accuracy of an analytical method
Quantitative PCR/Real time PCR	Technique based on PCR which is used to amplify and simultaneously detect/quantify a target DNA molecule/gene (determine how many copies of the gene are present).
Redfield Ratio	Atomic ratio of carbon, nitrogen and phosphorus found in phytoplankton and throughout the deep oceans.
RNAlater	Reagent used to stabilize and prevent the degradation of RNA in environmental samples until the samples can be processed.
Roche LC480/Lightcycler 480	The instrument used to perform the qPCR.
Sand	According to the Wentworth scale, sand is classified as the fraction of particles between the sizes of 62.5 µm and 2 mm.
SEM concentration	Simultaneously extracted metal concentration-measured in the residual solution after liberation of sulphide from the sediment sample after acidification
Silt	Sediments in the size fraction >4 microns ESD and <62.5 microns ESD
Soliton	A class of non-sinusoidal, non-linear more or less isolated waves that occur frequently in nature
Species	A group of organisms that resemble each other to a greater degree than members of other groups and that form a reproductively isolated group that will not produce viable offspring if bred with members of another group.
Spectrophotometer	Instrument used to determine the concentration/amount of nucleic acid.
Sulphur- or sulphate reducing bacteria	Anaerobic bacteria that use sulphate or sulphur (or both) during respiration.
Sulphur oxidising bacteria	Organisms which oxidise reduced sulphur compounds such as hydrogen sulphide, inorganic sulphur and thiosulphate to sulphuric acid.
SYBR-Green	A dye which binds specifically to nucleic acids and can therefore be used to

Term	Definition
	quantify the amount of DNA in a sample.
Taxon (plural – taxa)	Any group of organisms considered to be sufficiently distinct from other such groups to be treated as a separate unit (e.g. species, genera, families).
Vario Elementar	An instrument used for the determination of organically and inorganically bound carbon and nitrogen solids.
WAVESMON	Data collection software which provides intuitive deployment planning, easy data collection, and complete processing displays from ADCP's.

Abbreviation	Definition
ADCP	Acoustic Doppler Current Profiler is a hydroacoustic current meter, similar to a sonar, measuring water current velocities over a depth range using the Doppler effect.
AVS	Acid volatile sulphides
BBL	Benthic boundary layer
BCC	Benguela Current Commission
CapFish	Capricorn Fisheries Monitoring cc.
cDNA	Complementary DNA which is used as a stable RNA analogue
Chl	Chlorophyll, the green pigment found in chloroplasts found in plants.
cm/s	centimetres per second
CPUE	Catch per unit effort
CRM	Certified reference materials are 'controls' or standards used to check the quality and metrological traceability of products, to validate analytical measurement methods, or for the calibration of instruments
CSIR	Council for Scientific and Industrial Research
CSS	Current shear stress
CTD	An instrument used to determine the Conductivity and Temperature seawater and to record the depth at which the measurements are made.
DNA	Deoxyribonucleic acid: Encodes genetic information in the form of genes. Found in the genome of organisms.
DO	Dissolved oxygen, a relative measure of the amount of oxygen that is dissolved in a given medium.
DOC	Dissolved organic carbon
EAF	Ecosystems approach to fisheries
EAFM	Ecosystem approach to fisheries management
EBM	Ecosystem based management
EEZ	Exclusive economic zone
EIA	Environmental Impact Assessment, a formal process used to predict the environmental consequences (positive or negative) of a plan, policy, programme or project.
EIA	Environmental impact assessment
EMP	Environmental management plan
EPA	The United States Environmental Protection Agency (EPA or sometimes USEPA) is an agency of the U.S. Federal Government which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress
ESACW	Eastern South Atlantic Central Water

Abbreviation	Definition
ESD	Equivalent spherical diameter
ETP	Endangered, threatened and protected
FIA	Flow injection analyser is an instrument used for the colorimetric determination of analytes such as nitrate, phosphate, ammonia and chloride.
GIS	Geographic information systems
GSI	Gonadosomatic index
ICP MS	Inductively coupled plasma mass spectrometry is an analytical technique used for the detection of trace metals where the inductively coupled plasma produces excited atoms, ions and isotopes with specific molecular masses which are measured with a mass spectrometer.
ICP OES	Inductively coupled plasma optical emission spectrometry is an analytical technique used for the detection of trace metals where the inductively coupled plasma produces excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element
ICSEAF	International Commission of the South-East Atlantic Fisheries
Ma	Megaannum one million (1,000,000) years
MET	Ministry of Environment and Tourism, Namibia
MFMR	Ministry of Fisheries and Marine Research, Namibia
ML 170	Mining licence 170, held by Namibian Marine Phosphate (Pty) Ltd
MLA	Mining licence area
MME	Ministry of Mines and Energy, Namibia
MSI	Metocean Services International, a company that provides an entire range of oceanographic and meteorological services to the offshore oil and gas market.
mV	Millivolts
NatMIRC	National Marine Information and Research Centre, Swakopmund, Namibia
NCEP	National Centre for Environmental Protection
NMP	Namibia Marine Phosphate (Pty) Ltd
NTU	Nephelometric Turbidity Units, unit in which turbidity is measured.
ODV	Software for the analysis and visualization of oceanographic, atmospheric and other geo-referenced profile or time-series data.
ORP	Oxidation-Reduction Potential
PEL	Probable effect level
POC	Particulate organic carbon, measured by high temperature combustion.
POM	Particle organic matter
PON	Particulate organic nitrogen, measured by high temperature combustion.
PSA	Particle size analysis is the collective name of the technical procedures, or laboratory techniques which determines the size range, and/or the average, or mean size of the particles in a powder or liquid sample
PSU	Practical Salinity Units, unit in which salinity is measured.
PUC	Poleward undercurrent
qPCR	Quantitative polymerase chain reaction (polymerase is the enzyme used to make more copies of the gene)
RNA	Ribonucleic acid: Since RNA is translated into a functional protein, analysis of RNA is more informative than analysis of DNA as it shows which genes are being actively expressed at any given time.
ROV	Remotely operated vehicle
SA	Swept area

Abbreviation	Definition
SACW	South Atlantic Central Water
SADCO	Southern African Data Centre for Oceanography, retrieves and manipulates multi-disciplinary marine information from the areas around southern Africa.
SAIEA	Southern African Institute for Environmental Assessment
SANAS	South African National Accreditation Service
SANUMARC	Sam Nujoma Marine and Coastal Resources Research Centre, Henties Bay Namibia
SEM	Simultaneously extracted metal
sp	Species
SP-1	Sandpiper-1
SP-2	Sandpiper-2
SP-3	Sandpiper-3
SS	Shear stress
SWAPELS	South West African Pelagic Egg and Larval Survey
TEL	Threshold effect level
TN	Total nitrogen
TSHD	Trailing Suction Hopper Dredger
TSS	Total suspended solids
UCCB	University Central Consulting Bureau, University of Namibia
UML	Upper mixed layer
UML	Upper mixed layer
UNAM	University of Namibia
UWC	University of Western Cape
Vbbl	Velocity of the benthic boundary layer
VP	Verification Programme