

Data Documentation

Dataset Information

Dataset Title:

NCCOS Assessment: Water Quality in Fagatele Bay, National Marine Sanctuary of American Samoa, from 2019-04-22 to 2019-04-26

Description:

This dataset represents water quality chemistry information for Fagatele Bay, a unit of the National Marine Sanctuary of American Samoa (NMSAS). Contaminant groups quantified were: pesticides, personal care products, pharmaceuticals and hydrocarbons. Trace metals analysis of benthic sediments was also conducted. Additionally, standard suite of nutrient parameters (nitrate, nitrite, ammonium, urea, total nitrogen, orthophosphate, total phosphorus and silica), as well as tracers of human waste (sucralose and caffeine) were quantified at eight targeted sites (bottom samples) during the same time period.

Purpose:

American Samoa's reefs are considered to be among the most pristine in the United States. These reefs host approximately 950 species of fish, 240 species of algae, 330 species of coral and many other species of invertebrates. Fagatele Bay, a unit of the National Marine Sanctuary of American Samoa (NMSAS), is located on the south shore of the island of Tutuila, the largest and most populous island of the U.S. territory of American Samoa. There have been local concerns about the impacts of land-based sources of pollution and water quality on the coral reef ecosystems of the Bay, specifically related to an unlined solid waste landfill upslope from the Bay. Organic and inorganic chemical contaminants have a wide range of potential negative impacts on the marine environment, including endocrine disruption, loss of habitat and changes in species composition. Environmental data, such as the dataset presented here, serve as a baseline of current conditions, which are needed to determine the efficacy of management efforts, i.e. measuring change over time. The data presented here can be utilized by coastal managers to best prioritize management strategies in a way to maximize success in decreasing stressors on coral reef ecosystems.

Partners included: National Marine Sanctuary of American Samoa, American Samoa's Coral Reef Advisory Group, ASEPA, and American Samoa Community College.

Methods:

Sampling sites were selected (targeted) based on proximity to shore and distribution along the reef in an attempt to capture groundwater inputs to the reef. Continuous Low-level Ambient Monitoring (CLAM) devices were deployed on the substrate for 24-hour exposures to actively sample organic contaminants for subsequent laboratory analysis. Sites were sampled for nutrient samples and sediments by SCUBA divers.

Sediment were sampled directly into certified pre-cleaned jars were used to minimize the potential for contamination or cross contamination between sites. For nutrient analysis, and bottom water samples were collected directly into high density polyethylene (HDPE) bottles.

The bottles were rinsed three times with site water prior to sampling. Sediment and nutrient samples were labelled and placed on ice in a cooler until they could be transferred to a freezer at the conclusion of each sampling day. One jar per site was reserved for grain size analysis and stored at 4 degrees C (rather than frozen).

Samples were shipped under chain-of-custody and arrived in good condition to TDI Brooks International in College Station, TX for analytical services. All laboratory analyses were performed using protocols from the NOAA National Status and Trends Program (NS&T) by TDI-Brooks, International, or their subcontractor, AXYS Analytical. Detailed descriptions of NS&T protocols, including quality assurance/quality control (QA/QC) and analytical methods used can be found in Kimbrough et al., 2006. Laboratory analysis methods specifically for AXYS related analytical results (current use pesticides and human use pharmaceuticals) are proprietary and confidential. The method names used for this study were MLA-035 REV.07.04 and MLA-070 REV.07.04. Contact information for further references is: AXYS Analytical Services Ltd, 2045 Mills Road W., Sidney, BC, Canada, V8L 5X2. Tel. (250) 655-5800, fax (250) 655-5811.

Cited Publications:

- Armstrong, F., and C. Stearns. 1967. The measurement of upwelling and subsequent biological processes by means of the Technicon Autoanalyzer and associated equipment. *Deep-Sea Research*, 14:381-389. [https://doi.org/10.1016/0011-7471\(67\)90082-4](https://doi.org/10.1016/0011-7471(67)90082-4)
- Hansen, H., and F. Koroleff. 1999. Determination of Nutrients. In: Grasshoff, K., K. Kremling, and M. Ernhardt [Eds.], *Methods of Seawater Analysis*. New York, Wiley-VCH. ISBN 3-527-29589-5. <https://doi.org/10.1002/9783527613984>
- Harwood, J., and A. Kuhn. 1970. A colorimetric method for ammonia in natural waters. *Water Research*, 4:805-811. [https://doi.org/10.1016/0043-1354\(70\)90037-0](https://doi.org/10.1016/0043-1354(70)90037-0)
- Kimbrough, K.L., and G.G. Lauenstein. 2006. Major and Trace Element Analytical Methods of the National Status and Trends Program: Update 2000 - 2006. NOAA Technical Memorandum NOS NCCOS 29. Silver Spring, MD. 19 pp. <https://repository.library.noaa.gov/view/noaa/17784>
- Mason, A.L., and D.R. Whitall. 2019. A Baseline Chemical Contaminants Assessment of Sediment from the Nu'uuli Pala Lagoon, American Samoa. NOAA Technical Memorandum NOS NCCOS 267. Silver Spring, MD. 35 pp. <https://doi.org/10.25923/3sqf-vh06>

People & Projects

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- Mareike Sudek, US DOC; NOAA; NOS; Office of National Marine Sanctuaries (ONMS)
- Hanae Spathias, ONMS (formerly)

Partners:

- National Marine Sanctuary of American Samoa (NMSAS)
- American Samoa Coral Reef Advisory Group (CRAG)
- American Samoa Environmental Protection Agency (ASEPA)
- American Samoa Community College (ASCC)

Funding:

- US DOC; NOAA; NOS; National Centers for Coastal Ocean Science (NCCOS)
- US DOC; NOAA; NOS; Coral Reef Conservation Program (CRCP)

Associated Projects:

- NCCOS Project #444, Assessing Futiga Dump Site Impacts on Fagatele Bay in National Marine Sanctuary of American Samoa, <https://coastalscience.noaa.gov/project/assessing-futiga-dump-site-impacts-on-fagatele-bay-in-national-marine-sanctuary-of-american-samoa/>
- CRCP Project #31193, Assessing Futiga Dump Site Impacts on Fagatele Bay (National Marine Sanctuary of American Samoa)

Extents

Start Date: 2019-04-22

End Date: 2019-04-26

Northern Boundary: -14.3629

Southern Boundary: -14.3665

Western Boundary: -170.763

Eastern Boundary: -170.761

Keywords

Sea Areas, Water Bodies, Marine Protected Areas:

- Coastal Ocean
- American Samoa
- Tutuila
- Fagatele Bay
- National Marine Sanctuary of American Samoa (NMSAS)

NCCOS Keywords:

- NCCOS Research Priority > Stressor Impacts and Mitigation
- NCCOS Research Topic > Biological Effects of Contaminants and Nutrients
- NCCOS Research Location > Region > Pacific Ocean
- NCCOS Research Location > U.S. States and Territories > American Samoa
- NCCOS Research Data Type > Field Observation

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CoRIS Keywords:

CoRIS Discovery Thesaurus:

- Numeric Data Sets > Water Quality

CoRIS Theme Thesaurus:

- EARTH SCIENCE > Oceans > Ocean Chemistry > Chemistry Monitoring and Assessment

CoRIS Place Country/Territory Keywords:

- COUNTRY/TERRITORY > United States of America > American Samoa > Tutuila Island > Fagatele Bay (14S170W0002)

CoRIS Place Ocean/Seas Keywords:

- OCEAN BASIN > Pacific Ocean > Tutuila Island > Fagatele Bay (14S170W0002)

File Information

Total File Size: 404 KB total, 6 files in 1 folder (unzipped), 365 KB (zipped)

Data File Format(s): Comma-separated value (.CSV)

Data Files:

- NCCOS-Fagatele-Water-Quality_Data-01_Nutrients.CSV
- NCCOS-Fagatele-Water-Quality_Data-02_Sediment-Metals.CSV
- NCCOS-Fagatele-Water-Quality_Data-03_Organic-Contaminants.CSV

Documentation Files:

- BrowseGraphic.JPG
- DataDocumentation.PDF
- NCCOS-Fagatele-Water-Quality_Site-Info.CSV

Table 1: Inorganic Nutrients Data Dictionary

Column	Variable	Label	Definition	Units	Range
1	Sample ID	Site Name	Site name and sample depth	n/a	n/a
2	Date	Collection Date	Day of the year sample was collected	MM/DD/YYYY	04/22/2019 to 04/23/2019
3	Nitrate	NO3-	Water concentration	mg N/L	0.002 to 0.0144
4	Orthophosphate	HPO4=	Water concentration	mg P/L	0.0097 to 0.0429
5	Silica	HSiO3-	Water concentration	mg Si/L	0.1308 to 0.1960
6	Ammonium	NH4+	Water concentration	mg N/L	0.0192 to 0.0557
7	Nitrite	NO2-	Water concentration	mg N/L	0.0005 to 0.0038
8	Urea	Urea	Water concentration	mg N/L	0 to 0.00053
9	Total Nitrogen	Total N	Water concentration	mg N/L	0.2412 to 0.3553
10	Total Phosphorus	Total P	Water concentration	mg N/L	0.0240 to 0.0464

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Table 2: Metals Data Dictionary

Column	Variable	Label	Definition	Units	Range
1	Site Name	Site Name	Site Name	n/a	n/a
2	Date	Collection Date	Day of the year sample was collected	MM/DD/YYYY	04/24/2019
3	Metal	Analyte	Variable analyzed for	n/a	na
4	Concentration	Concentration	Sediment concentration	ppm	0.0023 to 14500

Table 3: Organic Contaminants Data Dictionary

Column	Variable	Label	Definition	Units	Range
1	Site Name	Site Name	Site name	n/a	n/a
2	Date	Collection Date	Day of the year sample was collected and depth (surface or bottom)	MM/DD/YYYY	04/23/2019 to 04/26/2019
3	Organic contaminant	Analyte	Variable analyzed for	n/a	n/a
4	Concentration	Concentration	Water concentration	ng/L	0 to 51.2808

Table 4: Site Information Data Dictionary

Column	Variable	Label	Definition	Units	Range
1	Site Name	Site Name	Site Name	n/a	n/a
2	Latitude	Latitude	Latitude of site	decimal degrees	-14.3629 to -14.3665
3	Longitude	Longitude	Longitude of site	decimal degrees	-170.763 to -170.761
4	Analyses	Analyses	Analyses performed at this site	n/a	n/a

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Table 5: List of Organic Chemicals

[13C12]-PBDE-209	C1-Naphthalenes	Dibenzothiophene
1,2,3,4-Tetrachlorobenzene	C1-Naphthobenzothiophenes	Dibutyltin
1,2,4,5-Tetrachlorobenzene	C1-Phenanthrenes/Anthracenes	Dieldrin
1,6,7-Trimethylnaphthalene	C20-TAS	Endosulfan I
18a-Oleanane	C21-TAS	Endosulfan II
1-Methyldibenzothiophene	C26(20R)/C27(20S)-TAS	Endosulfan Sulfate
1-Methylfluorene	C26(20S)-TAS	Endrin
1-Methylnaphthalene	C27(20R)-TAS	Fluoranthene
1-Methylphenanthrene	C28(20R)-TAS	Fluorene
2,4'-DDD	C28(20S)-TAS	Gamma-Chlordane
2,4'-DDE	C29-Hopane	Gamma-HCH
2,4'-DDT	C2-Benzothiophenes	Heptachlor
2,6-Dimethylnaphthalene	C2-Chrysenes	Heptachlor-Epoxide
2/3-Methyldibenzothiophene	C2-Decalins	Hexachlorobenzene
2-Methylanthracene	C2-Dibenzo(a,h)anthracenes	Indeno(1,2,3-c,d)pyrene
2-Methylfluoranthene	C2-Dibenzothiophenes	Mirex
2-Methylnaphthalene	C2-Fluoranthenes/Pyrenes	Monobutyltin
2-Methylphenanthrene	C2-Fluorenes	Naphthalene
3,6-Dimethylphenanthrene	C2-Naphthalenes	Naphthalene-d8
3-Methylphenanthrene	C2-Naphthobenzothiophenes	Naphthobenzothiophene
4,4'-DDD	C2-Phenanthrenes/Anthracenes	Oxychlordane
4,4'-DDE	C30-Hopane	PBB 1
4,4'-DDT	C3-Benzothiophenes	PBB 10
4/9-Methylphenanthrene	C3-Chrysenes	PBB 103
4'-Fluoro-PBDE160	C3-Decalins	PBB 15
4-Methyldibenzothiophene	C3-Dibenzo(a,h)anthracenes	PBB 155
Acenaphthene	C3-Dibenzothiophenes	PBB 18
Acenaphthene-d10	C3-Fluoranthenes/Pyrenes	PBB 2
Acenaphthylene	C3-Fluorenes	PBB 26
Aldrin	C3-Naphthalenes	PBB 3
Alpha-Chlordane	C3-Naphthobenzothiophenes	PBB 30
Alpha-HCH	C3-Phenanthrenes/Anthracenes	PBB 31
Anthracene	C4-Benzothiophenes	PBB 4
Benz(a)anthracene	C4-Chrysenes	PBB 49
Benzo(a)fluoranthene	C4-Decalins	PBB 52
Benzo(a)pyrene	C4-Dibenzothiophenes	PBB 53
Benzo(b)fluoranthene	C4-Fluoranthenes/Pyrenes	PBB 7
Benzo(b)fluorene	C4-Naphthalenes	PBB 77
Benzo(e)pyrene	C4-Naphthobenzothiophenes	PBB 80
Benzo(g,h,i)perylene	C4-Phenanthrenes/Anthracenes	PBB 9
Benzo(k,j)fluoranthene	Carbazole	PBDE-1
Benzothiophene	Chlorpyrifos	PBDE-10
Beta-HCH	Chrysene/Triphenylene	PBDE-100
Biphenyl	Chrysene-d12	PBDE-11
C1-Benzothiophenes	cis/trans Decalin	PBDE-116
C1-Chrysenes	Cis-Nonachlor	PBDE-118
C1-Decalins	DBOFB	PBDE-119
C1-Dibenzo(a,h)anthracenes	DDMU	PBDE-12
C1-Dibenzothiophenes	Delta-HCH	PBDE-126
C1-Fluoranthenes/Pyrenes	Dibenzo(a,h)anthracene	PBDE-13
C1-Fluorenes	Dibenzofuran	PBDE-138

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PBDE-15	PCB141/179	PCB66
PBDE-153	PCB146	PCB7/9
PBDE-154	PCB149/123	PCB70
PBDE-155	PCB15	PCB74/61
PBDE-166	PCB151	PCB8/5
PBDE-17	PCB153/132	PCB81
PBDE-181	PCB156/171/202	PCB82
PBDE-183	PCB158	PCB83
PBDE-190	PCB16/32	PCB84
PBDE-194	PCB166	PCB85
PBDE-195	PCB167	PCB86
PBDE-196	PCB169	PCB87/115
PBDE-197	PCB170/190	PCB88
PBDE-198/199/203/200	PCB172	PCB92
PBDE-2	PCB174	PCB95
PBDE-201	PCB176/137	PCB97
PBDE-202	PCB177	PCB99
PBDE-204	PCB178	Pentachloroanisole
PBDE-205	PCB18	Pentachlorobenzene
PBDE-206	PCB180	Perylene
PBDE-207	PCB183	Perylene-d12
PBDE-208	PCB185	Phenanthrene
PBDE-209	PCB187	Phenanthrene-d10
PBDE-25	PCB189	Pyrene
PBDE-28	PCB191	Retene
PBDE-3	PCB194	TCMX
PBDE-30	PCB195/208	Tetrabutyltin
PBDE-32	PCB196/203	Trans-Nonachlor
PBDE-33	PCB199	Tributyltin
PBDE-35	PCB200	Tri-n-propyltin
PBDE-37	PCB201/157/173	Tripentyltin
PBDE-47	PCB205	
PBDE-66	PCB206	
PBDE-7	PCB209	
PBDE-71/49	PCB22/51	
PBDE-75	PCB24/27	
PBDE-77	PCB25	
PBDE-8	PCB26	
PBDE-85	PCB28	
PBDE-99	PCB29	
PCB 103	PCB31	
PCB 198	PCB33/53/20	
PCB1	PCB40	
PCB101/90	PCB41/64	
PCB105	PCB42/59/37	
PCB107	PCB43	
PCB110/77	PCB44	
PCB114/131/122	PCB45	
PCB118	PCB46	
PCB128	PCB47/48/75	
PCB129/126	PCB49	
PCB136	PCB52	
PCB138/160	PCB56/60	

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Table 6: List of Pesticides and Pharmaceuticals

1,7-Dimethylxanthine	Cimetidine	Gemfibrozil
10-hydroxy-amitriptyline	Ciprofloxacin	Glipizide
2,4'-DDD	Citalopram	Glyburide
2,4'-DDE	Clarithromycin	HCH, alpha
2,4'-DDT	Clinafloxacin	HCH, beta
2-Hydroxy-ibuprofen	Clonidine	HCH, delta
4,4'-DDD	Clotrimazole	HCH, gamma
4,4'-DDE	Cloxacillin	Heptachlor
4,4'-DDT	Cocaine	Heptachlor Epoxide
4-Epianhydrochlortetracycline [EACTC]	Codeine	Hexachlorobenzene
4-Epianhydrotetracycline [EATC]	Colchicine	Hexazinone
4-Epichlortetracycline [ECTC]	Cotinine	Hydrochlorothiazide
4-Epioxytetracycline [EOTC]	Cyanazine	Hydrocodone
4-Epitetracycline [ETC]	Cyclophosphamide	Hydrocortisone
Acetaminophen	Dacthal	Ibuprofen
Albuterol	Daunorubicin	Iopamidol
Aldrin	DEET	Isochlortetracycline [ICTC]
alpha-Endosulphan	Dehydronifedipine	Lincomycin
Alprazolam	Demeclocycline	Lomefloxacin
Ametryn	Desethylatrazine	Malathion
Amitriptyline	Desmethyldiltiazem	Medroxyprogesterone Acetate
Amlodipine	Diatrizoic acid	Melphalan
Amphetamine	Diazepam	Meprobamate
Amsacrine	Diazinon	Metformin
Anhydrochlortetracycline [ACTC]	Diazinon-Oxon	Methoxychlor
Anhydrotetracycline [ATC]	Dieldrin	Methylprednisolone
Atenolol	Digoxigenin	Metoprolol
Atorvastatin	Digoxin	Metribuzin
Atrazine	Diltiazem	Metronidazole
Azathioprine	Dimethoate	Miconazole
Azinphos-Methyl	Diphenhydramine	Minocycline
Azithromycin	Disulfoton	Mirex
Benzoylecgonine	Disulfoton Sulfone	Moxifloxacin
Benztropine	Doxorubicin	Naproxen
beta-Endosulphan	Doxycycline	Nonachlor, cis-
Betamethasone	Drospirenone	Nonachlor, trans-
Bisphenol A	Enalapril	Norfloxacin
Busulfan	Endosulphan Sulphate	Norfluoxetine
Caffeine	Endrin	Norgestimate
Captan	Endrin Ketone	Norverapamil
Carbadox	Enrofloxacin	Ofloxacin
Carbamazepine	Erythromycin-H2O	Ormetoprim
Cefotaxime	Ethion	Oxacillin
Chlordane, alpha (cis)	Etoposide	Oxazepam
Chlordane, gamma (trans)	Fenitrothion	Oxolinic Acid
Chlordane, oxy-	Flumequine	Oxycodone
Chlorothalonil	Fluocinonide	Oxytetracycline [OTC]
Chlorpyrifos	Fluoxetine	Parathion-Ethyl
Chlorpyrifos-Methyl	Fluticasone propionate	Parathion-Methyl
Chlorpyrifos-Oxon	Fonofos	Paroxetine
Chlortetracycline [CTC]	Furosemide	Penicillin G

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Penicillin V	Tylosin
Perthane	Valsartan
PFBA	Venlafaxine
PFBS	Verapamil
PFDA	Virginiamycin M1
PFDoA	Warfarin
PFHpA	Zidovudine
PFHxA	
PFHxS	
PFNA	
PFOA	
PFOS	
PFOSA	
PFPeA	
PFUnA	
Phorate	
Phosmet	
Pirimiphos-Methyl	
Prednisolone	
Prednisone	
Promethazine	
Propoxyphene	
Propranolol	
Quintozone	
Ranitidine	
Rosuvastatin	
Roxithromycin	
Sarafloxacin	
Sertraline	
Simazine	
Simvastatin	
Sulfachloropyridazine	
Sulfadiazine	
Sulfadimethoxine	
Sulfamerazine	
Sulfamethazine	
Sulfamethizole	
Sulfamethoxazole	
Sulfanilamide	
Sulfathiazole	
Tamoxifen	
Tecnazene	
Teniposide	
Terbufos	
Tetracycline [TC]	
Theophylline	
Thiabendazole	
Trenbolone	
Trenbolone acetate	
Triamterene	
Triclocarban	
Triclosan	
Trimethoprim	

Parameter Information

List of major parameters included in this accession:

- Nutrients
- Organic Chemicals
- Metals

Parameter Description:

Parameter: Nutrients

Property Type: measured

Units: mg/L

Observation Category: laboratory analysis

Sampling Instrument: Continuous Low-level Ambient Monitoring (CLAM) devices

Sampling and Analyzing Method:

Nutrients analyzed include:

- nitrate, nitrite, ammonium, urea, total concentration of nitrogen
- total concentration of phosphorus
- silicate

Nitrate and nitrite analyses were based on the methodology of Armstrong et al. (1967).

Ammonium analysis was based on the method of Harwood and Kuhn (1970) using dichloroisocyanurate as the oxidizer. Urea was measured using diacetyl-monoximine and

themicarbozide with colorimetric analysis. The total concentration of nitrogen was

determined after an initial decomposition step. This method involves persulfate oxidation

while heating the sample in an autoclave (115°C, 20 minutes) (Hansen and Koroleff, 1999).

After oxidation of the samples, nitrogen determination was conducted on the Astoria Pacific

analyzer for nitrate. The total concentration of phosphorus was determined after an initial

decomposition step. This method involves persulfate oxidation while heating the sample in

an autoclave (115°C, 20 minutes) (Hansen and Koroleff 1999). After oxidation of the

samples, phosphorus determination was conducted on the Astoria Pacific analyzer for

orthophosphate. Silicate determination was accomplished using the methods of Armstrong

et al. (1967) using stannous chloride.

Data Quality Method:

All laboratory data contained blanks, spikes and percent recoveries. Data were QA/QC'd using National Status and Trends protocols.

Parameter Description:

Parameter: Organic Chemicals

Property Type: measured

Units: ng/g

Observation Category: laboratory analysis

Sampling Instrument: Continuous Low-level Ambient Monitoring (CLAM) devices

Sampling and Analyzing Method:

Organic chemicals analyzed include:

- polynuclear aromatic hydrocarbons (PAH)
- polychlorinated biphenyls (PCB)
- organochlorines, perfluorinated compounds (PFCs), polybrominated diphenyl ethers (PBDE)
- multiresidue pesticides (MRES)

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- human-use pharmaceuticals, personal care products, trace elements

For a complete description of the methods and analyses see Mason and Whitall (2019).

Data Quality Method:

All laboratory data contained blanks, spikes and percent recoveries. Data were QA/QC'd using National Status and Trends protocols. For a complete description of the methods and analyses see Mason and Whitall (2019).

Parameter Description:

Parameter: Metals

Property Type: measured

Units: ppm

Observation Category: laboratory analysis

Sampling Instrument: Continuous Low-level Ambient Monitoring (CLAM) devices

Sampling and Analyzing Method:

Organic chemicals analyzed include: aluminum, antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silica, silver, tin, zinc.

For a complete description of the methods and analyses see Kimbrough *et al.* (2006).

Data Quality Method:

All laboratory data contained blanks, spikes and percent recoveries. Data were QA/QC'd using National Status and Trends protocols.

Document Information

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Resource Provider: NCCOS Data Manager, nccos.data@noaa.gov, US DOC; NOAA; NOS; National Centers for Coastal Ocean Science (NCCOS)

Comment: This data documentation describes data files archived as a NOAA NCEI data accession, and is intended to provide dataset-level metadata for the purposes of discovery, use, and understanding.

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