VROISTANEWER, ALITURA

¹ Second Strategy and Constrained Strateg

P.O. BOX 270 HARTFORD, CONNECTICUT 06101 (203) 666-6911

July 3, 1980

Dockets No. 50-245 50-336 A01039

Director of Nuclear Reactor Regulation Attn: Mr. D. M. Crutchfield, Chief Operating Reactors Branch #5 Mr. R. A. Clark, Chief Operating, Reactors Branch #3 U.S. Nuclear Regulatory Commission Washington. D. C. 20555

References:

- Letter, W. G. Counsil to D. L. Ziemann and R. Reid, dated July 2, 1979
- (2) Letter, P. M. Crutchfield to W. G. Counsil, dated May 7, 1980
- (3) Letter, R. E. Moore, CT DEP, to W. G. Counsil, dated June 11, 1980
- (4) Letter, D. C. Switzer to G. Lear, dated February 3, 1978
- (5) Letter, W. G. Counsil to D. L. Ziemann and R. Ried, dated February [°], 1979

Gentlemen:

Millstone Nuclear Power Station, Unit Nos. 1 and 2 Proposed Revisions to Environmental Technical Specifications

In Reference (1), Northeast Nuclear Energy Company (NNECO) proposed to amend its Environmental Technical Specification (ETS), pursuant to 10 CFR 50.59, for Millstone Unit No. 1 (License No. DPR-21) and Millstone Unit No. 2 (License No. DPR-65). In reference (2), you requested additional information with respect to that proposed amendment. Enclosure 1 to this letter is intended to provide the additional information requested in Reference (2).

Also be advised that, in Reference (3) (copy enclosed), the Connecticut Department of Environmental Protection (CT DEP) has approved our Thermal Plume Study Report as the basis for corroborating their previous finding

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that the thermal component of the discharge does not result in a violation of Connecticut Water Quality Standards. This action further supports our request (Reference (1)) for deletion of ETS Section 4.6 (Thermal Plume Study).

Further, in Reference (4), NNECO requested other changes to its ETS, but in Reference (5), it clarified that request by withdrawing changes to certain sections, and deferring other changes because they related to radiological effluents. We would appreciate it if the remaining changes indicated in Enclosure 2 to Reference (5), could be processed at this time also. This action, along with removal of the radiological effluent specifications, will provide an updated ETS and facilitate conversion of the ETS in response to the Yellow Creek and other subsequent ASLAB decisions, in an expeditious manner.

Should you have any questions or require further information regarding Enclosure 1 to this letter, please contact our Mr. Paul M. Jacobson at (203) 447-1205.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

W. G. Counsil

Senior Vice President

Enclosure



STATE OF CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION



STATE OFFICE BUILDING

HARTFORD, CONNECTICUT 06115 June 11, 1980

Approval

RECEIVED

Northeast Nuclear Energy Company P.O. Box 270 Hartford, Connecticut 06101

JUN 1 3 1980

SC. VICE PRESIDENT Nuclear Engineering & Operations

Attention: Mr. W.G. Counsil, Vice President

> Re: DEP/WPC 152-001 Town of Waterford Long Island Sound Watershed

Dear Mr. Counsil:

The following reports have been reviewed by the Department of Environmental Protection:

Millstone Nuclear Power Station Units 1,2, and 3 Environmental Assessment of the Condenser Cooling Water Intake Structure 316 (b) Demonstration, Volumes I and II, September 1976 prepared for Northeast Nuclear Energy Company by Northeast Utilities Service Company.

Thermal Plume Modeling at the Millstone Nuclear Power Station August 1979 prepared for Northeast Utilities Service Company by Stolzenbach and Adams.

Annual Reports on a Monitoring Program of the Marine Environment of the Millstone Point, Connecticut Area 1975, 1976, 1977, 1978 prepared by Battelle Laboratories for Northeast Utilities Service Company.

These reports comply with Department of Environmental Protection Water Compliance Unit's Order No. 1505 to Northeast Nuclear Energy Lompany entered on December 30, 1974, fulfilling requirements of steps 5,14, 15,16, and 17 of the Order. The reports are hereby approved in accordance with Sections 25-54k and 25-54e of the Connecticut General Statutes as amended.

These reports shall be the basis for corroborating the Director's finding that the thermal component of the discharge does not result in a violation of Connecticut Water Quality Standards. These reports shall be the basis of the functional design of the intake structures to minimize adverse environmental impacts which may result, from impingement and entrainment. This approval does not relieve the discharger obligation to obtain any other authorizations as may be required by other provisions of the Connecticut General State agencies.

very truly yours, low

Robert E. Moore Director Water Compliance Unit

REM/dsm

cc: Northeast Utilities Service Co.

Enclosure 1

Response to Request for Additional Information Proposed Revisions to Environmental Technical Specification

Millstone Nuclear Power Station

Unit Nos. 1 & 2

Docket Nos. 50.245 and 336

Northeast Nuclear Energy Company

July 3, 1980

Question 1:

A technical justification as to why the subtidal rocky substrate sampling program should be discontinued--provide the results of this study for 1979, contrast and compare the 1979 data with the data collected over the last several years.

Response:

The justification for deletion of subtidal rock sampling from the Benthic Survey, ETS Section 3.1.2.1.5, is based on the knowledge that the current sampling procedures for subtidal rock substrates provide data of questionable value with regard to the stated objective, that rock accounts for only a small portion of the available subtidal substrate, and that additional effort presently being expended on the Rocky Shore Survey has resulted in a significant improvement in our ability to assess the potential impact of power plant operations on benthic communities.

Long Island Sound in general, and the Greater Millstone Bight in particular, are characterized by a soft bottom and a concommitant scarcity of subtidal rocks suitable for attachment and growth of marine algae (Sanders 1956; Lund, Stewart & Rathbun 1973; McCall 1975); this lack of available substrate necessitates rescraping the same rock surfaces every three months at our study sites.

Even when substrate is not a limiting factor, researchers in other areas of New England have found that intersample variability of biomass values is so great that only extensive harvesting (large area and/or many replicates) can permit valid comparisons between even the most similar stations (Vadas et al. 1976; Wilce et al. 1978). Giants Neck and Effluent differ with respect to exposure, water velocity, and slope, as well as degree of rescraping the same surfaces (Battelle 1977); as the subtidal ock sampling program is now implemented, it is impossible to distinguish possible man-induced impact from natural spatial and temporal variability.

Researchers at other power stations have reported that the environmental damage caused by repeated destructive sampling is more extensive than the studies can justify (and far more extensive than possible power plant impact), and have shifted the emphasis of their sampling programs away from biomass determinations and towards nondestructive growth studies and succession studies (Vadas et al. 1976; Wilce et al. 1978).

To this end, although the subtidal rock stations were sampled quarterly in 1979, and the collections preserved, further processing and analyses were deferred; effort was concentrated on the Rocky Shore Survey, whose scope has recently been increased to the extent that it is now more sensitive to minor variations in the benthic rock communities (see Pages 101-142 of 1979 Annual Report). Instead of a single horizontal transect at the mid-tide level, percent of substrate coverage is based on five vertical transects at eac. of the seven rocky intertidal sites. At four of the sites, three additional vertical transects were denuded for study of recolonization rates and succession patterns. These patterns were also studied in areas under wire mesh cages that excluded predators and grazers. Recruitment and growth of <u>Fucus</u> vesiculosus was also investigated at the same four stations.

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The growth of <u>Ascophyllus</u> nodosum is particularly sensitive to environmental conditions (Prinz 1956; Baardseth 1970; Keser 1978), and other investigators have used this alga as a bioindicator of thermal stress associated with power plant effluents (Vadas et al. 1978; Wilce et al. 1978). To identify a possible thermal impact, populations of <u>Ascophyllum</u> were chosen at four sites for growth and mortality studies.

The results of the Rocky Shore Survey are included in the 1979 Annual Report, and summarized on pages 138 and 139 therein. The larger number of data points, and larger area nondestructively sampled provide a more accurate representation of the local benthic rock communities than the subtidal rock program could.

In conclusion, we again request that subtidal rock sampling be deleted from the environmental monitoring program; many reports in recent years have stressed the inadequacy of repeated destructive sampling, especially when available substrate is limiting. The expanded scope and sensitivity of the Rocky Shore Survey should be ample to allow us to meet the stated objectives, namely, determination and description of any potential impact due to the operation of Millstone Nuclear Power Station on the benthic rock communities.

LITERATURE CITED

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Battelle-William F. Clapp Laboratories. 1977. A monitoring program on the ecology of the marine environment of the Millstone Point, Connecticut area. Annual Report for the year 1976. Presented to the Northeast Utilities Service Company.

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McCall, P. L. 1975. The influence of disturbance on community patterns and adaptive strategies of the infaunal benthos of central Long Island Sount. Ph.D. Thesis Yale Univ. New Haven, Conn. 198 pp.

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Vadas, R. L., M. Keser, and B. Larson. 1978. Effects of reduced temperatures on previously stressed populations of an intertidal alga. pp. 434-451. In J. H. Thorp and J. W. Gibons (eds.). Energy and environmental stress in aquatic systems. DOE Symposium Series (Cong-771114).

Wilce, R. T., J. Foertch, W. Grocki, J. Kilar, H. Levine, J. Wilce. 1978. Flora: Marine Algal Studies. In Benthic Studies in the Vicinity of Pilgrim Nuclear Power Station, 1969-1977. Summary Report, Boston Edison Co. pp. 307-656.

Question 2:

The data on reproductive activity and condition factors collected during the trawling survey--using this data present a technical justification as to why continued collection of this data is not warranted.

Response:

Qualitative observations of reproductive activity of fish caught in trawls have been made routinely since the study inception and have been recorded for winter flounder (<u>Pseudopleuronectes americanus</u>) since 1976. Emphasis has been placed on winter flounder since it is the most important local recreational and commercial fish species and is the only fish species caught in large numbers during its reproductive phases. Detailed information on the repreductive activity of winter flounder is also collected annually during the tag and recapture program in the Niantic River (ETS Section 4.4). The data thus far collected in trawls (Table 1) is in agreement with that obtained in the Niantic River winter flounder tag-recapture study. The mean percent of trawled females was between 60-75% and the number of fish in spawning condition was greatest before the second week of April. Most fish in spawning condition after the first week of April were mature males. (Annual Report, 1979).

Since the information on reproductive activity collected from trawls is useful only for winter flounder and since that species is studied in more detail during the Niantic River study, we suggest that specifying reproductive activity as an objective of trawls is redundant and no longer necessary.

Condition factor is usually considered as the relationship of weight to length. The coefficient of condition, K, is obtained using the following formula (from Carlander, K.D. 1969. Handbook of Freshwater Fishery Biology, Volume One. Iowa State University Press, Ames, Iowa.):

$$K = \frac{W-10^5}{L^3}$$

Where W = weight in grams L = length in millimeters 10⁵ is a factor to bring the value of K near unity

The condition factor is usable only where accurate lengths and weights can be obtained. On the basis of our initial measurements during 1973 through 1975 we found that accurate weights could not be obtained on board the boat due to wave action. The technical specification requires that efforts be made to release uninjured individuals alive. Since the taking of weights is not part of the specifications and all fish would have to be sacrificed in order to obtain an accurate weight, the weighing of fish was discontinued as part of the trawling procedure in January 1975. Tables 2 and 3 show the condition factor for 3 of the major species for which weights were obtained during 1973 through 1974. The Niantic River winter flounder length-weight data was compared to the 1974 trawl data. The maximum variation in condition factor units is equivalent to approximately 25 gm. Since the fish weights taken on board the boat could have been in error up to 25 - 50 gm, it is impossible to determine if the differences were due to changes in the weight length ratio or to variability of the weighing procedure.

Condition factor is not a widely used procedure in marine fisheries biology. A similar procedure where growth (length) per age is compared by year is part of the Niantic River winter flounder study.

When condition factors were originally placed in the technical specifications, it was not necessarily referring to the length-weight condition factor but as an observed adverse physical condition of fish in the sampling area which may have been caused by the power station.

To date no adverse physical condition of fish has been noted that could be considered other then normal net damage or a result of natural factors. These observations will continue to be made, however condition factors are no longer considered as a major objective of the trawling survey.

-3-

Table 1.	Percent of winter flounder in spawning condition before the	
	second week of April (SB) and after the first week of April	
	(SA) in the Millstone Point area based on routine otter trawls.	1

YEAR	% SB	% SA
1976	88.4	1.2
1977	44.0	0.0
1978	77.0	18.0
1979	83.7	28.8
MEAN	73.3	12.2

Table 2. Condition factors (CF) for Winter Flounder caught in the trawl survey (TS) and the Niantic River Winter Flounder STudy (NRWF).

Study	Year	Months	Mean CF	(<u>+</u>) 95% C I	Min. CF	Max. CF
T S ⁽¹⁾	1973	OctDec.	1.428	.038	.326	2.963
T S ⁽¹⁾	1974	OctDec.	1.257	.017	.527	2.903
T S ⁽²⁾	1974	March-April	1.177	.017	.408	2.448
NRWF	1977	March-April	1.135	.021	.626	1.878
NRWF	1978	March-April	1.110	.025	.421	.1697

(1) All stations in the Millstone Point area.

(2) Niantic River Station only.

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Table 3. Condition factors (CF) for Window pane Flounder (WP) and Skates (SK).

Species	Year	Mean CF	+ 95% C I	Min. CF	Max. CF
WP	1973	1.293	0.101	0.656	5.368
WP	1974	1.026	0.028	0.603	2.034
SK	1973	0.589	0.044	0.246	0.942
SK	1974	0.588	0.019	0.347	1.391

Question 3:

The results of the offshore ichthyoplankton net tows made in 1979 at station 5--provide as a minimum, percent composition, mean seasonal density and rank order of abundance; also, contrast and compare the results with the results from the discharge collections.

Response:

Table 1 (attached) shows the percent species composition, mean seasonal density and rank of icht⁴yoplankton collected during January through December 1979 at the discharge and at station 5, located in mid Niantic Bay. These values are slightly different from those of Table 6, attached, in the 1979 plankton report (NUSCO, 1980), because samples collected during the months of November and December were not processed at annual report preparation and were therefore excluded from Table 6. For instance, Table 1 shows the Engraulidae (anchovies) comprised 69.91% of the ichthyoplankton at the discharge (average of 1.670/M³). Differences for other species between Table 1 and Table 6 are also very small illustrating that the contribution of fall months to the characterization of the entrained ichthyoplankton is less important than other periods of the year.

The 1979 Report provides additional comparisons between densities at the power plant discharges and at station 5 (see pages 76-83 of the Report). A summary of the major conclusions follows:

Table 1. Percent species composition (o/o), mean seasonal density (#/M3), and rank order of Ichthyoplankton (based on percent composition) collected at the discharges and at station 5 in 1979. Ranks were estimated for species constituting 0.01% or more of percent species composition.

	DIS	CHARGES	3	SI	ATION 5	
Species Or Group	0/0	#/M3	Rank	0/0	», M3	Rank
Engraulidae	69.91	1.670	1	73.34	2.787	1
Ammodytes sp.	10.73	0.206	2	5.83	0.239	2
Pseudopleuronectes Americanus	6.15	0.198	3	4.16	0.139	4
Unindentified	2.30	0.041	4	1.14	0.049	8
Myoxocephalus su.	2.24	0.065	5	1.02	0.050	9
Sungnathus fuscus	2.17	0.056	6	0.55	0.034	10
Pholis aunnellus	1.42	0.045	7	0.16	0.027	18
Tautogolabrus adspersus	0.71	0.047	8	4.62	0.191	3
Ulvaria subbifurcata	0.68	0.051	9	0.35	0.026	16
Tautoga onitis	0.58	0.042	10	2.33	0.095	5
Liparis sp.	0.54	0.039	11	0.47	0.029	12
Scophthalms amosus	0.53	0.028	12	1.92	0.085	6
Enchelyopus cimbruis	0.52	0.035	13	1.56	0.086	7
Cunoscion regalis	0.26	0.081	14	0.36	0.101	15
Stenatomus chrusons	0.22	0.062	15	0.49	0.056	11
Anguilla postrata	0.22	0.014	16	0.01	0.005	28
Cluneid	0.18	0.027	17	0.03	0.008	23
Menidia sp.	0.16	0.013	18	0.10	0.058	20
Peprilus triacanthus	0.10	0.026	10	0.45	0.036	13
Brevoortia Turannus	0.07	0.008	20	0.45	0.014	21
Prionotus sp.	0.07	0.000	21	0.30	0.013	17
Gasterosteus aculeatus	0.06	0.006	22	0.01	0.04/	28
Gobiidae	0.03	0.000	22	0.01	0.004	20
Paralichthus oblongus	0.02	0.015	24	0.01	0.009	20
Paralichthus dentatus	0.02	0.003	25	0.00	0.076	21
Mianonadus tomand	1. 02	0.003	25	0.00	0.004	
Aloga on	0.02	0.004	20	0.00	0.003	20
Montunaius hilinoamie	0.02	0.009	20	0.01	0.000	20
Sanmhan gaomhmuc	0.01	0.019	20	0.11	0.033	19
Contrannictic stricta	0.01	0.010	29	0.42	0.055	14
Cod Or Naddock	0.01	0.020	30	0.00	0.004	
Cod of Haddock	0.01	0.006	31	Not F	ound	0.0
Guaus mornua	0.01	0.004	32	0.01	0.005	28
sumperius sumpretaejormis	0.01	0.050	33	Not F	ound	
Spraeroiaes maculatus	0.00	0.011		0.06	0.113	21
urophysic so.	0.00	0.004		0.02	0.021	24
Labridae	0.00	0.005		0.02	0.032	25
Apeltes Quadracus	0.00	0.004		Not F	ound	
Conger Oceanicus	0.00	0.002		0.00	0.003	
Hemitripterus americanus	0.00	0.004		Not F	ound	
Pungitius pungitius	0.00	0.007		Not F	ound	
Fundulus majalis	0.00	0.005		Not F	ound	
Trinectes maculatus	0.00	0.011		Not F	ound	
Lophius americanus	0.00	0.003		0.00	0.002	
Limanda ferruginea	0.00	0.007		0.00	0.005	
Osmerus mordax	0.00	0.003		0.00	0.006	
Myowocephalus scorpius	0.00	0.005		Not F	ound	
Etropus microstomus	0.00	0.003		Not F	ound	
Alosa aestivalis	Not F	ound		0.00	0.013	
Micropogon undulatus	Not F	ound		0.00	0.003	
Rissola marginata	Not F	ound		0.00	0.006	

Percent species composition, mean seasonal density (β/m^3) and rank order of ichthyoplankton (based on percent composition) collected at the discharges 1976 through 1979. ł. 4 Table

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Annolytes sp., 10.10 0.234 2 $4.1.7$ 0.236 1 $1.2.6$ 0.236 1 $1.1.30$ 0.271 2 Tenerdocuronectes 6.08 0.195 3 $11.2.6$ 0.236 3 $11.2.6$ 0.021 12 0.034 6 11.34 0.036 7 Teneriorum 2.27 0.064 4 1.112 0.020 7 1.24 0.034 6 11.34 0.036 7 Photrosephatus 0.143 0.063 5 1.26 0.034 6 1.26 0.031 12 2.72 0.031 12 Syngmathus 1.43 0.068 10 0.041 9 0.021 12 Syngmathus 1.43 0.003 12 0.034 11 1.28 0.031 12 Syngmathus 1.48 0.032 12 0.031 12 0.041 0.031 12	Neurolyter No. 0.234 2 $4.1.7$ 0.236 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.30 0.231 3 11.34 0.003 5 11.34 0.003 5 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 7 11.34 0.003 11.34 0.003 11.34 0.003 11.34 0.003 11.34 0.0034 11.34 0.003	Engraulidae	11.11	1.820	-	20.05	0.200		11 85	0 1 00	2	2.91	0.053	e
Pseudopleuronectes 6.08 0.195 3 13.26 0.261 3 5.40 0.103 5 1.43 0.006 5 menticanus 2.27 0.044 4 1.112 0.027 5 2.242 0.046 4 1.48 0.035 5 Mundentified 2.27 0.048 6 1.26 0.041 5 1.242 0.035 5 1.43 0.035 5 1.44 0.035 5 1.43 0.035 5 1.43 0.035 5 1.43 0.035 5 1.43 0.035 5 1.43 0.035 5 1.43 0.035 5 1.43 0.035 10 0.041 10 0.015 17 0.035 0.041 10 0.015 17 10 0.035 10 0.015 17 10 0.035 10 0.015 17 10 0.015 17 10 0.015 17 11 11 11 11		Ammodutes sp.	10.10	0.234	2	43.13	0.030	+	CO. TT	COL 0		11 20	0 271	0
americants 2.7 0.044 4 1.12 0.020 5 2.12 0.047 5 2.12 0.039 7 Mutalentified 2.77 0.064 5 1.26 0.031 6 1.134 0.039 7 Mutalentified 2.77 0.068 6 1.126 0.031 6 1.26 0.031 16 0.031 16 0.031 17 0.031 17 0.031 17 0.031 17 0.031 11 Sympacting function 0.025 0.002 18 0.001 11 0.013 11 0.031 11 0.031 11 0.031 11 0.031 11 0.031 11 0.031 11 11.12 0.031 11 11.12 0.031 11 11.12 0.031 11 11.12 0.031 11 11.12 0.031 11 11.12 0.031	americants americants 2.7 0.044 6 1.12 0.020 7 2.74 0.044 6 1.48 0.039 7 Muldentias spin 2.27 0.045 5 2.121 0.047 5 2.42 0.041 9 0.031 7 Moltis gamelias 2.77 0.048 6 1.156 0.034 6 1.26 0.031 19 0.031 19 Moltis gamelias 0.05 0.026 7 0.032 10.031 10 0.031 19 0.031 14 Sympacting function 0.122 0.036 9 0.031 110 0.031 110 0.031 111 Sympacting function 0.122 0.032 110 0.031 110 0.031 110 0.031 110 Sympacting function 0.122 0.032 110 0.122 0.031 111 0.032 1112 Sophthilum function 0.122 0.032 111 2.25 0.031 111 0.032 1112 Tautoga onitis 0.122 0.032 111 2.25 0.032 1112 2.25 0.032 112 Tautoga onitis 0.122 0.032 1112 2.25 0.032 1112 0.032 112 Tautoga onitis 0.122 0.032 112 0.032 112 0.032 112 Tautoga onitis 0.252 0.032 112 0.252 0.041 0.022 1021 <td>Pseudopleuronectes</td> <td>6.08</td> <td>0.195</td> <td>3</td> <td>13.26</td> <td>0.261</td> <td>m</td> <td>0.4.0</td> <td>C01.0</td> <td>n</td> <td>00.44</td> <td>4 . 4 . 9</td> <td></td>	Pseudopleuronectes	6.08	0.195	3	13.26	0.261	m	0.4.0	C01.0	n	00.44	4 . 4 . 9	
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Mycoroce/plaius sp. 2.27 0.065 5 2.211 0.047 5 2.42 0.001 6 0.021 15 Pholis gunnellus 1.43 0.048 6 1.256 0.041 12 0.041 0.015 0.015 16 Pholis gunnellus 0.725 0.048 6 1.256 0.031 16 0.025 0.013 16 Plotis gunnellus 0.725 0.048 6 1.256 0.031 112 0.041 0 0.117 0.049 6 Taxtogalary largersus 0.752 0.030 111 2.559 0.031 119 0.031 117 Taxtogalary largersus 0.559 0.0309 111 2.526 0.031 117 0.089 6 Taxtogalary suble harmonic 0.553 0.0309 111 2.526 0.031 117 0.031 117 Taxtogal critics 0.553 0.039 111 2.526 0.031 117 2.071 0.091 10 Taxtogal critics 0.553 0.028 111 2.526 0.031 9 1.745 0.032 121 Scophthilumu 0.053 0.026 112 0.031 19 0.025 0.018 117 Diparie sp. 0.553 0.026 113 0.021 1145 0.025 0.018 121 Scophthilumu 0.021 117 0.021 121 0.022 0.012 121 0.021 121 <	Myozocerhalus sp. 2.27 0.065 5 2.21 0.067 5 2.42 0.003 10 0.021 10 Pholis gunnellus 0.025 0.048 6 0.034 6 0.225 0.042 0.021 11 0.015 14 Pholis gunnellus 0.22 0.048 0.034 6 1.256 0.0031 19 0.041 0.015 14 Tautogolizhus 0.25 0.042 10 0.031 11 0.031 19 0.043 11 Tautogolizhus 0.058 0.034 11 0.031 11 0.031 11 0.031 11 0.013 11 Tautogolizhus 0.053 0.042 11 0.031 11 2.22 0.031 11 0.032 11 Tautogolizhus 0.053 0.034 110 0.036 11 2.22 0.031 11 2.22 0.033 11 Tautogolizhus 0.055 0.032 111 2.22 0.003 11 2.22 0.033 11 Tautogolizhus 0.053 0.032 112 0.036 11 2.22 0.033 11 2.22 0.033 11 Tautogolizhus 0.055 0.032 112 0.226 0.033 11 2.22 0.033 12 Tautogor 0.021 113 0.022 113 0.022 12 0.033 12 Scophthalums $aquorus0.2250.032$	Unidentified	2.29	0.044	4	1.12	0.020	1	C1.7	0.000		70 4	0 030	
	Photics prostrates by: Photis grant last 1.43 1.43 0.006 0.06 1.43 1.26 0.026 0.041 0.031 9 0.031 0.046 0.031 0.046 0.032 0.046 0.031 0.046 0.032 0.046 0.031 0.046 0.032 0.046 0.033 0.046 0.033 0.046 0.033 0.046 0.033 0.046 0.033 0.042 0.033 0.042 0.033 0.042 0.033 0.042 0.033 0.042 0.033 0.042 0.033 0.032 0.033 0.042 0.033 0.032 0.033 0.042 0.033 0.032 0.033 0.042 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.033 0.042 0.033 0.033 0.033 0.033 0.033 0.033 <b< td=""><td>M. and and a Turn and</td><td>20 0</td><td>0.065</td><td>5</td><td>2.21</td><td>0.047</td><td>5</td><td>2.42</td><td>0.075</td><td>0</td><td>1.34</td><td>200.0</td><td></td></b<>	M. and and a Turn and	20 0	0.065	5	2.21	0.047	5	2.42	0.075	0	1.34	200.0	
Finouse Finouse 0.035 0.026 7 0.036 10 0.015 0.026 10 0.016 11 0.015 0.016 11 0.015 0.016 11 0.015 0.016 11 0.015 0.016 11 0.016 11 0.016 11 0.016 11 0.013 116 0.016 11 0.013 119 0.026 10 0.016 11 0.013 119 0.013 119 0.016 11 0.013 117 0.016 11 0.013 117 0.013 117 0.013 117 0.013 0.013 117 0.013 0.013 117 0.013 117 0.013 117 0.013 117 0.013 117 0.013 117 0.013 117 0.013 117 0.013 0.013 117 0.013 0.013 117 0.013 117 0.013 0.013 117 0.013 0.013 117 0.013 117 0.013 117 0.013 0.013 117 0.013 117 0.013 117 0.013 117 0.013 116 0.013 116 0.013 <t< td=""><td>Symotric function$0.001$$0.001$$0.001$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$10$$0.015$$11$$11$$10$$0.015$$11$<</td><td>Whoroceburgine sp.</td><td>1217</td><td>0.000</td><td>4</td><td>1.56</td><td>0.034</td><td>9</td><td>1.26</td><td>0.041</td><td>6</td><td>0.64</td><td>0.021</td><td>54</td></t<>	Symotric function 0.001 0.001 0.001 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 10 0.015 11 11 10 0.015 11 <	Whoroceburgine sp.	1217	0.000	4	1.56	0.034	9	1.26	0.041	6	0.64	0.021	54
Syngating fuscus Syngating fuscus 0.93 0.026 0.025 0.0163 5 1.47 0.089 6 Tautogolubrus adspersus 0.72 0.042 9 0.031 19 0.031 19 0.033 10 Tautogolubrus adspersus 0.59 0.042 10 0.133 0.0031 17 1.82 0.033 11 Tautogolubrus adspersus 0.59 0.042 10 0.13 0.010 17 1.82 0.033 11 Tautogo orbits 0.55 0.033 11 2.22 0.031 11 2.122 0.031 11 Tautoga orbits 0.53 0.035 11 2.232 0.031 14 0.225 0.031 15 Enchelyopus cimbrus 0.53 0.026 13 0.042 11 2.22 0.031 14 0.22 0.031 15 Enchelyopus cimbrus 0.53 0.022 14 0.022 0.031 14 0.22 0.031 16 Enchelyopus cimbrus 0.25 0.034 12 0.042 12 0.031 14 0.22 0.018 15 Enchelyopus cimbrus 0.25 0.034 14 0.022 0.018 16 0.23 0.018 16 Enchelyopus cimbrus 0.022 0.012 12 0.021 12 0.021 12 0.021 12 Enchelyopus cimbrus 0.022 0.014 0.012 0.012 0.021 11 <td>Syngmatrixs function$0.92$$0.026$$0.026$$0.025$$0.026$$0.025$$0.026$$10$$0.031$$11/7$$0.089$$10$Trategogicative axiptersus$0.68$$0.050$$9$$0.036$$18$$2.59$$0.011$$19$$0.93$$0.048$$10$Trategogicative axiptersus$0.53$$0.030$$11$$2.52$$0.031$$11$$0.28$$0.032$$11$Trategogicative axiptersus$0.53$$0.033$$11$$2.52$$0.010$$17$$2.07$$0.039$$10$$0.53$$0.033$$11$$2.52$$0.039$$11$$2.52$$0.033$$17$$0.53$$0.035$$11$$2.52$$0.034$$10$$0.22$$0.031$$19$$0.53$$0.038$$11$$2.52$$0.004$$37$$0.032$$10$$0.23$$0.026$$0.038$$11$$2.52$$0.034$$0.012$$21$$0.032$$20$$0.026$$0.038$$14$$0.032$$0.041$$16$$0.23$$0.031$$28$$0.026$$0.038$$14$$0.006$$10$$0.032$$0.031$$28$$0.026$$0.038$$14$$0.006$$10$$0.032$$20$$0.026$$0.038$$14$$0.022$$0.034$$0.021$$28$$0.026$$0.031$$18$$0.022$$0.012$$11$$0.026$$0.026$<td>FROLIS GUIDELLUR</td><td>C + T</td><td>0.040</td><td>) r</td><td>0 82</td><td>0.015</td><td>10</td><td>0.84</td><td>0.021</td><td>12</td><td>0.41</td><td>0.015</td><td>14</td></td>	Syngmatrixs function 0.92 0.026 0.026 0.025 0.026 0.025 0.026 10 0.031 $11/7$ 0.089 10 Trategogicative axiptersus 0.68 0.050 9 0.036 18 2.59 0.011 19 0.93 0.048 10 Trategogicative axiptersus 0.53 0.030 11 2.52 0.031 11 0.28 0.032 11 Trategogicative axiptersus 0.53 0.033 11 2.52 0.010 17 2.07 0.039 10 0.53 0.033 11 2.52 0.039 11 2.52 0.033 17 0.53 0.035 11 2.52 0.034 10 0.22 0.031 19 0.53 0.038 11 2.52 0.004 37 0.032 10 0.23 0.026 0.038 11 2.52 0.034 0.012 21 0.032 20 0.026 0.038 14 0.032 0.041 16 0.23 0.031 28 0.026 0.038 14 0.006 10 0.032 0.031 28 0.026 0.038 14 0.006 10 0.032 20 0.026 0.038 14 0.022 0.034 0.021 28 0.026 0.031 18 0.022 0.012 11 0.026 0.026 <td>FROLIS GUIDELLUR</td> <td>C + T</td> <td>0.040</td> <td>) r</td> <td>0 82</td> <td>0.015</td> <td>10</td> <td>0.84</td> <td>0.021</td> <td>12</td> <td>0.41</td> <td>0.015</td> <td>14</td>	FROLIS GUIDELLUR	C + T	0.040) r	0 82	0.015	10	0.84	0.021	12	0.41	0.015	14
Taxtogolairus adspersus 0.72 0.048 6 0.050 9 0.045 10 0.031 19 0.93 0.048 10 $Ulvaria subrifurcata0.680.05090.042100.280.09171.820.0824Taxtogolairus0.550.039112.520.010171.130.069171.820.0824Taxtogolairus0.550.035112.520.013112.520.0319Taxtogolairus0.530.035112.520.03690.1690.01817Taxtogolairus0.550.035112.520.03690.051100.280.031Taxtogolairus0.530.028130.003131.130.0450.0319Scophthalmus aquosus0.530.028130.0012220.03190.0110.05Scophthalmus aquosus0.2220.0014160.012210.0012210.0319Scophthalmus aquosus0.2220.014160.0220.0012120.0520.0319Scophthalmus aquosus0.2220.012110.0012220.0100.027110.025Scophthalmus chraca0.12418$	Taxtogolairus aispersus 0.72 0.048 0 0.012 0.049 0.031 19 0.93 0.048 10 Ulbaria subbifurcata 0.68 0.050 10 0.13 0.001 17 1.82 0.082 4 Taxtogolairus aispersus 0.53 0.030 11 2.52 0.010 17 1.82 0.082 4 Taxtogolairus aibbifurcata 0.53 0.039 11 2.52 0.011 4 1.13 0.069 10 0.28 0.032 Taxtogora 0.53 0.039 11 2.52 0.036 11 2.52 0.031 11 Dacheliyopus crimbrius 0.53 0.035 12 0.036 11 2.52 0.031 11 Disputs crimbrius 0.53 0.038 12 0.036 11 2.52 0.031 11 Disputs crimbrius 0.53 0.028 11 2.52 0.031 11 0.022 0.018 12 Scophthalmus aquosus 0.53 0.028 13 0.002 11 2.52 0.031 28 Cynoscion regalis 0.222 0.0014 16 0.022 0.002 10 0.022 0.018 25 Cynoscion regalis 0.214 0.022 0.014 16 0.022 0.012 11 0.022 0.018 25 Cynoscion regalis 0.222 0.012 11 0.022 0.012 11 0.025 0.018 <	Syngmathus fuscus	0.95	0.026		10.0	0000	35	2.59	0.163	5	1.47	0.089	9
$ \begin{array}{llllllllllllllllllllllllllllllllllll$	$ \begin{array}{llllllllllllllllllllllllllllllllllll$	Tautogolabrus adspersus	0.72	0.048	a	CT.0	0.000	01	36 0	0 031	19	0.93	0.048	10
Tautoga onitis 0.59 0.042 10 0.013 11 1.00 0.049 10 0.28 0.038 11 Liparie sp. 0.55 0.039 11 2.52 0.010 17 1.13 0.069 10 0.28 0.03 17 Liparie sp. 0.55 0.039 11 2.52 0.036 11 2.52 0.016 10 0.22 0.016 10 0.22 0.016 10 0.22 0.016 10 0.22 0.014 10 0.22 0.012 0.011 10 0.22 0.012 0.011 11 0.021 10 0.22 0.011 10 0.22 0.011 10 0.22 0.011 10 0.22 0.011 11 0.021 11 0.021 11 0.22 0.011 11 0.22 0.011 11 0.22 0.011 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.22 0.012 11 0.022 0.022 11 0.022 0.022 11 0.022 <td>Tautoga onitis$0.59$$0.042$$10$$0.13$$0.010$$11$$1.00$$0.069$$10$$0.28$$0.018$$15$Liparie sp.$0.55$$0.039$$11$$2.52$$0.010$$11$$1.13$$0.069$$10$$0.28$$0.018$$15$Exchelyous cimbrius$0.55$$0.039$$11$$2.52$$0.036$$9$$0.151$$0.039$$14$$0.32$$0.018$$15$Exchelyous cimbrius$0.25$$0.038$$13$$0.26$$0.036$$13$$0.042$$8$$1.08$$0.031$$9$Scophthiclmus aquosus$0.25$$0.008$$14$$0.004$$37$$0.042$$8$$1.08$$0.031$$9$Scophthiclmus aquosus$0.22$$0.062$$15$$0.004$$37$$0.042$$8$$1.08$$0.031$$9$Scophthiclmus aquosus$0.22$$0.004$$37$$0.042$$14$$0.031$$28$$0.031$$28$Scophthiclmus aquosus$0.22$$0.014$$16$$0.004$$37$$0.062$$20$$0.031$$28$Standard$0.22$$0.014$$16$$0.012$$12$$0.012$$12$$0.011$$16$$0.022$$10$$0.022$$0.011$$16$Standard$0.22$$0.014$$18$$0.021$$11$$0.021$$11$$0.022$$10$$0.022$$0.003$$24$Standard$0.022$$0.010$$12$$0.010$</td> <td>Ulvaria subbifurcata</td> <td>0.68</td> <td>0.050</td> <td>6</td> <td>0.95</td> <td>0.026</td> <td>0</td> <td>1.1.0</td> <td>100 0</td> <td>in</td> <td>1 82</td> <td>0 082</td> <td>4</td>	Tautoga onitis 0.59 0.042 10 0.13 0.010 11 1.00 0.069 10 0.28 0.018 15 Liparie sp. 0.55 0.039 11 2.52 0.010 11 1.13 0.069 10 0.28 0.018 15 Exchelyous cimbrius 0.55 0.039 11 2.52 0.036 9 0.151 0.039 14 0.32 0.018 15 Exchelyous cimbrius 0.25 0.038 13 0.26 0.036 13 0.042 8 1.08 0.031 9 Scophthiclmus aquosus 0.25 0.008 14 0.004 37 0.042 8 1.08 0.031 9 Scophthiclmus aquosus 0.22 0.062 15 0.004 37 0.042 8 1.08 0.031 9 Scophthiclmus aquosus 0.22 0.004 37 0.042 14 0.031 28 0.031 28 Scophthiclmus aquosus 0.22 0.014 16 0.004 37 0.062 20 0.031 28 Standard 0.22 0.014 16 0.012 12 0.012 12 0.011 16 0.022 10 0.022 0.011 16 Standard 0.22 0.014 18 0.021 11 0.021 11 0.022 10 0.022 0.003 24 Standard 0.022 0.010 12 0.010	Ulvaria subbifurcata	0.68	0.050	6	0.95	0.026	0	1.1.0	100 0	in	1 82	0 082	4
Lipparies 0.55 0.039 11 2.52 $C.071$ 4 1.13 0.069 10 0.226 0.016 11 Lipparies 0.53 0.035 112 0.26 0.036 11 1.13 0.069 10 0.22 0.018 15 Prochetiyons 0.53 0.028 113 0.026 0.003 13 1.45 0.039 14 0.032 0.031 28 Scophthalmus $aquosus$ 0.53 0.026 0.0062 13 0.062 20 0.031 28 Scophthalmus $aquosus$ 0.222 0.004 0.012 12 0.062 10 0.031 28 Scophthalmus $aquosus$ 0.222 0.004 0.012 12 0.004 31 0.012 0.031 28 Scophthalmus $aquosus$ 0.022 0.004 0.012 12 0.041 0.062 10 0.031 28 Stemotomus $chryscys$ 0.014 116 0.012 12 0.012 11 0.022 0.011 16 Stemotomus 0.014 18 0.012 117 0.002 11 0.012 0.011 16 Curpeidae 0.012 117 0.010 116 0.022 0.002 11 0.012 0.012 12 Remidia sp. 0.010 0.022 0.010 116 0.012 12 0.012 0.012 0.012 0.012 0.012 0.0	Lipsurf Lipsurf Lipsurf Scophthalmus0.550.03911 2.52 $C.071$ 4 1.13 0.069 10 0.26 0.016 15 Exchelyons cophthalmus0.530.03511 2.52 $C.071$ 4 1.13 0.069 14 0.25 0.018 15 Exchelyons cophthalmus0.530.02813 0.26 0.003 14 0.32 0.018 15 Scophthalmus0.26 0.088 14 0.004 37 0.042 8 1.08 0.034 28 Cynoscion regalis 0.226 0.004 37 0.042 0.012 12 0.062 10 0.29 0.034 28 Cynoscion regalis 0.222 0.004 13 0.042 0.012 12 0.042 20 0.037 11 Stemotomus 0.122 0.014 18 0.001 12 0.037 17 0.022 0.013 24 Menidia sp. 0.12 0.014 18 0.022 0.007 31 0.12 0.02 23 Revidia sp. 0.03 0.010 15 0.010 26 0.012 26 0.013 24 Revidia sp. 0.03 0.026 11 0.026 0.012 21 0.022 0.013 24 Revidia sp. 0.03 0.010 15 0.010 26 0.012 21 0.022 0.010 21 Revidia sp. 0.03	Trant and the	0.59	0.042	10	0.13	0.010	17	7.01	T40.0		90.7	0.0.0	
uxparrs sp. 0.03 0.03 0.03 0.03 0.03 0.018 15 $uxparrs sp.$ 0.03 0.03 12 0.03 12 0.03 12 0.018 15 $Enchelyopus cimbrius0.530.035130.0351.450.0410.03119Eophthialmus aquosus0.530.0260.008140.031190.03128Eophthialmus aquosus0.2560.088140.004370.0190.0621001116Cynoscion regalis0.2220.062150.004370.012120.03128Cynoscion regalis0.2220.014160.0122220.027170.00116Steniolanes cirryscops0.2220.014180.027170.0027170.00323Renidia sp.0.027170.0100.007120.0070.0070.00334Renidia sp.0.027180.0220.01020.007190.0120.02100323Renidia sp.0.020.01020.012110.02100720.02100720.02Renidia sp.0.020.012120.01020.021007210.0220.01221Renidia sp.0.020.010$	uiparte sp. 0.33 0.035 12 0.83 0.036 9 0.51 0.039 14 0.32 0.018 15 $miclellyopus cimbrius0.530.0260.008131.450.04281.0680.0319Scophthalma aquosus0.260.008130.004370.011160.03428Scophthalma aquosus0.260.008140.004370.0410.061116Scophthalma aquosus0.220.004370.012120.034280.03428Scophthalma sapes0.220.014160.027170.061160.03723Stenotomus chrysops0.120.014180.027170.061160.02720Mguilla rostrata0.130.027170.027170.027210.01823Mguilla rostrata0.027170.027170.027170.02223Mguilla rostrata0.014180.0220.010120.026120.01623Mguilla rostrata0.014180.027110.027110.012210.01823Menidia sp.0.0120.012110.0250.010210.01022$	ALLANDIA DOLLAND	0.55	0 030	11	2.52	C.071	4	1.13	0.069	10	0.28	0.010	11
	Exche Lyorus cumbrius 0.03 0.03 13 0.03 13 0.03 13 0.03 9 Scophthalmus aquosus 0.53 0.028 114 0.006 37 0.042 8 1.08 0.031 28 Scophthalmus aquosus 0.26 0.088 14 0.006 37 0.062 20 0.034 28 Scophthalmus aquosus 0.222 0.062 15 0.061 16 0.029 0.071 16 Stenotomus chrysops 0.222 0.014 16 0.027 17 0.003 34 Stenotomus chrysops 0.22 0.014 18 0.027 17 0.003 34 Stenotomus chrysops 0.22 0.014 18 0.027 17 0.003 34 Stenotomus chrysops 0.25 0.014 18 0.027 17 0.003 34 Stenotomus chrysops 0.25 0.014 18 0.027 17 0.003 34 Stenotomus chrysops 0.027 17 0.007 0.027 17 0.012 0.012 Stenotomus chrysops 0.027 18 0.027 18 0.026 0.003 34 Stenotomus chrysops 0.026 0.012 16 0.027 17 0.027 10 Stenotomus chrysops 0.027 18 0.027 18 0.026 0.003 28 Residicas 0.07 0.026 0.010 26 0.007	httparte sp.		200.0	12	0.83	0.036	6	0.51	0.039	14	0.32	0.018	15
Scophthalmus aquosus 0.53 0.028 13 0.004 37 0.19 0.062 20 0.034 28 Cynoscion regalis 0.26 0.088 14 0.004 37 0.061 16 0.29 0.071 16 Cynoscion regalis 0.22 0.088 14 0.0012 22 0.012 17 0.061 16 0.29 0.071 16 Cynoscion regalis 0.22 0.004 17 0.012 17 0.012 17 0.008 23 Stenotomus chrysops 0.22 0.014 16 0.027 17 0.003 34 Maguilla rostrata 0.22 0.011 16 0.027 17 0.003 34 Remidia sp. 0.027 17 0.010 15 0.007 31 0.14 0.012 23 Menidia sp. 0.026 117 0.021 117 0.010 15 0.007 31 0.012 23 Menidia sp. 0.027 117 0.010 15 0.010 21 0.012 21 0.012 Menidia sp. 0.026 118 0.027 117 0.012 21 0.012 21 Menidia sp. 0.027 118 0.027 112 0.027 112 0.012 21 Menidia sp. 0.022 0.010 21 0.012 21 0.027 12 0.027 Menidia sp. 0.022 0.010 22 0.01	Scophthalmus aquosus 0.028 1.9 0.026 0.03 0.034 28 Scophthalmus aquosus 0.26 0.088 1.4 0.004 3.7 0.19 0.061 1.6 0.29 0.071 16 Cynoscion regalis 0.222 0.0062 15 0.0012 22 0.012 17 0.0012 22 Cynoscion regalis 0.222 0.0014 16 0.012 17 0.0012 17 0.0012 23 0.003 34 Stemotomus chrysops 0.222 0.014 16 0.007 19 0.007 31 0.022 0.003 34 Maguilla rostrata 0.122 0.0101 117 0.0012 117 0.003 34 Menidia sp. 0.027 117 0.010 15 0.007 31 1.25 0.010 Menidia sp. 0.012 0.010 16 0.012 10007 31 1.25 0.0101 8 Remidia sp. 0.027 117 0.010 20010 26 0.017 10 0.016 1002 0.012 Remidia sp. 0.027 118 0.022 0.0102 16 0.025 11 0.012 0.012 Remidia sp. 0.027 0.012 0.0102 116 0.025 11 0.012 12 Remidia sp. 0.012 0.012 0.010 21 0.012 10010 21 0.012 Remidia sp. 0.012 0.010 </td <td>Enchelyopus cumbrus</td> <td>1.0</td> <td>cc0.0</td> <td>27</td> <td>90.0</td> <td>0000</td> <td>51</td> <td>1.45</td> <td>0.042</td> <td>8</td> <td>1.08</td> <td>0.031</td> <td>6</td>	Enchelyopus cumbrus	1.0	cc0.0	27	90.0	0000	51	1.45	0.042	8	1.08	0.031	6
		Scophthalmus aquosus	0.53	0.028	11	0.4.0	0.001	12	0.10	0.062	20	0.05	0.034	28
Stenotomus cirrysops 0.22 0.062 15 0.001 0.012 22 0.002 23 0.027 17 0.10 0.08 25 Anguilla rostrata 0.22 0.014 16 0.021 17 0.02 17 0.02 0.03 34 Anguilla rostrata 0.22 0.014 16 0.027 17 0.02 0.03 34 Anguilla rostrata 0.13 0.027 17 0.02 0.03 34 Anguilla rostrata 0.13 0.027 17 0.03 0.027 17 0.015 23 Anguilla rostrata 0.13 0.027 17 0.03 17 0.03 34 Annidia sp. 0.014 18 0.022 0.010 15 0.007 12 0.011 8 Menidia sp. 0.03 0.027 19 0.012 16 0.226 0.011 8 Peprilus triacanthus 0.025 0.012 12 0.012 21 0.027 12 Neuotus sp. 0.012 0.012 21 0.012 21 0.022 12 Repoortia tyramus 0.01 0.010 22 0.012 11 0.012 12 Repoortia tyramus 0.01 0.01 21 0.015 11 0.012 12 Repoortia tyramus 0.01 0.01 21 0.019 0.015 11 0.012 12 Repoortia tyramus 0.01 0.01 0	Stenotomus chrysops 0.22 0.062 15 0.04 0.012 12 0.027 17 0.10 0.008 25 Anguilla rostrata 0.22 0.014 16 0.027 17 0.02 0.003 34 Anguilla rostrata 0.22 0.014 16 0.027 17 0.02 0.003 34 Anguilla rostrata 0.13 0.027 17 0.02 0.003 34 Anguilla rostrata 0.12 0.014 18 0.027 17 0.003 23 0.014 0.013 Menidiae 0.014 18 0.027 17 0.007 31 1.25 0.014 8 Menidia sp. 0.026 0.007 18 0.026 0.017 0.019 21 0.010 8 Menidia sp. 0.007 0.025 20 0.010 15 0.007 12 0.010 8 Menidia sp. 0.027 119 0.012 0.010 126 0.026 112 0.20 120 Menidia sp. 0.007 0.025 110 0.026 0.012 120 0.027 12 Menidia sp. 0.007 0.025 110 0.010 21 0.010 21 0.027 12 Menidia sp. 0.017 0.012 21 0.010 21 0.027 12 0.22 Prioretus sp. 0.012 0.012 21 0.010 21 0.012 0.022 12 <	Cynoscion regalis	0.26	0.088	14	0.00	0.004	10	17.0	0 061	16	0.29	0.071	16
Anguilla rostrata 0.22 0.014 16 0.34 0.015 12 0.027 11 0.02 0.003 34 Anguilla rostrata 0.18 0.027 17 0.08 0.007 19 0.009 23 0.02 0.003 34 Cupeidae 0.15 0.014 18 0.222 0.010 15 0.007 31 0.14 0.015 23 Revidia sp. 0.09 0.024 19 0.010 15 0.007 31 0.014 8 Revidus triacanthus 0.09 0.024 19 0.010 16 0.26 0.026 18 1.25 0.0101 8 Review thus 0.09 0.025 20 0.010 26 0.017 0.026 1007 0.020 1003 19 Review thus 0.007 0.025 21 0.010 26 0.17 0.019 21 0.022 12 Revortia tyramus 0.012 21 0.010 26 0.010 26 0.019 21 0.022 11 Scomber scontras 0.01 20 0.010 22 0.010 21 0.022 11 0.022 112 Revortia tyramus 0.01 20 0.010 21 0.019 21 0.012 11 0.012 112 Revortia tyramus 0.01 21 0.010 21 0.0105 111 0.0105 111 0.012 112 0.022	Anguilla rostrata 0.22 0.014 16 0.34 0.015 12 0.027 11 0.02 0.01 0.02 0.02 0.01 0.02 0.02 0.01 0.02 0.02 0.01 0.02 0.003 34 New idia sp. 0.02 0.024 19 0.012 16 0.026 18 1.25 0.010 0.02 19 0.101 8 Peprilus triacanthus 0.012 0.012 21 0.012 21 0.012 21 0.02 0.012 12 0.02 0.022 12 0.02 0.012 12 0.02 0.012 12 0.02 0.012 12 0.02 0.012 12 0.02 0.022 12 0.02 0.021 12 0.022 0.022 12 0.022 0.022 12 0.022 0.0	Stonotomis chrusons	0.22	0.062	15	0.04	0.012	77	17.0	100.0		010	0.000	26
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Scomber scombrus 0.01 0.01 0.010	Scomber scombras	Brevoortta tyrannus		*****	27	0.06	0.011	20	0.33	0.105	11	0.17	0.034	21
		Scomber scombrus	10.0	0.010	30									

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- Total fish larvae, sand lance, grubby sculpin and winter flounder showed no significant difference in mean seasonal density at the two stations.
- Total fish eggs, anchovies, cunner and mackerel were higher in mean seasonal density at station 5 than at the plant discharges.
- 3) When the 1979 data was reduced to periods of peak and post-peak density, winter flounder and anchovy larvae showed a higher mean density, over these time periods, at the plant discharge than at station 5.
- 4) Using the 1979 fish larvae data from station 5 and the discharges, power curves were developed giving the probability of detecting different levels of density at the discharge and station 5 (in units of the log transformed mean seasonal density, I.G. the geometric mean). Figure 14 of the 1979 Report showed that:
 - Winter flounder, sand lance, cunner, and tautog had similar power curves suggesting that the sampling program had a 90% probability of detecting a change of 0.25 units.
 - Anchovy larvae had lower detectability, perhaps associated with increased patchiness and variability over their growth season, - total larvae had relatively high detectability since more samples were represented.

The request for the reduction of fall (October, November, and December) sampling from the present 18 samples (3 days/nights) per week at the discharge to 6 samples (1 day/night) would have little, if any, impact on the above conclusions or on the overall annual composition or density estimates of the resident and representative fish larvae around Millstone, larvae ranked among the top ten and comprising over 95% of the species composition (Tables 1 & 6) largely do not occur during these fall months either at the discharge or at station 5.

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Question 4:

An assessment of the significance of <u>Teredo bartschi</u> population discovered in 1975 a. the effluent sampling station--address the potential for expansion in range of this species, <u>T. navalis</u> and <u>Limmoria</u> spp. under both present two-unit operation and future three-unit operation.

Response:

The following discussion has been prepared in response to your request for additional information concerning present and potential biological changes in marine, wood-boring communities surrounding the Millstone Nuclear Power Stations. Data from the Millstone environmental monitoring program describes population fluctuations in these communities over the last eleven years. Considering these long term data and the biology of wood-boring molluscs, Teredo navalis and Teredo bartschi, we conclude that Units 1 and 2 have had no detectable effects on the population of wood-boring organisms. The percent destruction of wood exposure panels by Teredo spp. has been monitored since 1968 (Table 1) and the numerical abundance of Limnoria since 1971 (Table 2). During this time the dominant aspect from these data has been the variability in population density both among stations within the same year and between years at the same station. Many factors could influence the abundance and distribution of wood boring species; among which, temperature, salinity, currents and availability of substratum are mos. important (Turner, 1966). In the case of Limmoria, our data point o the availability of wood, as well as the distance of the panel from the bottom sediments, as the most critical

factors controlling abundance. This is supported by the low numbers of Limnoria collected at the Intake. At this site the exposure panels are moored from floats 25 feet from the bottom where no wooden structures are present; the other panels are located at dock sites placing them near the bottom sediments and close to wooden structures.

The wood-boring molluscan, <u>Teredo navalis</u>, has shown less dependency than <u>Limnoria</u> on panel location and availability of wooden structures, which can probably be attributed to the extended planktonic life of its veliger stages,

4 - 20 days (Turner and Johnson, 1971). However, considerable fluctuations in the average annual attack of wooden panels has been observed (Table 1). These fluctuations could be caused as much by biological factors as by the previously stated physical factors (Temperature, salinity, current, and availability of substratum).

Fouling species such as <u>Limnoria</u> (Battelle, 1976), encrusting bryozoans, compound tunicates, barnacles, or mussels, which dominate wood surfaces during certain periods of the year could possibly reduce substratum availability for metamorphosing <u>Teredo</u> larvae. In addition, parasitism of adult populations of <u>Teredo</u> (Turner and Johnson, 1971; Hillman, 1978) or poor phytoplankton blooms during critical reproductive phases (Turner, 1966) could, in any given year, influence the attack of <u>Teredo</u> on wooden structures.

<u>Teredo bartschi</u>, a species more common south of Long Island Sound, was first documented in the Millstone area in 1975 and since that time has only been found at the Effluent site. The reason for its appearance and

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existence can only be hypothesized. Since this species is larviperous, retaining its young in a brood pouch to the veliger stage, and does not release its young until the pediveliger stage, the last stage before metamorphosing into is adult form, it is highly probable that some transient wood structure or debris brought reproductive individuals into the Millstone area. An alternate possibility, but less likely, is if the brief planktonic stage of these larvae were transported to the Effluent site by a southern current. An explanation for the occurrence of <u>Teredo bartschi</u> at the Effluent site is most likely temperature related. It is not known whether the temperature in the effluent counters a lower lethal limit for the adults in the winter or provides the only temperature regimes needed for successful reproduction.

The ability of <u>T</u>. <u>bartschi</u> to remain at the Effluent site is probably associated with the pediveliger larvae metamorphosing within hours after release from the parent's gills (Turner, 1971). Our data further suggests that <u>Teredo bartschi</u> is a poor competitor in this extended range, and Teredo navalis is able to dominate the panels at the Effluent site.

It would seem highly unlikely that the operation of Unit 3 will alter the population dinamics previously described for the wood-boring species. First of all, we are only expecting a two degree centrigrade increase in the immediate area around Millstone point (Stolzenbach and Adams, 1979). This is only a rise of 2°C over a total annual range of 26°C. Secondly, if this slight increase in the annual range did benefit the range extension of <u>Teredo bartschi</u> or increase fecundity of other wood-boring species, this effect would be restricted to a small area of low substratum availability.

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In light of the above discussion, it is our belief that wood-borer communities will show little or no changes in their natural community dynamics with the operation of Units 1, ? and 3 at the Millstone Nuclear Power Station.

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Table 1. MEAN ANNUAL PERCENT ATTACK OF TEREDO MOLLUSCS ON LONG-TERM EXPOSURE PANELS IN THE MILLSTONE POINT AREA FROM 1968 THROUGH 1979.

(a) Sítes	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	(b) 1979
Effluent												
Teredo navalis Teredo bartschi			10	39	20	9	38	50	100	57	83	8
Intake								0	1	1		1
Teredo navalis		7	18	49	한 동물	58	66	22	41	57	40	5
Teredo bartschi		0	0	0		0	0	0	0	0	0	0
Fox Island - Nor	th											
Teredo navalis	1	35	15	30	20	12	22	8	34	57	53	8
Teredo bartschi		0	0	0	0	0	0	0	0	0	0	0
White Point												
Teredo navalis	15	49	23	23	47	20	76	50	31	47	76	21
Teredo bartschi	0	0	0	0	0	0	0	0	0	0	0	0
Giants Neck												
Teredo navalis						70	90	72	67	86	74	34
Teredo bartschi						0	0	0	0	0	0	0

Frame or panel missing at (1) White Point - July and August, 1973.

- (2) Intake December, 1971; January through September, 1972; December 1973; January through March, 1974; March through May, 1975.
- (3) Giants Neck March and April, 1972; January and February, 1973; March, May, June and July, 1974; January, 1977.

b) Numbers base on 3/4 of a years sampling using six month exposure panels.

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a)

Table 2. MEAN ANNUAL NUMBER FOR EACH SPECIES OF THE ARTHROPOD BORER, LIMNORIA, OCCURRING ON LONG-TERM EXPOSURE PANELS IN THE MILLSTONE POINT AREA FROM JUNE, 1971 THROUGH NOVEMBER 1979.

(b)	(a)							(d)
Sites	1971	19.2	1973	1974	1975	1976	1977	1978	1979	-
Effluent										
Limnoria Lignorum			0	0	0	0	0	0	0	
Limnoria tripunctata			0	14	770	1941	(c)	597	10	
Limmoria tuberculata			0	0	0	0	0	0	0	
Total			0	14	770	1941		597	10	
Intake										
Limnoria lignorum	292	0	0	13	1	0	0	0	0	
Limnoria tripunctata	198	0	0	2	9	0	5	1	0	
Limnoria tuberculata	43	0	0	0	0	0	0	0	0	
Total	533	0	0	15	10	0	5	1	0	
Fox Island North										
Limnoria lignorum	188	144	173	35	27	10	0	120	0	
Limnoria tripunctata	1439	2400	1435	1317	2412	1265	228	167	213	
Limnoria tuberculata	263	132	70	46	38	1	0	0	0	
Total	1890	2676	1678	1398	2477	1276	228	287	213	
White Point										
Limnoria lignorum	86	90	34	13	44	17	126	100	114	38
Limnoria tripunctata	914	1808	249	335	3637	752	1758	1526		457
Limnoria tuberculata	85	101	27	8	24	0	0	0	0	(
Total	1085	1999	310	356	3705	769	1884	1626		495
Giants Neck										
Limnoria lignorum	891	134	147	38	212	299	373	479	416	
Limnoria tripunctata	241	128	247	45	409	308	176	207	1	
Limnoria tuberculate	41	27	20	0	1	0	0	0	0	
Total	1173	289	414	83	622	607	549	686	417	

(a) Counts of individual Limnoria did not begin until May, 1971

- (b) Frame or panel missing at (1) White Point ~ July and August, 1973
 - (2) Intake December, 1971; January through September, 1972; December, 1973; January through March, 1974; March through May, 1975
 - (3) Giants Neck March and April, 1972; January and February, 1973; March, May, June and July, 1974; January, 1977

(c) Too numerous to count.

(d) Numbers based on 3/4 of a years' sampling using six month exposure panels.