Oyster Creek Generating Station
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Exelon Nuclear

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RA-11-067

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United States Nuclear Regulatory Commission
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Oyster Creek Nuclear Generating Station
Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Non-Routine Operating Report of Important Environmental Event

On July 28, 2011, the Oyster Creek Nuclear Generating Station (OCNGS) Unit 1 experienced a loss of the 34.5 kV 'B' bus supplying offsite power to the dilution plant. Although two dilution pumps were restarted after restoration of power to the dilution plant, more than 100 fish were stunned or killed. The fish kill was reported to New Jersey Department of Environmental Protection (NJDEP) as required by NJ Admin Code 7:14A-6.10(c) and to the U.S. Nuclear Regulatory Commission in accordance with reporting requirements of OCNGS Environmental Technical Specifications §3.5.2. The results of this event are detailed in the enclosed report.

Please advise Malcolm Browne, Environmental Specialist, at 609.971.4124 of any further information you may require in regards to the environmental aspects of this event.

Sincerely,

Michael J. Massaro

Michael J. Massaro
Vice President – OCNGS

Enclosure
cc: New Jersey Department of Environmental Protection (3 addressees)
NRC Administrator, Region I
NRC Senior Project Manager
NRC Senior Resident Inspector

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NRR

ENCLOSURE

OYSTER CREEK NUCLEAR GENERATING STATION

FISH KILL MONITORING REPORT

JULY 2011

Exelon Generation

August 2011

Executive Summary

During the evening of Thursday July 28, 2011, Oyster Creek Nuclear Generating Station (OCNGS) was operating at 100% power level when the site experienced a loss of power to the dilution plant and various other station equipment at 2003 hrs due to a fault on the "B" 34.5 kV electrical bus in the Oyster Creek/JCP&L substation. Although Exelon performed a power reduction to 70% power, restarted the dilution pumps, followed by a further power reduction to 53% power, a fish kill totaling 1801 fish occurred beginning at approximately 2115 hrs.

Exelon contacted the DEP Hotline at 2301 hrs as required by NJ Admin Code 7:14A-6.10(c) to report the loss of the thermal dilution plant and the dead fish.

Exelon dispatched its ecological consultants Normandeau Associates (ecological experts contracted by Exelon) to monitor for and remove all stressed or dead fish from the discharge canal. The discharge canal was monitored by OCNGS personnel and environmental contractors subsequent to the discovery of the fish kill until completion of the monitoring efforts at noon on July 31.

Exelon is performing an investigation to determine cause(s) of the event and corrective actions will be assigned based on the results of that investigation.

Introduction

This report documents the results of aquatic monitoring conducted between July 28 and July 31, 2011, by Exelon and its contractors following a thermal shock fish kill that occurred in the OCNGS discharge canal subsequent to an unplanned and unanticipated loss of power on July 28, 2011 to the thermal dilution plant. The objectives of the monitoring program were to:

1) Determine the species composition, relative abundance and distribution of fish in the OCNGS discharge canal following the loss of power to the dilution pumps, and

2) Quantify the extent of any fish mortalities.

Results

During the evening of Thursday July 28, 2011, OCNGS was operating at 100% power level when a fault occurred on a JCP&L- owned power line that resulted in a partial loss of 34.5 kV power in the Oyster Creek substation that tripped all 34.5KV "B" bus related breakers at 2003 hrs. This fault resulted in the loss of power to the J-69361, R-144, Q-121 and Z-52 electrical feed lines, as well as the Bank 5 and Bank 7 transformers. Because the Bank 5 transformer provides power to the dilution pumps, this electrical fault resulted in the loss of all power to the dilution plant as well as other station equipment. Main Control Room personnel responded to these events by initially reducing power to 70% power level as well as a subsequent power drop to 53% power level, and restarting the dilution pumps shortly after power to them was restored. Two dilution pumps were restarted at 2121 hrs and 2129 hrs, respectively, which resulted in a reduction of discharge canal temperatures (Figures 1-4). The failure of an electrical cross-connect disconnect switch in the Oyster Creek /JCP&L substation at 2218 hrs resulted in another loss of power to the dilution

pumps and required Exelon to work with JCP&L to establish the seldom-used Q-121 line as an electrical alternate feed to re-energize the dilution pumps. Following the restoration of power to the dilution pumps via the Q-121 alternate feed, Exelon restarted two dilution pumps at 0235 hrs and 0304 hrs, respectively, during the early morning of July 29.

Normandeau fishkill monitoring activities began early in the morning of July 29 and continued until 1200 hrs July 31. With the unit at nearly full power prior to the initial loss of power to the dilution pumps, the Main Condenser discharge temperature had been approximately 19 to 20°F above ambient in the days leading up to July 28. In contrast, the dilution discharge provides a substantial flow of ambient temperature water for thermal dilution of the discharge canal. Fish that are typically heat-sensitive, such as striped bass, may have been residing in areas of the discharge canal cooled by the large volume of ambient water temperature provided by the dilution pump discharge. The sudden removal of this moderate temperature water source following loss of power to the dilution pumps caused a sudden change in discharge canal temperature and resulted in thermal shock to these fish, resulting in the observed fishkill.

Plant personnel and Normandeau boat crews collected a total of 1801 dead fish, predominantly striped bass and menhaden, during the early morning of July 29 and the following two days. A total of 13 fish species ranging in length from 80 mm to 1000 mm was collected during the three-day monitoring period (Table 1). Single individuals of black sea bass, northern kingfish and northern searobin were recovered along with large numbers of striped bass and menhaden. A random subsample of these fish was measured to determine approximate average lengths.

Discussion and Conclusions

Field observations indicate that the fish mortalities on July 28, 2011, were likely caused by the sudden change in the temperature in the discharge canal. These fish, primarily striped bass, were probably residing in the ambient temperature dilution pump discharge or other moderate temperature areas of the discharge canal at the time of the plant shutdown. They were probably attracted to these areas in the discharge canal earlier in the year and remained there. The death of these fish is consistent with what is known about their thermal tolerances and upper lethal temperature limits, and past observations of heat-shock events.

The July 28, 2011 fish kill resulted from the inability of some of the fish species inhabiting the OCNGS discharge canal to tolerate the relatively warm water temperatures they encountered in the discharge canal subsequent to the loss of power to the dilution pumps. Intake canal temperatures were about 28.3 °C (83.0 °F), at the time of the dilution pump loss of (Figure 1). The Main Condenser discharge temperature at the time the dilution pumps became de-energized was approximately 39.4 °C (103.0 °F), resulting in a temperature difference of about 11.1°C (20 °F). The discharge canal temperature reached a peak temperature of about 38.0 °C (100.5°F) at the Route 9 bridge approximately 1.75 hours following the loss of dilution pump power.

At OCNGS, several fish species collected during this fish kill (including striped bass, menhaden, and bluefish) have been involved in fish kills on previous occasions. In the past it was possible to observe that species other than those involved in a particular fish kill were observed to be within the discharge canal but unaffected by the canal water temperature changes. During this most recent fish kill monitoring, the only species incidentally observed in the area but apparently unaffected was the Atlantic needlefish (*Strongylura marina*). However, Atlantic needlefish may have simply been the first species to repopulate the upstream areas of the discharge canal following passage of the peak water temperatures.

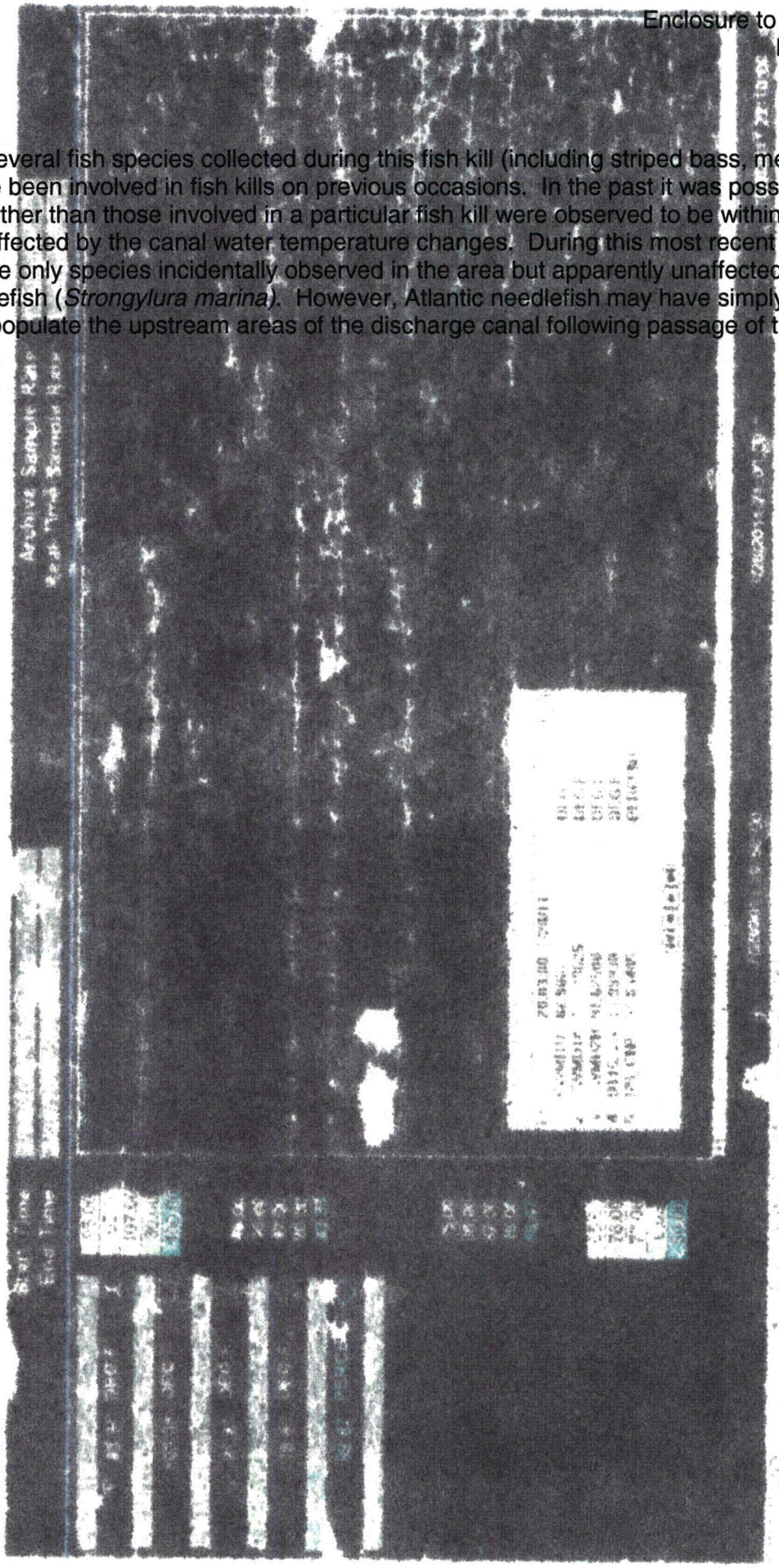
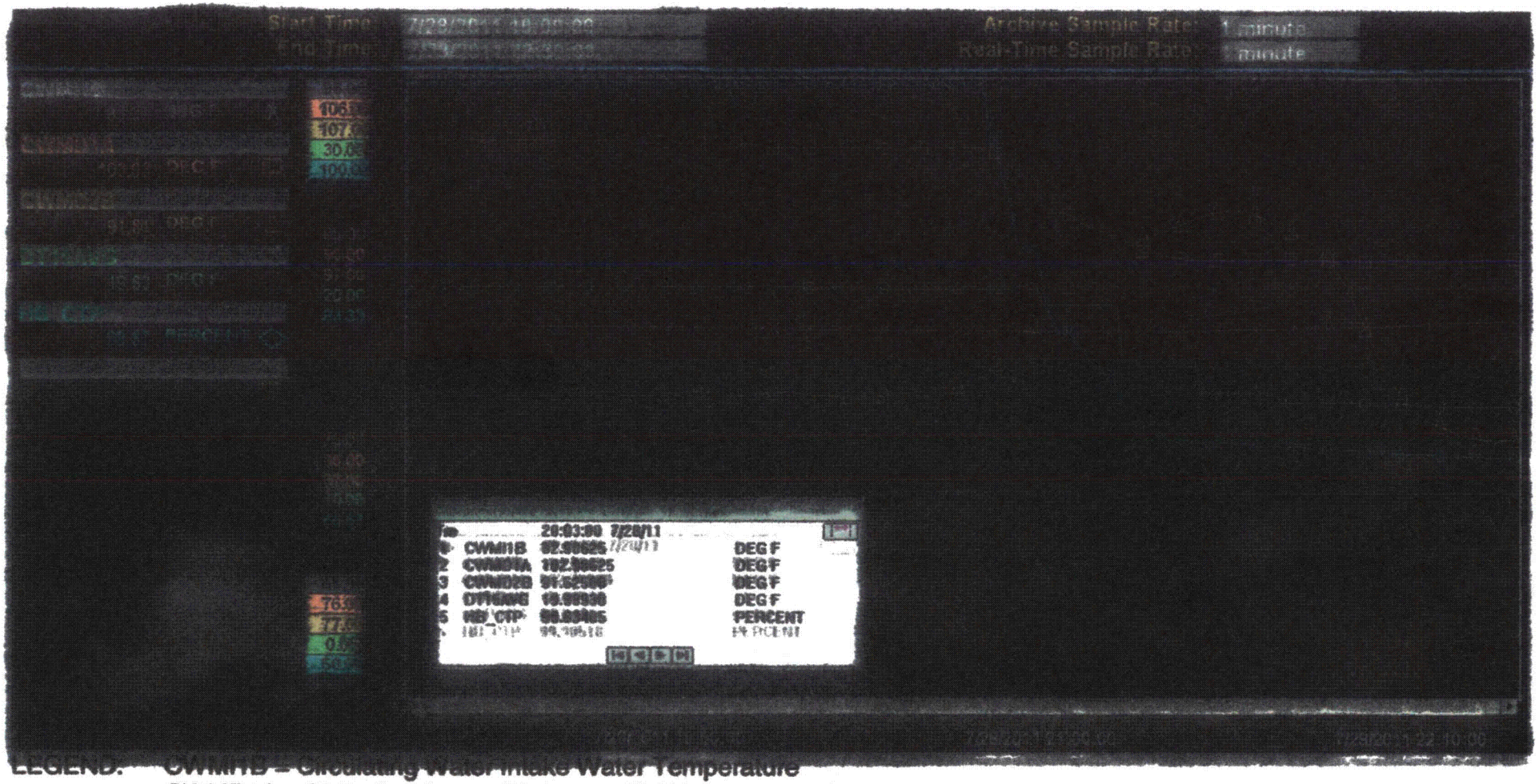


Figure 1. Loss of 34.5kV 'B' Bus, 2003 hrs



LEGEND: CWMI1B = Circulating Water Intake Water Temperature
CWMD1A = Main Condenser Discharge (DSN001) Water Temperature
CWMD2B = Route 9 Bridge Water Temperature
DT15AVG = Main Condenser - Intake Water Temperature Differential (Delta T)
HB_CTP = Reactor Core Thermal Power (Percent)

Figure 2. Power Reduction, 2048 hrs

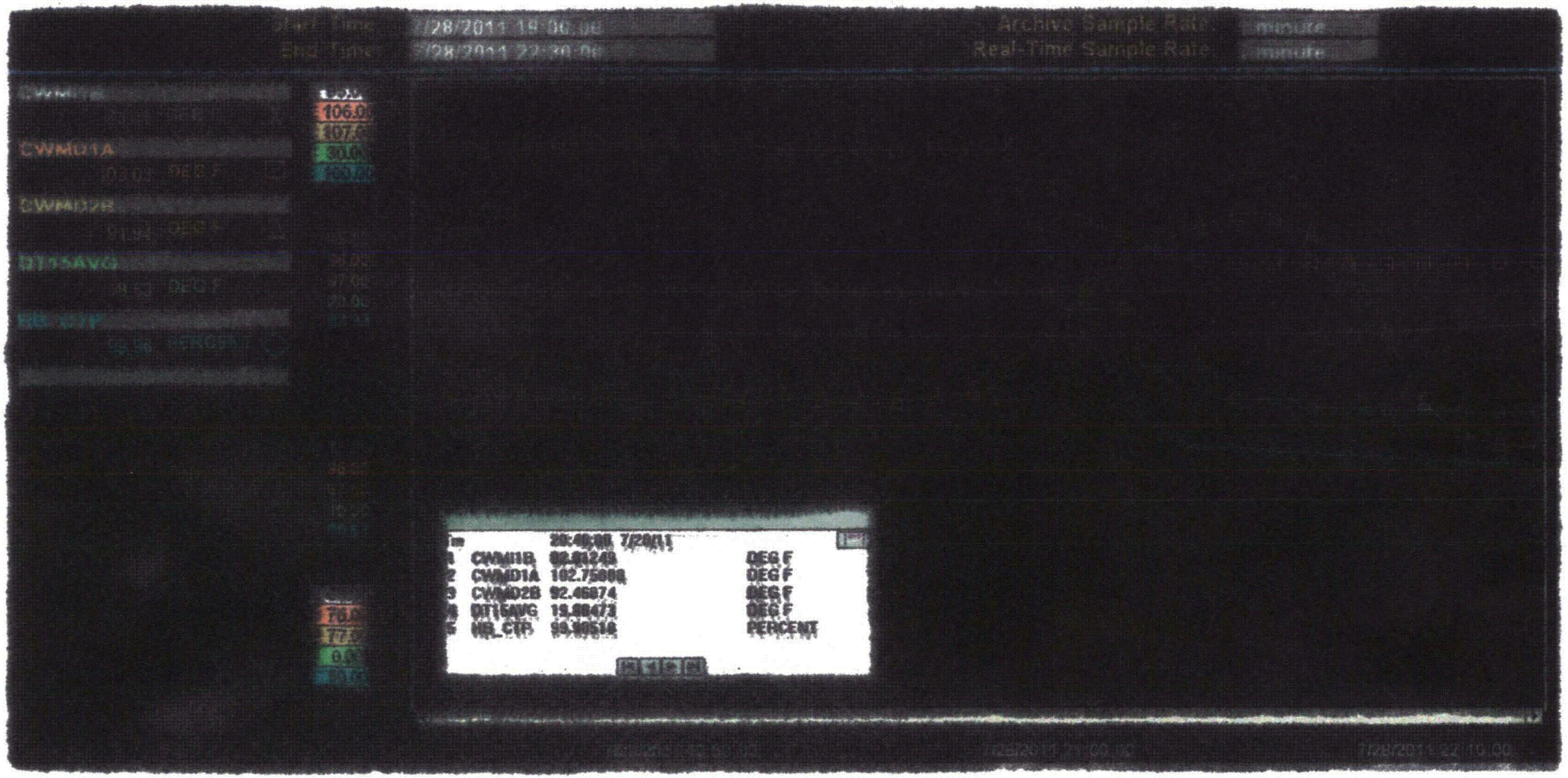


Figure 3. Rt 9 Bridge Temperature Approaching 97˚ F, 2100 hrs

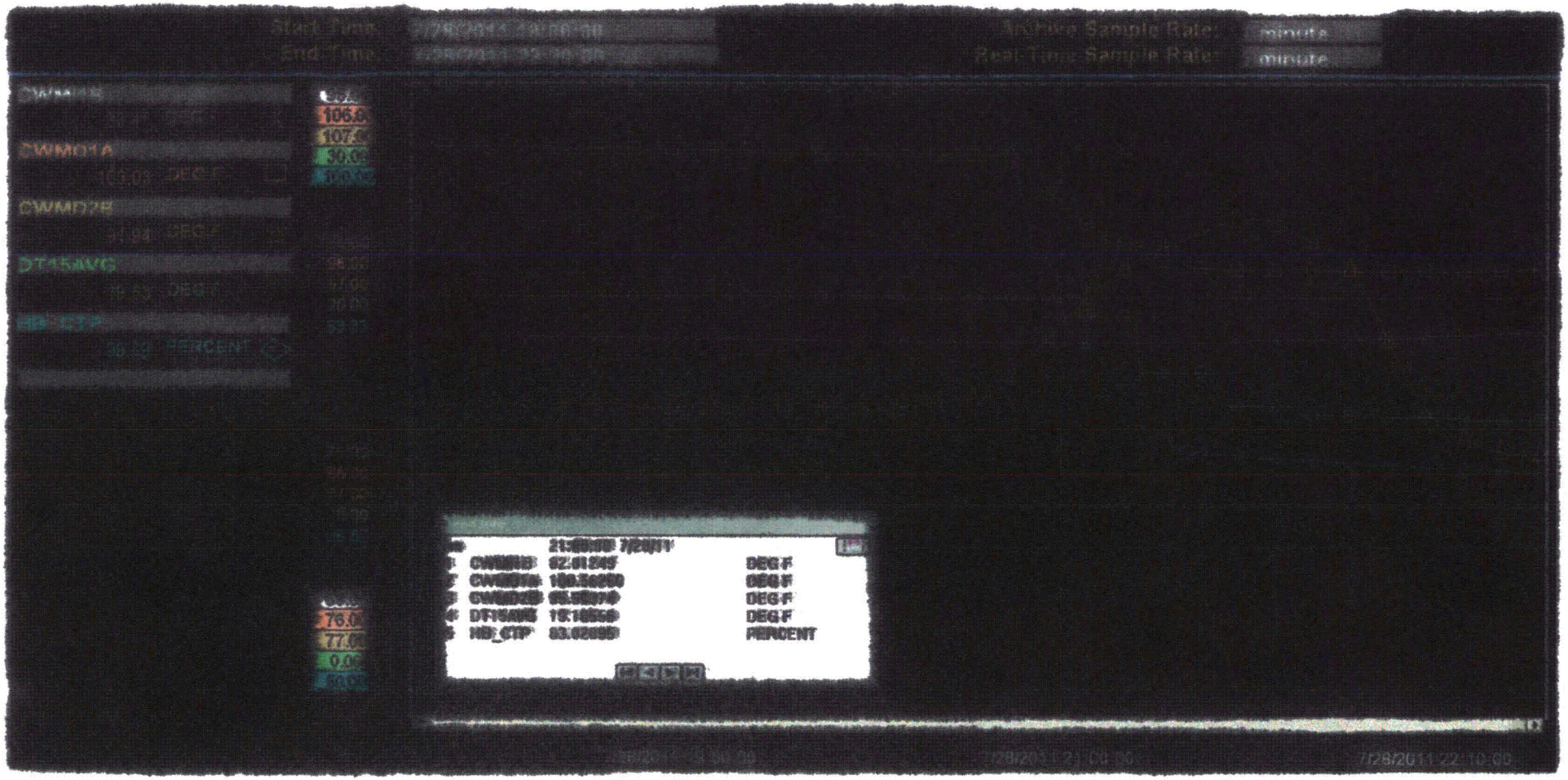


Figure 4. Rt 9 Bridge Temperature Below 97˚ F, 2200 hrs

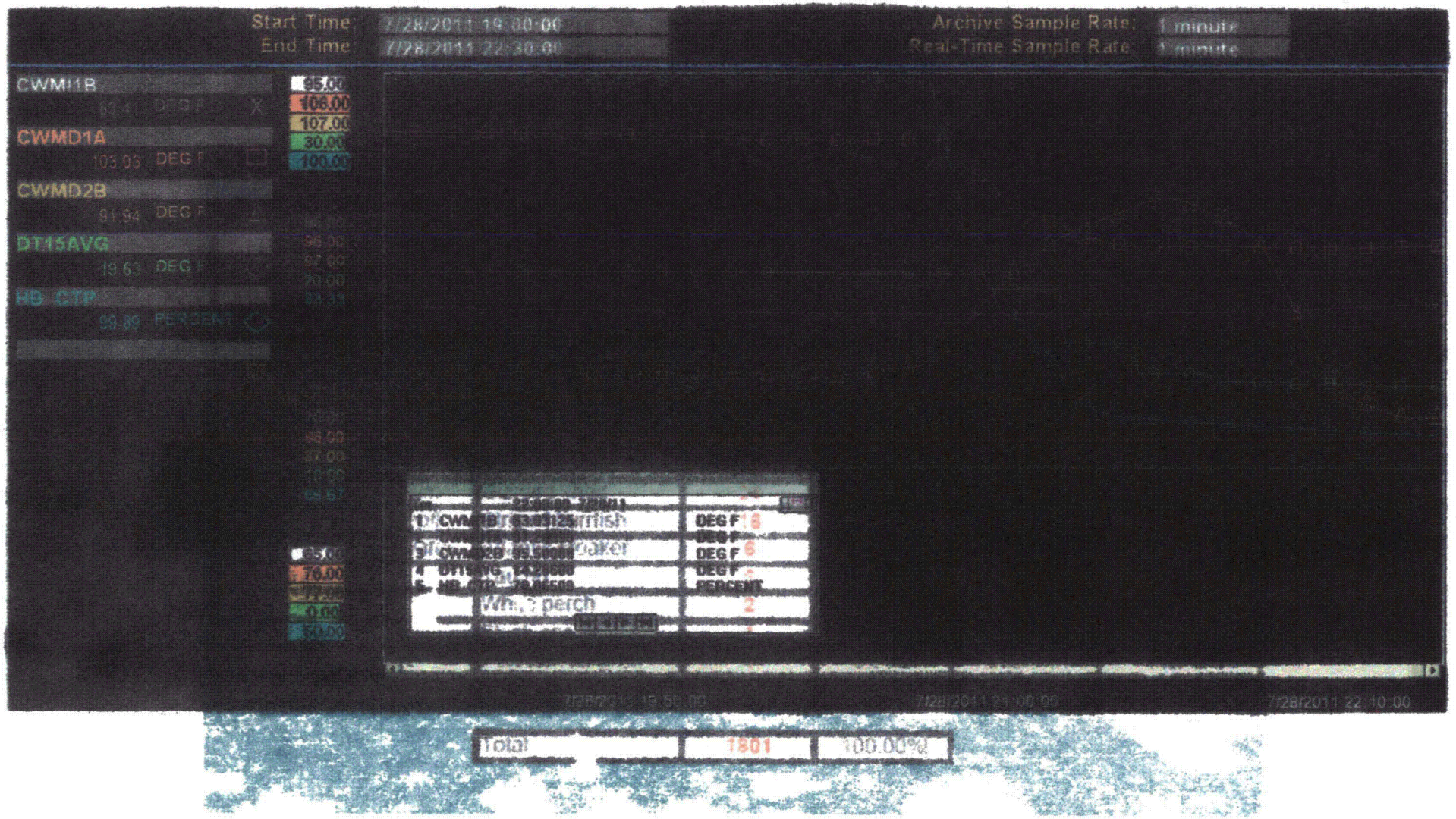


Table 1.
Number and size of dead and stressed fish and invertebrates collected from Oyster Creek following the OCGS dilution pump shutdown on July 28, 2011

Species of Dead/Stressed Fish and Invertebrates Collected	Species Common Name	Total Count Per Species	Percentage of Total (%)	Minimum Length (mm)	Maximum Length (mm)
Morone saxatilis	Striped bass	1422	78.96%	370	1000
Brevoortia tyrannus	Atlantic menhaden	221	12.27%	80	103
Pomatomus saltatrix	Bluefish	49	2.72%	520	850
Rhinoptera bonasus	Cownose ray	26	1.44%	762	914
Pogonias cromis	Black drum	24	1.33%	220	550
Dorosoma cepedianum	Gizzard shad	24	1.33%	unknown	unknown
Chilomycterus schoepfi	Striped burrfish	18	1.00%	unknown	215
Micropogonias undulatus	Atlantic croaker	6	0.33%	200	210
Tautoga onitus	Tautog	6	0.33%	unknown	unknown
Morone americana	White perch	2	0.11%	unknown	unknown
Centropristis striata	Black sea bass	1	0.06%	unknown	unknown
Menticirrhus saxatilis	Northern kingfish	1	0.06%	unknown	unknown
Prionotus carolinus	Northern searobin	1	0.06%	300	300
Total		1801	100.00%		