



P.O. Box 148  
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November 6, 2006

Mr. Jonathan Bishop  
California Water Quality Control Board  
Los Angeles Regions  
320 W. 4<sup>th</sup> Street, Suite 200  
Los Angeles, California 90013

**Subject: Updated Proposals for Information Collection (PICs) and Interim Impingement Mortality and Entrainment Characterization Data for Reliant Energy's Mandalay and Ormond Beach Generating Stations**

Dear Mr. Bishop:

We appreciate the opportunity to have met with your staff on multiple occasions this year to receive input regarding implementation of the 316(b) Phase II rule and the subject ongoing sampling. In response to those meetings we've implemented revisions to our characterization study sampling locations and added new elements to our studies. Our two PICs and associated sampling plans have therefore been updated accordingly. In addition, as suggested by staff, we are pleased to share a preliminary synopsis of our sampling results to date. Currently we have collected and analyzed entrainment samples through August and impingement samples through September. We are continuing to review the data and will provide the LARWQCB with a final IMECS report with our final Comprehensive Demonstration Study submittal in January 2008.

**Revised PICs**

In response to the comments received, ENSR has revised the documents to enhance their overall clarity and focus, provided a more detailed description of the area of the cooling water intake structures (CWIS), provided an explicit statement of the CWIS at Mandalay, provided additional detail on QA/QC measures, provided further characterization of the QA/QC of historical and on-going data collection efforts, reduced the discussion of restoration in the PICs, and explicitly included shellfish in the sampling plan.

In addition, the sampling plans have been amended to incorporate numerous LARWQCB's requests. These changes include:

- 1) Measuring the performance of the entrainment sampling adjacent to the velocity cap at Ormond Beach;

- 2) conducting a flow reversal study to investigate directly the performance of the velocity cap at Ormond Beach;
- 3) increasing the frequency of impingement and entrainment sampling to two episodes per month at each plant;
- 4) increasing the number of entrainment samples at each location in each 24-hour episode to four; and
- 5) adding six monthly samples of entrained organisms at two additional locations in the Edison Canal and Channel Islands Harbor to supplement data for the Mandalay plant.

The above changes have either been completed or are well underway at this time.

Reliant has also appreciated the opportunity to provide comments in response to the ongoing initiative by the State Water Board to develop a California policy that would substantially diverge from the existing federal rule. Of course, we are committed to meet any future state 316(b) compliance provisions that may apply to our existing Ventura County facilities. At this time, however, we're uncertain how the potential scope and schedule distinctions can be accommodated within the ongoing Phase II rule compliance efforts. It seems probable that some or all of the ongoing work may require reevaluation per any applicable new state requirements. We note that among the deviations proposed to the federal approach is to provide detailed characterization of ambient population levels in the source water. While we have added various additional sampling stations, we continue to believe that there is no basis for the collection of ambient data under the existing regulations, particularly given staff preference against restoration as a compliance approach. Rather, we believe that identification of fish and shellfish susceptible to impingement and entrainment is best accomplished by direct monitoring of these phenomena and continue to proceed on that basis.

### **Interim Data Synopsis**

To date impingement and entrainment sampling have been conducted at both Ormond Beach and Mandalay from February through September 2006. Entrainment data collected through August 2006 and impingement data collected through September 2006 have been processed and are discussed below (See Attachment 1 for tables). Entrainment samples from September have been collected and are in the process of being analyzed.

**Figure 1** illustrates the three entrainment sampling stations associated with Mandalay, while **Figure 2** shows the approximate location of the entrainment sampling station for Ormond Beach. Impingement sampling at both plants occurs at the screens.

Samples for impingement and entrainment were collected on an approximately twice monthly basis. This schedule is dictated by the operation of the circulation pumps at each facility according to the methods described in the revised PICs. Starting in June, monthly samples of ichthyoplankton and commercially important invertebrates were collected from two locations within the Channel Islands Harbor (CI Harbor). These samples were collected concurrent with one of the twice monthly samples at Mandalay. These CI Harbor samples were collected to help address the LARWQCB

staff's questions regarding the definition of the CWIS for Mandalay. Specifically, the question is whether or not the CWIS should include the Edison Canal and/or the Channel Islands Harbor.

### Operations Data

The Ormond and Mandalay facilities have in recent years operated at less than 15% capacity factor. Ormond Beach did not run during the latter half of January or during the month of February. Additionally, both Mandalay and Ormond Beach operated on irregular schedules between March and September, which has precluded establishing regular sampling periods (e.g., at precise two week intervals). Since entrainment sampling at Ormond Beach is at the velocity cap and independent from the operation of the facility, it is the most regularly-timed data collection effort.

### Impingement Data

Impingement sampling was completed on a twice-monthly basis starting in February. Sampling is based on the operational schedule of each facility.

#### *Mandalay*

**Table 1** presents the average daily impingement of fish and invertebrates at Mandalay between January and September of this year. These data represent an average of the number of individuals of each species impinged during the two monthly sampling episodes. The data in Table 1 do not reflect total monthly impingement rates or impingement rates adjusted for daily flow. These analyses will be provided in the CDS.

Impingement at Mandalay was dominated by three species, shiner perch (48%), northern anchovies (17%), and topsmelt (16%), collectively totaling approximately 80% of the total impingement for samples collected to date. The remaining 20% of impingement was comprised of white seaperch (4%), opaleye perch (4%), California pilchard (3%), Pacific staghorn sculpin (2%) and 17 other species (6%). Of note, there was quite substantial periodicity in the observed impingement. Northern anchovies, in particular, were impinged in relatively low numbers except for one substantial episode in January. It is also worth noting that previous impingement sampling noted similar episodic impingement dominated by a few species, particularly grunion. Grunion were not collected in this impingement sampling effort.

Four species of invertebrates were impinged in samples taken at Mandalay between January and September, with three species being impinged in August and September. Invertebrate species were not impinged at Mandalay during the six month period between January and July

**Table 2** presents the diurnal impingement of fish and invertebrates over four, six-hour periods (midnight, morning, noon, and evening). Although there is a considerable amount of variability in this data, particularly within individual species, there appears to be less activity in the hours around midafternoon than during the morning, noon and evening sampling periods. There seems to be a

clearer diurnal behavior for the four invertebrate species impinged with the majority of individuals impinged in the hours before and after midnight.

#### *Ormond Beach*

**Table 3** presents average daily fish and invertebrate impingement sampled at Ormond Beach between March and September of this year. There were 37 species of fish and 26 species of invertebrates collected with 11 species comprising 80% of the total (as compared to three at Mandalay). The larger number of fish and invertebrate species impinged at Ormond Beach compared to Mandalay reflects the much greater diversity of species around the Ormond Beach intake pipe compared to the terminal end of the Edison Canal for Mandalay. This pattern is also seen in the impingement data collected over the last several years.

While nearly one-half of the impingement of invertebrates was due to the yellow-legged shrimp, the species was present in large numbers in only two consecutive days of sampling.

**Table 4** presents the diurnal impingement fish and invertebrates. There was approximately twice as many fish impinged during the midnight and evening periods than during the morning and noon periods. However, the numbers were affected by two species, white seaperch and Pacific sanddab. The diurnal impingement of invertebrates appears much stronger with over 70% of impingement occurring between midnight and noon. However, these results are skewed by a single peak event that occurred in April in which a large number of yellowleg shrimp were impinged. Without that event, the data display only a weak diurnal pattern in impingement.

#### Entrainment Data

Entrainment sampling is completed twice monthly with one set of samples collected during each of the four daily sampling periods, approximately 00:00 (midnight), 06:00, 12:00, and 18:00.

#### *Mandalay*

**Table 5** presents the average daily density of ichthyoplankton measured at Mandalay. Entrainment at Mandalay was dominated by gobies and blennies (86%) which comprised four of the five most common larvae collected. Eggs of drums and croakers dominated the ichthyoplankton comprising nearly 75% of all fish eggs in these groups. Similarly, shrimp larvae dominated the invertebrate larvae comprising approximately 94% of the sample. When Caridean shrimp were included in the shrimp category, shrimp larvae dominated essentially the entire sample.

**Table 6** compares the results of the plankton samples collected at Mandalay (MG) and the two locations within the Channel Islands Harbor, where the Edison Canal joins the Harbor (EC) and at the mouth of the Harbor (CH). These data include samples collected during the three sampling periods (June, July, and August) for which data from all three locations were collected. Note that the data reported in Table 5 for each month represents the average densities recorded for each

species while the data in Table 6 includes only those samples coinciding to the data collected at the other stations for the specific sampling day.

Blennies and gobies again dominate the samples with the bay blennies being more common within the Harbor as compared to at Mandalay. There were more larvae collected in August than June or July and there were substantially more larvae collected at the two Harbor locations than at Mandalay during this period. Based on these preliminary data, there appears to be roughly an 80% reduction in larvae available for entrainment at the terminal end of the Edison Canal when compared to the mouth of the Harbor. However, this trend is least pronounced for the June sampling set and more pronounced for the August sampling period.

The trend of more eggs in August is similar to that for the larvae, but it is not the case for the invertebrate larvae. On the other hand the general trend during the three months of sampling to date of many more larvae and eggs within the Harbor than at Mandalay is very pronounced with roughly 99% reduction in fish eggs and 97% reduction for invertebrates between the mouth of the Harbor and Mandalay. While this trend is dramatic for all the periods for fish eggs, it only occurs for two of the three sampling periods for shellfish larvae. The August sampling period had the lowest concentration of shellfish larvae at the mouth of the Channel Islands Harbor and highest densities at the end of the Harbor where it joins the Edison Canal. For the other two periods, the trend observed in finfish was also strong for shellfish.

**Table 7** compares diurnal variations for these same three stations during the June through August time frame. There is a marked diurnal pattern with most larvae (fish and invertebrates) being collected in the late evening and early morning and relatively few during the day. This pattern may reflect the larvae's tendency to rise to the surface during the darkness.

Not surprisingly the pattern is much less marked with fish eggs since they cannot actively move up or down. Although, the data do suggest they are most common in the plankton in the late afternoon and evening.

#### *Ormond Beach*

**Table 8** presents entrainment samples for the waters just off the intake to the CWIS for Ormond Beach. There were 36 species of fish larvae and 18 different types of fish eggs identified from these samples. Anchovies dominated the samples with roughly 32% of the total number. White croaker were the next most common, although there were a dozen species comprising 80% of the specimens collected. Two groups of fish eggs, queen fish and drums and croakers were roughly 80% of the fish eggs while the vast majority of commercially important invertebrates were shrimp larvae.

**Table 9** presents the results of the three reverse flow studies that have been performed to date to evaluate the effectiveness of the velocity cap. Sufficiently few fish have been impinged making a rigorous statistical analysis impractical. However, the data do support that the velocity cap does result in a reduction in impingement.


## Summary

Impingement and entrainment sampling initiated in February 2006 has documented impingement and entrainment at both plants. The most dramatic patterns observed were the substantial reduction in plankton between the Channel Islands Harbor and the intake at Mandalay. This reduction ranged from 90% to 99%.

The data collected as part of this monitoring work will support the characterization of impingement and entrainment as required by the Phase II rule. That characterization will likely include more detailed analysis of data including statistical analysis, more complete evaluation of data for diel or seasonal patterns, and analysis for pumping rates and flow regimes. As noted, there is some potential that future state policy may dictate additions or modifications to these protocols.

Reliant appreciates your continued interest in addressing these issues and we look forward to your comments, questions, and discussion. If you wish to discuss our submittals, please feel free to contact me at (713) 488-8080 or KWhelan@reliant.com.

Sincerely,



Kerry Whelan  
Principal, Water & Wastewater

Attachment: Figures 1 & 2, Tables 1 through 9

Enclosures: Revised PICs for Ormond Beach and Mandalay Generating Stations

## **Attachment 1**

### **Data Tables**

**Table 1 Average Daily Impingement (Individuals Sampled) at Mandalay Generation Station  
(January – September 2006)**

Date	Jan	Feb	March	April	May	June	July	Aug	Sept	Ave	% Comp
<b>Fish Species</b>											
shiner perch	67.0	0.0	0.0	0.0	14.0	0.5	65.0	58.0	9.5	30.6	48.0%
northern anchovy	66.0	0.0	0.0	0.0	6.5	0.5	1.0	1.5	2.0	11.1	17.4%
topsmelt	17.0	0.0	0.5	23.5	7.0	1.5	10.5	5.5	4.5	10.0	15.7%
white seaperch	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	4.0%
opaleye perch	13.0	2.0	0.5	0.0	0.5	0.0	0.0	0.0	0.0	2.3	3.6%
California pilchard	11.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.6	2.6%
Pacific staghorn sculpin	3.0	0.0	0.0	0.0	5.0	1.0	0.5	0.5	0.5	1.5	2.4%
white seabass	3.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.6	0.9%
bat ray	0.0	0.0	0.0	0.0	1.0	0.0	0.0	2.0	0.5	0.5	0.8%
Pacific herring	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.7%
bay pipefish	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.4	0.6%
deep body anchovy	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.3	0.4%
diamond turbot	1.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.5	0.3	0.4%
jacksmelt	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4%
flathead mullet	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4%
queenfish	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.2	0.3%
Pacific barracuda	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.2	0.3%
walleye surfperch	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2%
yellowfin goby	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.1%
spotted kelpfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1%
crevice kelpfish	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.1%
rainbow surfperch	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.1%
halfblind goby	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1%
thornback ray	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1%
<b>Total</b>											<b>100%</b>
<b>Invertebrate Species</b>											
two spotted octopus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.2	30.0%
California spiny lobster	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.2	30.0%
navanax	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.2	30.0%
lined shore crab	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1	10.0%
<b>Total</b>											<b>100%</b>



**Table 2 Diurnal Impingement (Individuals Sampled) by sampling period at Mandalay Generating Station (January – August 2006)**

<b>Time Period</b>	<b>Midnight</b>	<b>Morning</b>	<b>Noon</b>	<b>Evening</b>
<b>Fish Species</b>				
shiner perch	92	111	116	42
topsmelt	25	23	58	17
northern anchovy	54	21	9	5
opaleye perch	1	0	4	14
Pacific staghorn sculpin	2	8	3	5
white seaperch	13	5	0	0
California pilchard	9	1	1	1
bat ray	3	0	2	2
white seabass	1	2	0	2
deep body anchovy	0	3	1	0
bay pipefish	1	1	2	0
Pacific herring	3	0	0	0
diamond turbot	0	2	0	1
queenfish	1	0	2	0
Pacific barracuda	0	3	0	0
jacksmelt	0	0	0	2
flathead mullet	0	0	0	2
yellowfin goby	0	1	0	0
spotted kelpfish	0	1	0	0
crevice kelpfish	0	0	0	1
walleye surfperch	1	0	0	0
rainbow surfperch	0	0	1	0
halfblind goby	0	1	0	0
thornback ray	0	0	0	1
<b>Total</b>	<b>206</b>	<b>183</b>	<b>199</b>	<b>95</b>
<b>Invertebrate Species</b>				
two spotted octopus	1	1	0	1
California spiny lobster	1	2	0	0
navanax	2	0	0	0
lined shore crab	0	1	0	0
<b>Total</b>	<b>4</b>	<b>4</b>	<b>0</b>	<b>1</b>

**Table 3 Average Daily Impingement (Individuals Sampled) at Ormond Beach Generation Station (January – September 2006)**

Date	Jan	Feb	March	April	May	June	July	Aug	Sept	Ave **	% Comp
<b>Fish Species</b>	*	*									
shiner perch			3.0	0.0	0.0	0.0	0.0	0.0	9.3	1.8	13.9%
Pacific sanddab			0.0	9.5	0.0	0.0	0.0	0.0	0.3	1.4	11.1%
Northern anchovy			5.5	0.5	0.0	0.5	0.0	0.0	1.3	1.1	8.8%
white seaperch			0.5	0.0	0.0	0.0	0.0	0.0	6.0	0.9	7.4%
plainfin midshipman			0.0	6.5	0.0	0.0	0.0	0.0	0.0	0.9	7.4%
topsmelt			0.0	3.5	0.0	0.0	0.0	0.0	1.8	0.8	6.0%
speckled sanddab			1.0	3.0	0.0	0.0	0.0	0.0	0.0	0.6	4.5%
bay pipefish			0.0	2.0	0.0	0.0	0.0	0.0	2.0	0.6	4.5%
queenfish			0.0	2.0	0.0	0.5	0.0	0.0	1.0	0.5	4.0%
Pacific pompano			1.0	1.5	0.0	0.0	0.0	0.0	0.5	0.4	3.4%
horneyhead turbot			0.5	2.0	0.0	0.0	0.0	0.0	0.0	0.4	2.8%
California tonguefish			0.0	2.0	0.5	0.0	0.0	0.0	0.0	0.4	2.8%
Pacific staghorn sculpin			0.0	1.5	0.5	0.0	0.0	0.0	0.3	0.3	2.6%
bat ray			0.0	1.5	0.5	0.0	0.0	0.0	0.3	0.3	2.6%
walleye surfperch			0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.3	2.3%
thornback ray			0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.2	1.7%
specklefin midshipman			0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.2	1.7%
vermillion rockfish			0.0	0.0	0.0	0.0	0.0	1.0	0.3	0.2	1.4%
Pallid eelpout			0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1%
shovelnose guitarfish			0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1%
California lizardfish			0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1%
chub mackerel			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
kelp greenling			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
Pacific halibut			0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
silver surfperch			0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.1	0.6%
diamond turbot			0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
senorita			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
English sole			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
C-O sole			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
curlfin sole			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
California ray			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
South American pilchard			0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.6%
bocaccio			0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
spiny dogfish			0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
California halibut			0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.3%
<b>Total</b>											<b>100%</b>
* Ormond Beach was not operating in the latter part of January or the month of February.											
** Average excluding non-sampling months of January and February.											

**Table 3 Average Daily Impingement (Individuals Sampled) Ormond Beach Generation Station  
(January – September 2006) (cont.)**

Date	Jan	Feb	March	April	May	June	July	Aug	Sept	Ave**	% Comp
<b>Invertebrate Species</b>	*	*									
Farfantepenaeus californiens			6.5	196.5	8.5	3.5	18.0	0.0	0.0	33.3	44.4%
red rock crab			0.0	0.0	0.0	0.0	72.5	1.0	7.5	11.6	15.5%
salp			0.5	8.5	0.0	0.0	44.0	0.0	0.0	7.6	10.1%
brown rock crab			0.5	10.0	5.0	2.5	9.0	0.5	17.3	6.4	8.5%
graceful rock crab			1.5	2.0	0.5	2.0	19.5	1.0	10.8	5.3	7.1%
yellow rock crab			2.0	0.5	1.5	4.0	20.5	0.5	6.0	5.0	6.7%
market squid			0.0	2.0	11.0	0.0	0.0	0.0	0.0	1.9	2.5%
red rock shrimp			0.0	0.5	0.5	0.0	1.0	0.5	1.8	0.6	0.8%
spider crab			0.0	0.0	0.5	0.5	2.5	0.0	0.0	0.5	0.7%
Xantus' swimming crab			0.5	2.0	0.0	0.0	0.0	0.5	0.0	0.4	0.6%
blackspotted bay shrimp			1.0	0.0	1.0	0.0	0.0	0.0	0.3	0.3	0.4%
giant green anemone			0.0	0.0	0.0	0.0	0.5	0.0	1.5	0.3	0.4%
jellyfish			0.0	0.0	1.5	0.5	0.0	0.0	0.0	0.3	0.4%
hairy rock crab			0.0	0.0	0.0	0.0	0.5	0.0	1.5	0.3	0.4%
sheep crab			0.0	0.0	0.5	0.0	1.0	0.0	0.0	0.2	0.3%
stout shrimp			0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.2	0.3%
purple sea urchin			0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.1	0.2%
transparent shrimp			0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.1	0.1%
two spot octopus			0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.1	0.1%
lined shore crab			0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.1	0.1%
giant octopus			0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1%
dwarf teardrop crab			0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1%
warty sea cucumber			0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1%
Giant spined seastar			0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0%
littleneck clam			0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0%
southern kelp crab			0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0%
<b>Total</b>											<b>100%</b>
* Ormond Beach was not operating in the latter part of January or the month of February.											
** Average excluding non-sampling months of January and February.											

**Table 4 Diurnal Impingement (Individuals Sampled) at Ormond Beach  
(February – September 2006)**

<b>Time Period</b>	<b>Midnight</b>	<b>Morning</b>	<b>Noon</b>	<b>Evening</b>
<b>Fish Species</b>				
shiner perch	9	18	9	11
white seaperch		23	1	1
Pacific sanddab	20			
Northern anchovy	1	3	5	9
topsmelt	6	2	3	3
bay pipefish	4	6	1	2
plainfin midshipman	5	6	2	
queenfish	3	2	3	1
speckled sanddab	1	4	3	
Pacific pompano	2		3	2
horneyhead turbot	3	2		1
Pacific staghorn sculpin		4	1	
bat ray	1		2	2
California tonguefish	3	1	1	
walleye surfperch	2	2		
thornback ray	1	1		1
specklefin midshipman	1	2		
vermillion rockfish		1	1	1
Pallid eelpout	2			
shovelnose guitarfish		1	1	
California lizardfish		2		
torpedo ray	1	1		
chub mackerel	1			
kelp greenling	1			
Pacific halibut	1			
silver surfperch		1		
diamond turbot	1			
senorita				1
California halibut			1	
English sole			1	
C-O sole				1
curlfin sole	1			
California ray		1		
South American pilchard	1			
Cabazon			1	
bocaccio				1
spiny dogfish			1	
rainbow surfperch				
<b>Total</b>	<b>71</b>	<b>83</b>	<b>40</b>	<b>37</b>

**Table 4 Diurnal Impingement (Individuals Sampled) at Ormond Beach  
(February – September 2006) (cont.)**

<b>Time Period</b>	<b>Midnight</b>	<b>Morning</b>	<b>Noon</b>	<b>Evening</b>
<b>Invertebrate Species</b>				
Farfantepenaeus californiens	213	226	25	2
red rock crab	35	56	21	68
brown rock crab	27	38	24	38
graceful rock crab	44	57	4	13
salp	2	41	29	34
yellow rock crab	57	5	16	4
market squid	2	14	9	1
red rock shrimp	4	3	5	1
hairy rock crab	1	5	2	
giant green anemone	2		3	2
Xantus' swimming crab	2	3	1	1
spider crab		2	2	3
blackspotted bay shrimp		4	1	
two spot octopus	2		2	1
jellyfish	1		3	
purple sea urchin		2	2	
sheep crab	1	1		1
stout shrimp	1		1	1
transparent shrimp	2			
warty sea cucumber			2	
lined shore crab	1			
giant octopus	1			
dwarf teardrop crab		1		
giant spined seastar		1		
littleneck clam				1
southern kelp crab		1		
<b>Total</b>	<b>398</b>	<b>460</b>	<b>152</b>	<b>171</b>

**Table 5 Average Daily Density of Ichthyoplankton (#/100m<sup>3</sup>) at Mandalay**

Species	Feb	Mar	Apr	May	June	July	Aug	Ave	% Comp
<b>Juveniles</b>									
Longjaw mudsucker				0.1				0.1	--
<b>Fish Larvae</b>									
Yellowfin goby	96.3	21.8	45.7	0.8	0.5	0.0	0.0	23.6	46.0%
Arrow goby	25.9	6.6	16.8	4.9	3.5	4.9	30.2	13.3	25.9%
Bay blenny	0.4	0.2	1.1	23.3	2.2	1.9	3.4	4.6	9.1%
Topsmelt	0.0	0.5	11.2	3.3	3.9	2.0	0.3	3.0	5.9%
Shadow goby	4.4	3.4	1.9	1.1	1.0	0.0	0.0	1.7	3.3%
goby	0.0	0.0	0.0	2.4	0.5	1.2	3.4	1.1	2.1%
California clingfish	0.0	0.5	1.5	1.8	0.7	1.1	0.5	0.9	1.7%
Longjaw mudsucker	1.7	1.0	0.9	1.5	0.3	0.2	0.0	0.8	1.6%
Kelpfish	0.5	0.2	0.6	0.8	0.0	0.2	2.5	0.7	1.4%
Jacksmelt	0.9	0.5	1.3	0.3	0.0	0.0	0.3	0.5	0.9%
Pacific herring	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3%
Northern Anchovy	0.0	0.0	0.3	0.3	0.0	0.0	0.5	0.1	0.3%
Giant kelpfish	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.1	0.3%
Blennies	0.5	0.0	0.0	0.0	0.0	0.2	0.0	0.1	0.2%
Coralline sculpin	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.1	0.1%
Pacific sanddab	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.1	0.1%
Righteye flounder	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.1%
larvae	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.1	0.1%
Northern lampfish	0.2	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.1%
Cheekspot goby	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1%
Snailfishes and lumpsuckers	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1%
Bay pipefish	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.1%
Blind goby	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1%
Painted greenling	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1%
Spotted turbot	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.1%
Pacific staghorn sculpin	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1%
<b>Total Fish Larvae</b>	<b>132.5</b>	<b>34.9</b>	<b>83.2</b>	<b>41.3</b>	<b>13.1</b>	<b>12.4</b>	<b>41.5</b>		<b>100%</b>
<b>Fish Eggs</b>									
Drums and croakers	0.0	0.0	3.1	28.8	1.1	1.3	0.3	4.9	73.3%
pleurinctidae, paralichtidae	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.6	9.7%
Speckled sanddab	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.4	5.9%
Kelp Bass	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.3	3.9%
California halibut	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.2	2.7%
Topsmelt	0.0	0.0	0.0	0.5	0.8	0.0	0.0	0.2	2.6%
Righteye flounder	0.0	0.0	0.0	0.0	0.0	0.3	0.6	0.1	1.9%
<b>Total Fish Eggs</b>	<b>0.0</b>	<b>0.0</b>	<b>3.1</b>	<b>29.3</b>	<b>1.9</b>	<b>1.5</b>	<b>11.3</b>		<b>100%</b>
<b>Shellfish Larvae</b>									
shrimp larvae	21.5	36.5	6.5	60.2	1.3	7.3	7.6	20.1	93.9%
shrimp larvaeA (Caridean)	0.0	0.0	0.0	0.0	0.0	0.0	8.9	1.3	5.9%
crab larvae	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.2%
<b>Total Shellfish Larvae</b>	<b>21.5</b>	<b>36.7</b>	<b>6.5</b>	<b>60.2</b>	<b>1.3</b>	<b>7.3</b>	<b>16.5</b>		<b>100%</b>

**Table 6 Average Daily Density (#/100m<sup>3</sup>) comparison of three station locations at Mandalay**

Fish Larvae	6/15/06			7/5/06			8/23/06			6/15/06	7/5/06	8/23/06	MG	EC	CH	Overall
	MG	EC	CH	MG	EC	CH	MG	EC	CH	Sum	Sum	Sum	Sum	Sum	Sum	Sum
Bay blenny	4.2	11.4	11.8	0.3	3.8	31.0	3.1	18.2	35.3	27.4	35.1	56.6	7.6	33.4	78.1	119.1
Arrow goby	3.6	2.2	0.2	1.5	4.6	1.4	5.1	66.0	27.1	6.0	7.5	98.2	10.2	72.7	28.7	111.6
California clingfish	0.9	2.3		0.2	7.7	1.0		0.5	0.4	3.2	8.9	0.9	1.1	10.5	1.4	13.0
goby			1.0		0.7	1.3	3.4		1.0	1.0	2.0	4.4	3.4	0.7	3.3	7.3
Topsmelt	1.3	1.2		0.2	0.3	0.3	0.2	0.2		2.5	0.8	0.5	1.8	1.7	0.3	3.7
Bay goby									2.1	0.0	0.0	2.1	0.0	0.0	2.1	2.1
Kelpfish			0.2		1.3	0.3		0.3		0.2	1.5	0.3	0.0	1.5	0.5	2.0
Bay pipefish			0.7			0.3		0.3	0.3	0.7	0.3	0.5	0.0	0.3	1.2	1.5
Northern lampfish		0.5		0.3		0.5				0.5	0.8	0.0	0.3	0.5	0.5	1.2
Jacksmelt		0.4				0.8				0.4	0.8	0.0	0.0	0.4	0.8	1.1
Northern Anchovy		0.2	0.2					0.3	0.2	0.5	0.0	0.5	0.0	0.5	0.5	1.0
Island keplfish		1.0								1.0	0.0	0.0	0.0	1.0	0.0	1.0
California grunion			0.2						0.5	0.2	0.0	0.5	0.0	0.0	0.8	0.8
Longjaw mudsucker	0.3		0.2						0.2	0.5	0.0	0.2	0.3	0.0	0.5	0.7
White croaker						0.4		0.3		0.0	0.4	0.3	0.0	0.3	0.4	0.6
Yellowfin goby	0.5									0.5	0.0	0.0	0.5	0.0	0.0	0.5
larvae							0.5			0.0	0.0	0.5	0.5	0.0	0.0	0.5
Shadow goby					0.2					0.0	0.2	0.0	0.0	0.2	0.0	0.2
Blennies				0.2						0.0	0.2	0.0	0.2	0.0	0.0	0.2
Blind goby										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cheekspot goby										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coralline sculpin										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Giant kelpfish										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pacific herring										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pacific sanddab										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pacific staghorn sculpin										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Painted greenling										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Righteye flounder										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snailfishes and lumpsuckers										0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spotted turbot										0.0	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total Fish Larvae</b>	<b>10.7</b>	<b>19.1</b>	<b>14.7</b>	<b>2.8</b>	<b>18.5</b>	<b>37.2</b>	<b>12.3</b>	<b>86.0</b>	<b>67.1</b>	<b>44.5</b>	<b>58.4</b>	<b>165.5</b>	<b>25.8</b>	<b>123.6</b>	<b>119.0</b>	<b>268.4</b>

**Table 6 Average Daily Density (#/100m<sup>3</sup>) comparison of three station locations at Mandalay (cont)**

	6/15/06			7/5/06			8/23/06			6/15/06	7/5/06	8/23/06	MG	EC	CH	Overall
	MG	EC	CH	MG	EC	CH	MG	EC	CH	Sum	Sum	Sum	Sum	Sum	Sum	Sum
<b>Fish Eggs</b>																
Speckled sanddab							2.8	6.7	450.4	0.0	0.0	459.9	2.8	6.7	450.4	459.9
Drums and croakers	2.0	5.9	110.9	0.5	2.2	212.5				118.9	215.3	0.0	2.5	8.2	323.4	334.2
Rigteye flounder		0.5	8.2		0.8	138.2	0.2	32.6	25.2	8.7	139.0	58.1	0.2	33.8	171.6	205.7
Queenfish					0.2	125.3				0.0	125.6	0.0	0.0	0.2	125.3	125.6
pleurinctidae, paralichtidae							4.5	10.2	90.9	0.0	0.0	105.7	4.5	10.2	90.9	105.7
Kelp Bass							1.9	1.3	82.2	0.0	0.0	85.3	1.9	1.3	82.2	85.3
unidentified eggs		0.2						2.8	4.3	0.2	0.0	7.1	0.0	3.1	4.3	7.3
White croaker			0.2			6.8				0.2	6.8	0.0	0.0	0.0	7.1	7.1
Soles and turbot			1.0			1.0			0.5	1.0	1.0	0.5	0.0	0.0	2.5	2.5
Northern Anchovy						0.2			1.0	0.0	0.2	1.0	0.0	0.0	1.3	1.3
California halibut							1.3			0.0	0.0	1.3	1.3	0.0	0.0	1.3
California Tonguefish									0.8	0.0	0.0	0.8	0.0	0.0	0.8	0.8
Topsmelt	0.8									0.8	0.0	0.0	0.8	0.0	0.0	0.8
Sanddab								0.5		0.0	0.0	0.5	0.0	0.5	0.0	0.5
Spotted turbot						0.3				0.0	0.3	0.0	0.0	0.0	0.3	0.3
Halibut									0.3	0.0	0.0	0.3	0.0	0.0	0.3	0.3
<b>Total Fish Eggs</b>	<b>2.8</b>	<b>6.7</b>	<b>120.3</b>	<b>0.5</b>	<b>3.2</b>	<b>484.4</b>	<b>10.7</b>	<b>54.2</b>	<b>655.5</b>	<b>129.7</b>	<b>488.2</b>	<b>720.4</b>	<b>14.0</b>	<b>64.0</b>	<b>1260.2</b>	<b>1338.3</b>
<b>Shellfish Larvae</b>																
shrimp larvae	0.5	21.4	225.6	10.9	6.6	4.7	1.5	44.4	175.1	247.5	22.2	221.0	12.9	72.5	405.3	490.7
shrimp larvaeA (Caridean)					29.5					0.0	29.5	0.0	0.0	29.5	0.0	29.5
crab larvae						0.3			0.2	0.0	0.3	0.2	0.0	0.0	0.5	0.5
<b>Total Shellfish Larvae</b>	<b>0.5</b>	<b>21.4</b>	<b>225.6</b>	<b>10.9</b>	<b>36.2</b>	<b>4.9</b>	<b>1.5</b>	<b>44.4</b>	<b>175.3</b>	<b>247.5</b>	<b>52.0</b>	<b>221.2</b>	<b>12.9</b>	<b>102.0</b>	<b>405.8</b>	<b>520.8</b>



**Table 7 Total number of individuals of each species (#/100m<sup>3</sup>) collected at each of the four time periods comparison at all three locations at Mandalay**

Species	A			B			C			D			A	B	C	D	Overall
	MG	EC	CH	MG	EC	CH	MG	EC	CH	MG	EC	CH	Sum	Sum	Sum	Sum	Sum
<b>Juveniles</b>																	
Longjaw mudsucker				0.07									0.00	0.07	0.00	0.00	0.07
<b>Fish Larvae</b>																	
Arrow goby	24.4	23.5	18.7	4.5	0.8	0.3	2.2	0.3	0.3	22.0	72.3	18.9	66.6	5.7	2.8	113.2	188.3
Bay blenny	3.6	5.9	12.2	2.7	0.3	1.2	2.5	0.3	8.3	9.7	37.9	82.5	21.7	4.2	11.1	130.1	167.1
Yellowfin goby	34.2			4.1			2.0			53.9			34.2	4.1	2.0	53.9	94.2
California clingfish	0.4	1.0	0.8	0.6	0.3		0.9			1.4	12.7	1.0	2.3	1.0	0.9	15.1	19.2
Topsmelt	2.9	0.3		0.9		0.3	0.9			7.4	2.0		3.2	1.3	0.9	9.3	14.7
goby	0.5	0.3		0.1			0.5	0.6	0.3	1.8		4.0	0.8	0.1	1.4	5.8	8.1
Shadow goby	1.5	0.3		0.5			0.4			4.0			1.8	0.5	0.4	4.0	6.7
Kelpfish	0.9		0.3	0.2			0.1			0.7	2.0	0.3	1.3	0.2	0.1	3.0	4.5
Longjaw mudsucker	0.5			0.6			0.3			1.7		0.6	0.5	0.6	0.3	2.3	3.7
Bay goby												2.9	0.0	0.0	0.0	2.9	2.9
Jacksmelt	0.3					0.3	0.4		0.3	0.5	0.5	0.3	0.3	0.3	0.7	1.3	2.7
Bay pipefish			1.3	0.1							0.3	0.3	1.3	0.1	0.0	0.7	2.0
Northern Anchovy	0.1	0.3								0.2	0.3	0.6	0.4	0.0	0.0	1.2	1.6
Northern lampfish	0.1									0.1	0.6	0.7	0.1	0.0	0.0	1.4	1.5
Island keplfish											1.3		0.0	0.0	0.0	1.3	1.3
California grunion			1.0										1.0	0.0	0.0	0.0	1.0
White croaker											0.3	0.5	0.0	0.0	0.0	0.9	0.9
Pacific herring	0.2			0.1						0.1			0.2	0.1	0.0	0.1	0.3
Giant kelpfish	0.2						0.1						0.2	0.0	0.1	0.0	0.3
Blennies							0.1			0.1			0.0	0.0	0.1	0.1	0.2
Coralline sculpin	0.1									0.1			0.1	0.0	0.0	0.1	0.1
Pacific sanddab										0.1			0.0	0.0	0.0	0.1	0.1
Righteye flounder	0.1												0.1	0.0	0.0	0.0	0.1
larvae	0.1									0.1			0.1	0.0	0.0	0.1	0.1

**Table 7 Total number of individuals of each species (#/100m<sup>3</sup>) collected at each of the four time periods comparison at all three locations at Mandalay (cont)**

Species	A			B			C			D			A	B	C	D	Overall
	MG	EC	CH	MG	EC	CH	MG	EC	CH	MG	EC	CH	Sum	Sum	Sum	Sum	Sum
Cheekspot goby	0.1												0.1	0.0	0.0	0.0	0.1
Snailfishes and lumpsuckers										0.1			0.0	0.0	0.0	0.1	0.1
Blind goby				0.1									0.0	0.1	0.0	0.0	0.1
Painted greenling				0.1									0.0	0.1	0.0	0.0	0.1
Spotted turbot				0.1									0.0	0.1	0.0	0.0	0.1
Pacific staghorn sculpin										0.1			0.0	0.0	0.0	0.1	0.1
<b>Total Fish Larvae</b>	<b>70.1</b>	<b>31.8</b>	<b>34.3</b>	<b>14.6</b>	<b>1.5</b>	<b>2.2</b>	<b>10.3</b>	<b>1.3</b>	<b>9.3</b>	<b>103.8</b>	<b>130.3</b>	<b>112.9</b>	<b>136.2</b>	<b>18.3</b>	<b>20.9</b>	<b>346.9</b>	<b>522.3</b>
<b>Fish Eggs</b>																	
Speckled sanddab	0.6	7.3	65.9	0.1	0.3	52.3		0.7	201.1	0.1	0.7	281.1	73.9	52.8	201.8	281.9	610.3
Drums and croakers	7.3	1.0	21.0	1.9	0.3	19.1	1.7	3.9	151.8	7.9	5.7	239.3	29.3	21.3	157.4	252.9	460.9
Righteye flounder		3.0	79.8		1.0	4.7			142.0	0.4	41.1	2.4	82.8	5.7	142.0	43.9	274.4
Queenfish			128.5		0.3	38.6							128.5	38.9	0.0	0.0	167.4
pleurinctidae, paralichtidae	1.2		23.3	0.1							13.6	97.9	24.5	0.1	0.0	111.5	136.1
Kelp Bass		1.0	7.0			0.3			9.6	0.5	0.7	92.7	8.0	0.3	9.6	93.9	111.8
unidentified eggs		3.8			0.3	1.0			4.7				3.8	1.3	4.7	0.0	9.8
White croaker			1.9			2.7			2.7			2.2	1.9	2.7	2.7	2.2	9.4
Soles and turbot			0.7						0.3			2.3	0.7	0.0	0.3	2.3	3.3
Northern Anchovy			1.7										1.7	0.0	0.0	0.0	1.7
California Tonguefish			0.3						0.3			0.3	0.3	0.0	0.3	0.3	1.0
Sanddab					0.7								0.0	0.7	0.0	0.0	0.7
California halibut				0.2						0.1			0.0	0.2	0.0	0.1	0.4
Topsmelt	0.2			0.1									0.2	0.1	0.0	0.0	0.4
Spotted turbot						0.3							0.0	0.3	0.0	0.0	0.3
Halibut			0.3										0.3	0.0	0.0	0.0	0.3
<b>Total Fish Eggs</b>	<b>9.3</b>	<b>16.1</b>	<b>330.6</b>	<b>2.5</b>	<b>3.0</b>	<b>118.9</b>	<b>1.7</b>	<b>4.5</b>	<b>512.6</b>	<b>9.0</b>	<b>61.8</b>	<b>718.2</b>	<b>356.0</b>	<b>124.4</b>	<b>518.8</b>	<b>789.1</b>	<b>1788.3</b>
<b>Shellfish Larvae</b>																	
shrimp larvae	18.3	13.5	8.4	20.4	1.7	2.7	13.0	1.0	3.2	28.8	80.5	526.2	40.1	24.8	17.1	635.5	717.6
shrimp larvaeA		36.8		0.4	1.6			1.0		2.1			36.8	2.1	1.0	2.1	41.9
crab larvae						0.3				0.1		0.3	0.0	0.3	0.0	0.4	0.7
<b>Total Shellfish Larvae</b>	<b>18.3</b>	<b>50.3</b>	<b>8.4</b>	<b>20.9</b>	<b>3.3</b>	<b>3.0</b>	<b>13.0</b>	<b>2.0</b>	<b>3.2</b>	<b>31.0</b>	<b>80.5</b>	<b>526.5</b>	<b>76.9</b>	<b>27.2</b>	<b>18.1</b>	<b>638.1</b>	<b>760.2</b>

**Table 8 Entrainment Samples at Ormond Beach (2/06 – 8/06)**

<b>Species</b>	<b>Feb*</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>June</b>	<b>July</b>	<b>Aug*</b>	<b>Ave</b>	<b>% Comp</b>
<b>Fish Larvae</b>									
Northern Anchovy	0.2	0.1	3.0	8.4	4.6	2.2	1.1	2.8	31.8%
White croaker	0.4	1.5	6.2	0.0	0.3	0.1	4.4	1.8	21.0%
Northern lampfish	0.6	0.1	1.5	1.2	0.3	0.1	0.6	0.6	7.2%
Bay blenny	0.0	0.1	0.1	0.0	0.9	0.4	1.2	0.4	4.5%
Arrow goby	0.0	0.9	0.2	0.0	0.1	0.5	0.2	0.3	3.4%
California clingfish	0.0	1.6	0.4	0.0	0.0	0.0	0.0	0.3	3.2%
Coralline sculpin	0.2	0.6	0.8	0.1	0.0	0.0	0.0	0.3	2.8%
California smoothtongue	0.0	0.2	1.2	0.0	0.1	0.0	0.0	0.2	2.5%
Pacific hake	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.2	2.4%
California halibut	0.0	0.1	0.2	0.5	0.4	0.0	0.0	0.2	2.1%
Speckled sanddab	0.0	0.8	0.2	0.2	0.0	0.0	0.0	0.2	2.1%
English sole	0.0	0.2	0.2	0.4	0.0	0.3	0.0	0.2	1.8%
Rockfish	0.0	0.5	0.4	0.1	0.0	0.1	0.0	0.2	1.8%
Queenfish	0.0	0.0	0.1	0.0	0.0	0.1	0.8	0.1	1.6%
Diamond turbot	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.1	1.5%
unidentified larvae	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.1	1.4%
Yellowfin goby	0.5	0.0	0.1	0.0	0.1	0.0	0.0	0.1	1.2%
Popeye blacksmelt	0.0	0.0	0.1	0.0	0.0	0.4	0.0	0.1	0.9%
Pacific staghorn sculpin	0.0	0.0	0.0	0.1	0.4	0.0	0.0	0.1	0.8%
Bay pipefish	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.1	0.6%
goby	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.6%
Jacksmelt	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.1	0.6%
spotfin croaker	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.6%
Shadow goby	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.4%
Spotted turbot	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.4%
Bay goby	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.4%
Kelpfish	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.4%
Blind goby	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.4%
Island Kelpfish	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2%
Pygmy poacher	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2%
Scalyhead sculpin	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2%
Giant kelpfish	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2%
Pacific sand lance	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2%
Pacific Barracuda	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2%
Anchovy	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2%
Painted greenling	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.2%
<b>Total Fish Larvae</b>									<b>100%</b>
<b>Fish Eggs</b>									
Queenfish	180.2	174.1	323.4	111.2	319.6	356.3	377.9	263.2	54.2%
Drums and croakers	17.1	23.2	95.9	495.2	31.1	79.8	216.8	137.0	28.2%
White croaker	31.3	93.0	46.8	25.6	3.8	10.9	33.3	35.0	7.2%
Soles and turbot	4.0	5.1	15.8	20.5	7.5	5.6	3.0	8.8	1.8%
Northern Anchovy	0.0	0.5	2.9	8.6	26.2	2.2	30.0	10.1	2.1%
Unidentified eggs	5.2	2.7	10.1	4.4	3.3	24.9	11.6	8.9	1.8%

**Table 8 Entrainment Samples at Ormond Beach (February – August 2006) (cont'd)**

Species	Feb*	Mar	Apr	May	June	July	Aug*	Ave	% Comp
Righteye flounder	5.5	23.4	2.0	4.9	0.1	10.5	10.6	8.1	1.7%
Spotted turbot	0.9	0.7	20.0	6.5	7.1	0.8	0.5	5.2	1.1%
California tonguefish	0.0	0.1	2.3	0.0	0.9	8.1	11.9	3.3	0.7%
Pacific hake	1.0	4.0	8.5	0.0	3.4	0.8	0.0	2.5	0.5%
Rockfish	0.0	0.0	10.2	0.0	0.0	0.0	0.0	1.5	0.3%
Speckled sanddab	0.0	0.0	0.0	0.0	0.0	0.0	6.7	1.0	0.2%
kelp bass	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.7	0.1%
Paralichthidae/Pleuronectidae	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.5	0.1%
Pacific herring	0.2	0.4	0.5	0.3	0.1	0.0	0.0	0.2	0.0%
Mackerals	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
unidentified eggsA	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0%
Popeye blacksmelt	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0%
Total Fish Eggs									100%
Shellfish									
shrimp larvae	15.8	132.2	882.7	71.4	61.2	14.5	72.1	178.6	97.2%
crab megalopa	0.4	11.5	2.6	1.6	3.6	0.8	0.5	3.0	1.6%
shrimp	0.0	0.0	0.0	0.0	10.9	0.0	0.0	1.6	0.8%
Crab juveniles	0.0	0.0	0.2	0.0	1.9	0.3	0.3	0.4	0.2%
shrimp juveniles	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.2	0.1%
Total Shellfish Larvae									100%
* only one sample for the month									

**Table 9 Total number of individuals impinged during normal and reverse flow events at Ormond Beach**

Date	Sample Time	# of Seawater Circulation Pumps	Flow Direction	Fish Number	Total
Event 1					
6/6/2006	18:20	2	Normal	1	2
6/7/2006	0:15	2	Normal	0	
6/7/2006	6:35	2	Normal	1	
6/7/2006	13:48	2	Normal	0	
6/7/2006	18:20	2	Reverse	1	8
6/8/2006	0:20	2	Reverse	1	
6/8/2006	6:25	2	Reverse	6	
6/8/2006	12:24	2	Reverse	0	
Event 2					
8/19/2006	18:23	2	Reverse	0	1
8/20/2006	0:15	2	Reverse	0	
8/20/2006	6:20	2	Reverse	1	
8/20/2006	12:20	2	Reverse	0	
8/20/2006	18:30	2	Normal	1	2
8/21/2006	0:30	2	Normal	0	
8/21/2006	5:40	2	Normal	0	
8/21/2006	12:36	2	Normal	1	
Event 3					
9/21/2006	1:00	2	Normal	1	1
9/21/2006	6:15	2	Normal	0	
9/21/2006	12:08	2	Normal	0	
9/21/2006	18:28	2	Normal	0	
9/22/2006	0:30	2	Reverse	1	6
9/22/2006	6:18	2	Reverse	2	
9/22/2006	12:26	2	Reverse	2	
9/22/2006	18:18	2	Reverse	1	

## **Attachment 2**

### **Figures**



Sampling Locations Mandalay



Ormond Beach