



## Frequency Composition of Orange Roughy Sampled on Board the *F.V. Ocean Explorer*, Southern Indian Ocean, July and August 2007.

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### 1. INTRODUCTION

As part of its programme to support sustainable fisheries in the Southern Indian Ocean Fisheries Agreement (SIOFA) area, members of the Southern Indian Ocean Deepwater Fishers Association (SIODFA) are undertaking a programme to collect biological data from the catch both during the austral winter orange roughy (*Hoplostethus atlanticus*) fishery and the year-round mid-water fishery for alfonsino (*Beryx splendens*). This note provides an interim presentation of the results of one sampling period. These data will be combined with those collected by the other operators for subsequent presentation as a SIODFA Technical Report.

### 2. DATA COLLECTED

Each sample, in general, consisted of measurements of 50 orange roughy. The length, weight and sex were recorded. In the case of the females, the condition of the gonad was measured as outlined by Patchell (2006). The weights of the gonads were measured. A small number of otoliths were collected. These data have been entered into an ACCESS data base. The feature from where the catch was taken was also recorded. This location information is considered confidential at this time.

### 3. RESULTS

#### 3.1 Dates and Locations of Samples

Table 1 shows the dates and locations of samples.

**Table 1**

	<b>Date and Time</b>	<b>Location/Feature</b>	<b>No. of Fish Measured</b>
1	03/07/2007 09:00	Jimmy's	50
2	04/07/2007 11:50	Jimmy's	10
3	05/07/2007 10:00	Jimmy's	25
4	06/07/2007 13:30	Jimmy's	50
5	07/07/2007 13:35	Jimmy's	50
6	08/07/2007 12:15	Jimmy's	50
7	09/07/2007 16:55	Jimmy's	50
8	10/07/2007 13:38	Jimmy's	50
9	11/07/2007 12:40	Jimmy's	50
10	12/07/2007 12:54	Jimmy's	50
11	13/07/2007 12:20	Jimmy's	50
12	15/07/2007 20:25	Jimmy's	50
13	16/07/2007 11:40	Unspecified	50
14	01/08/2007 17:30	Unspecified	50
Total sampled:			635

### 3.2 Sample Composition by Sex

Table 2 shows the composition by sex for each of the samples. The frequency of males in the samples ranged from 50% to 100%.

**Table 2**  
**Sample Composition by Sex**

Sample No.	No. of Males	% of Males	No. of Females	% of Females
1	39	78	11	22
2	6	60	4	40
3	24	100	1	0
4	32	64	18	36
5	34	78	16	12
6	27	54	23	46
7	37	74	13	36
8	25	50	25	50
9	29	58	21	42
10	44	88	6	12
11	47	94	3	6
12	39	78	11	22
13	35	70	15	30
14	28	56	22	44
Total/ means	446	70%	189	30%

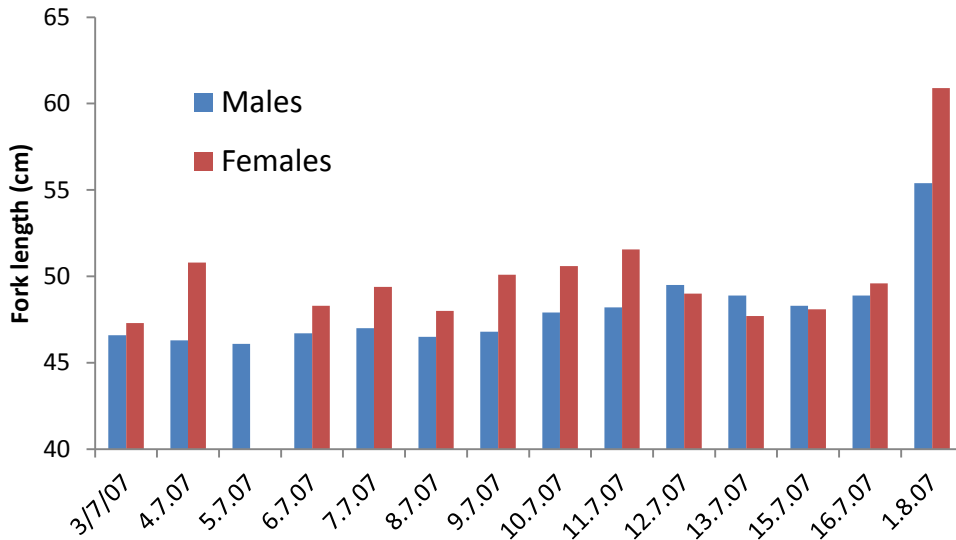
### 3.3 Sample Composition by Length

Table 3 presents the mean sample length for males and females. Figure 1 shows this information in chart form.

**Table 3**  
**Mean Sample Lengths**

		Males (cm)	Females (cm)	% Female is larger than male
1	03/07/2007	46.6	47.3	1.35
2	04/07/2007	46.3	50.8	3.80
3	05/07/2007	46.1	-	-
4	06/07/2007	46.7	48.3	3.48
5	07/07/2007	47.0	49.4	5.12
6	08/07/2007	46.5	48.0	3.17
7	09/07/2007	46.8	50.1	6.98
8	10/07/2007	47.9	50.6	5.60
9	11/07/2007	48.2	51.6	6.93
10	12/07/2007	49.5	49.0	-1.01
11	13/07/2007	48.9	47.7	-2.47
12	15/07/2007	48.3	48.1	-3.96
13	16/07/2007	48.9	49.6	1.46
14	01/08/2007	55.4	60.9	9.92

**Figure 1**  
**Relative lengths of samples separated by sex**



Figures 2 and 3 provide box plots<sup>1</sup> of the lengths that give an indication of the spread of orange roughy lengths in each sample.

**Figure 2**  
**Box plots of length distributions - males**

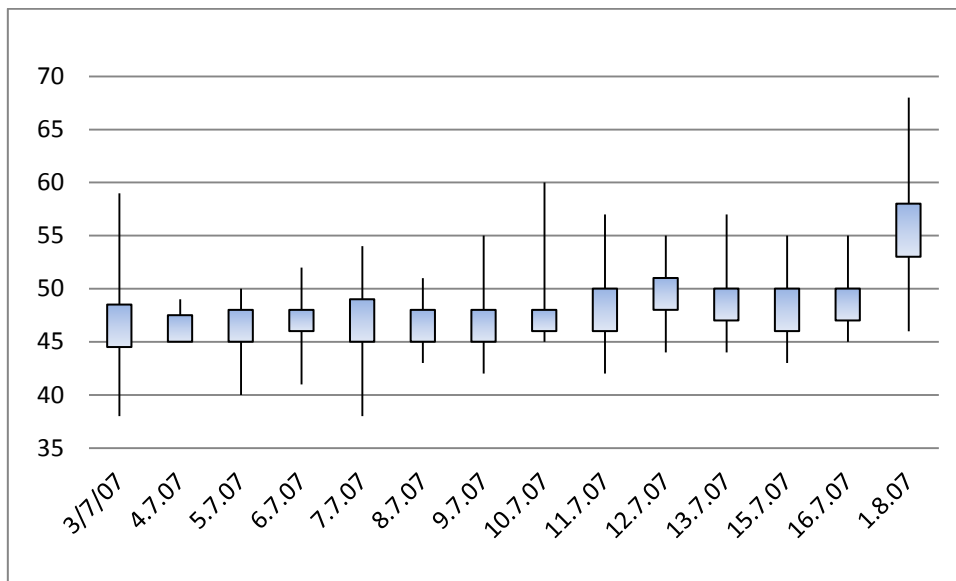
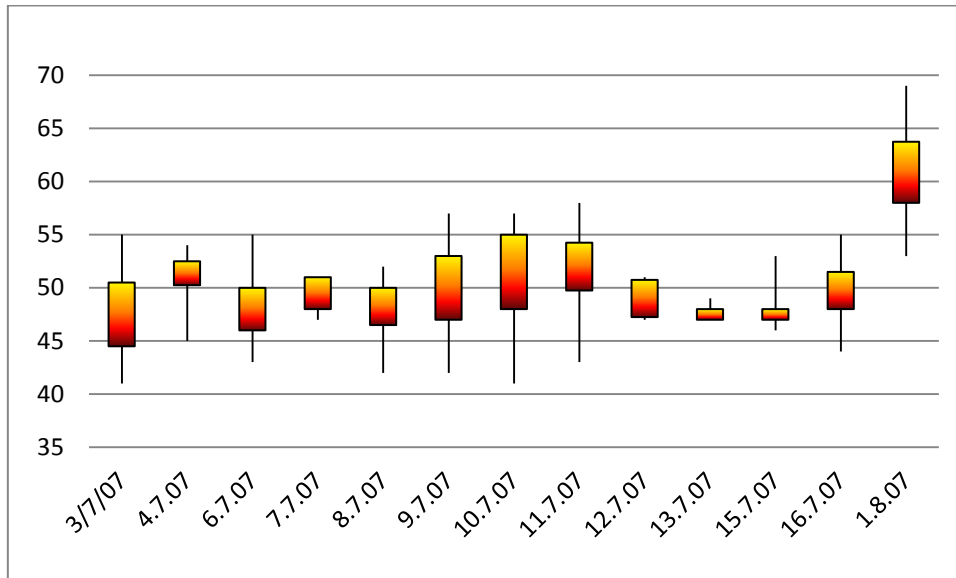


Figure 3 shows similar data for the female fish that were measured. Two phenomena are evident: (a) the difference in means of the last sample, which were taken from a different feature and the greater spread on lengths of the male fish.

<sup>1</sup> The rectangular area in a box plot presents the range covered by the central 50 percentile of observations, each tail, the upper and lower 25 percentiles.

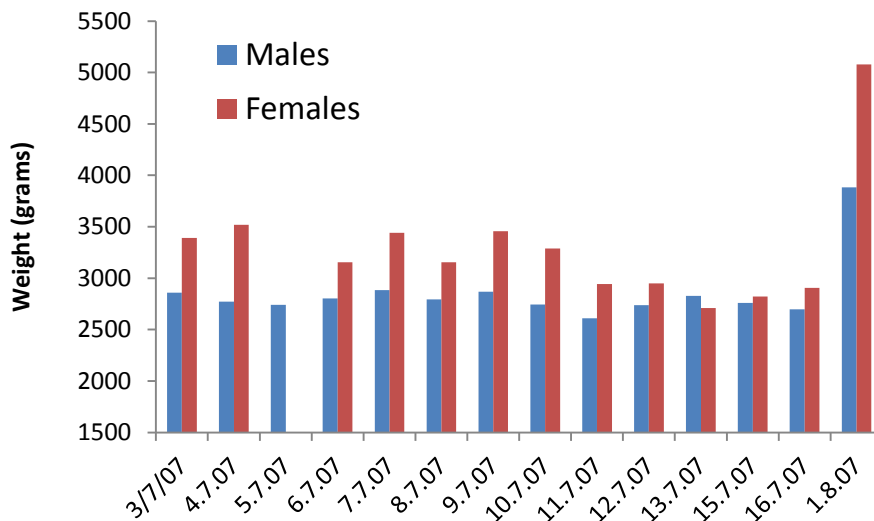
**Figure 3**  
**Box plots of length distributions – females**



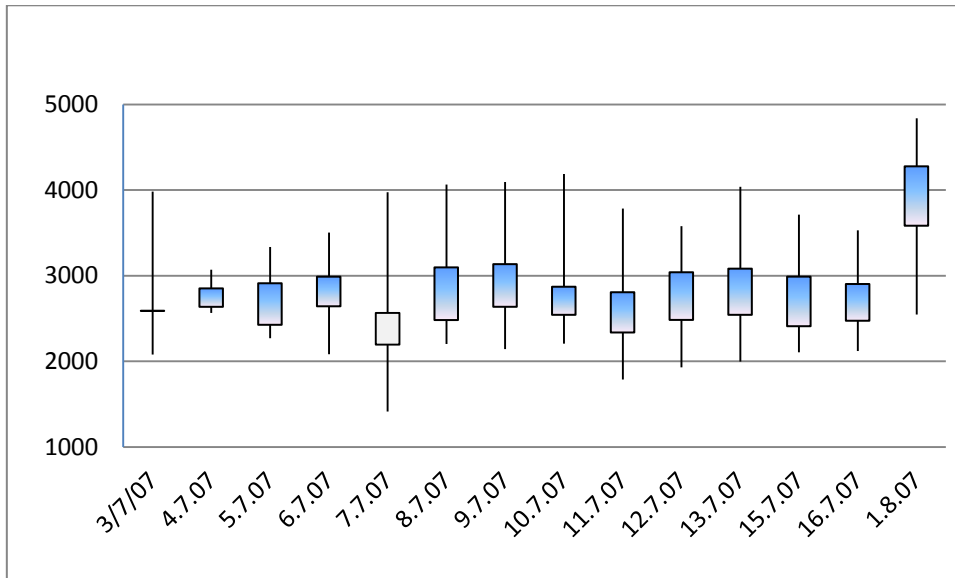
### 3.4 Sample Composition by Weight

Figure 4 shows the distribution by weight, separated for sex for the respective samples. Again, there is a noticeable difference in the last sample taken on 1 August 2007. Also apparent is a fairly regular trend in mean size for both sexes in the first 13 samples. Figures 5 and 6 show the distribution of weights separated for the two sexes. The regular trend in mean sample value seen for the orange roughy lengths is evident in the weight data as well.

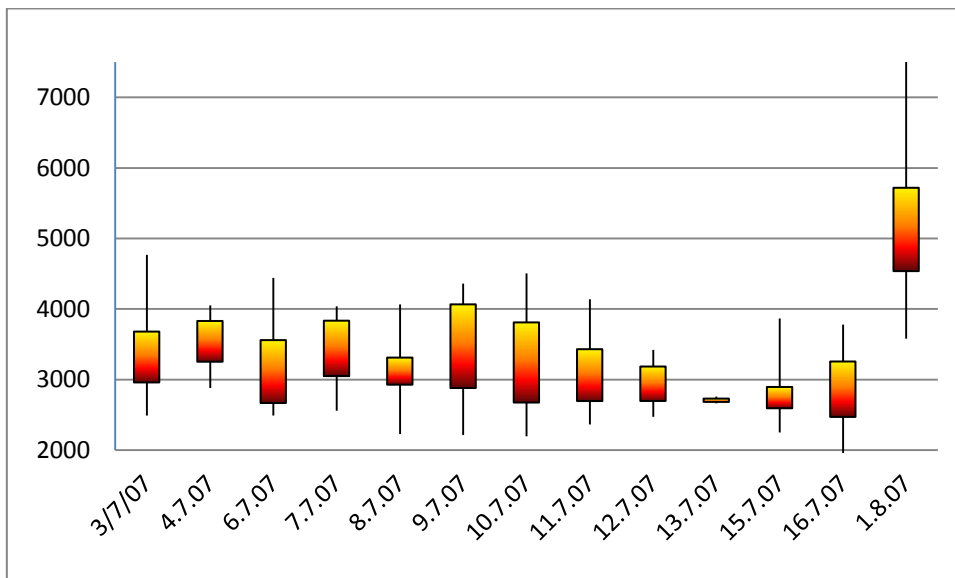
**Figure 4**  
**Mean weights by sample for males and females**



**Figure 5**  
**Box plots of male weight distributions**



**Figure 6**  
**Box plots of weight distributions - females**



### 3. Female Gonad Condition

Not all females had gonad condition or weights recorded. And in some cases, the gonads were broken before they were weighed. These measurements have been included but the weights may be biased downward, i.e. as a consequence, underestimated. Table 4 lists the mean gonad condition for each sample size.

**Table 4**  
**Mean Sample Lengths**

		Mean Gonad Condition	No. of gonads measured
1	03/07/2007	3.9	11
2	04/07/2007	3.75	4
3	05/07/2007	2.9	18
4	06/07/2007	3.4	16
6	08/07/2007	2.5	3
7	09/07/2007	2.7	13
8	10/07/2007	2.5	25
9	11/07/2007	3.5	20
10	12/07/2007	3.2	6
11	13/07/2007	4	3
12	15/07/2007	3	10
13	16/07/2007	2.1	14
14	01/08/2007	6	22

**Figure 7**  
**Mean Gonad Condition Plotted Against Date of Sample**

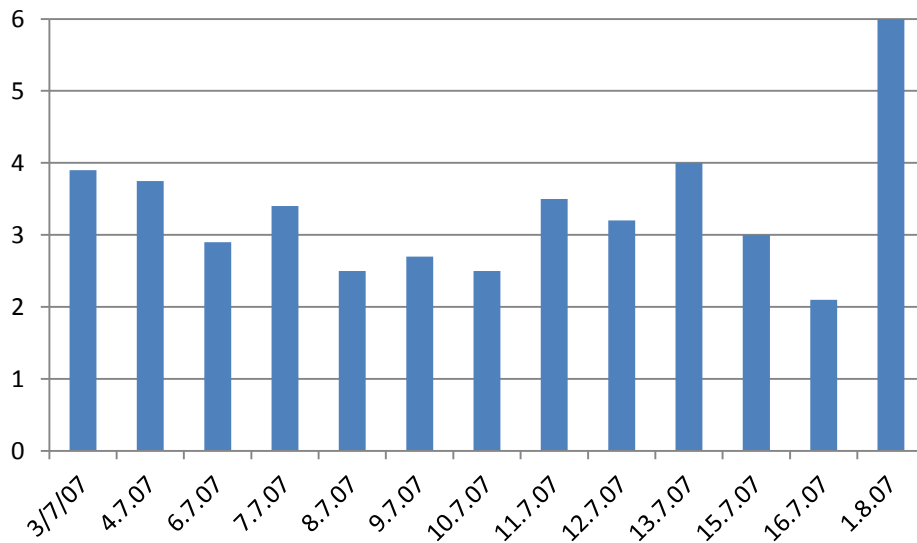
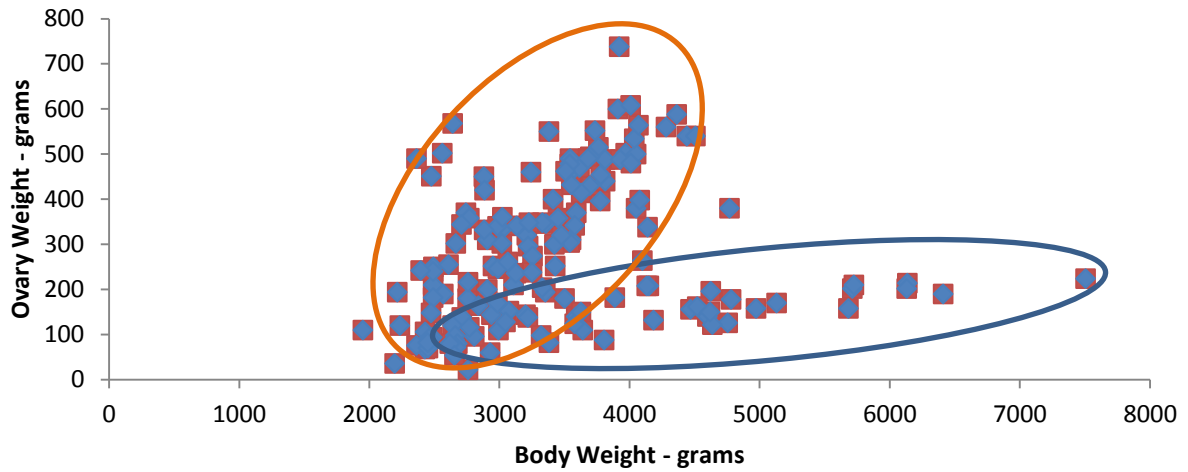


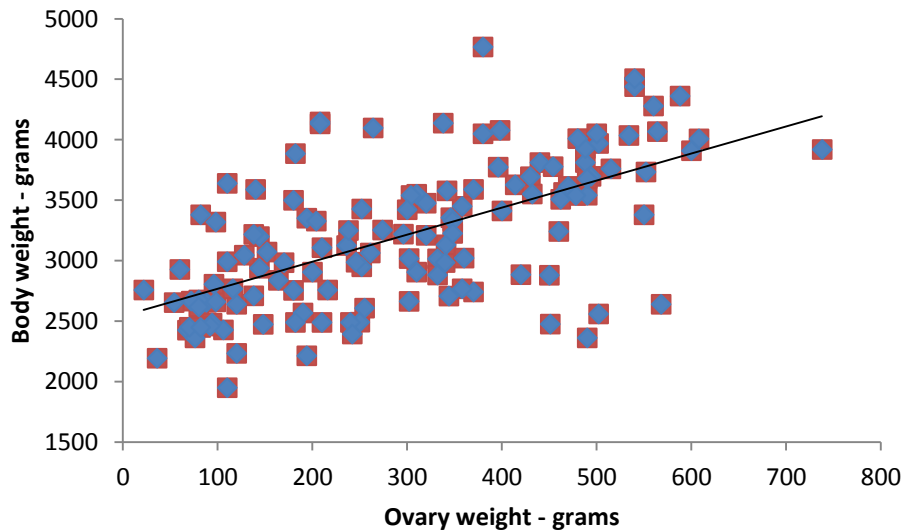
Figure 8 shows a scatter plot of all ovary and body weight data. It is apparent that two functional relationships exist, (a) a steeper ovary-weight relation at lower body weight and a less steep relation at higher body weight. These correspond to the samples collected on the *Jimmy's* feature and those taken on 1 August. These are illustrated in Figures 9 and 10 (Note the transposition of the variables represented on the axes to better demonstrate the functional relationships).

**Figure 8****Plot of ovary weight versus body weight – all data**

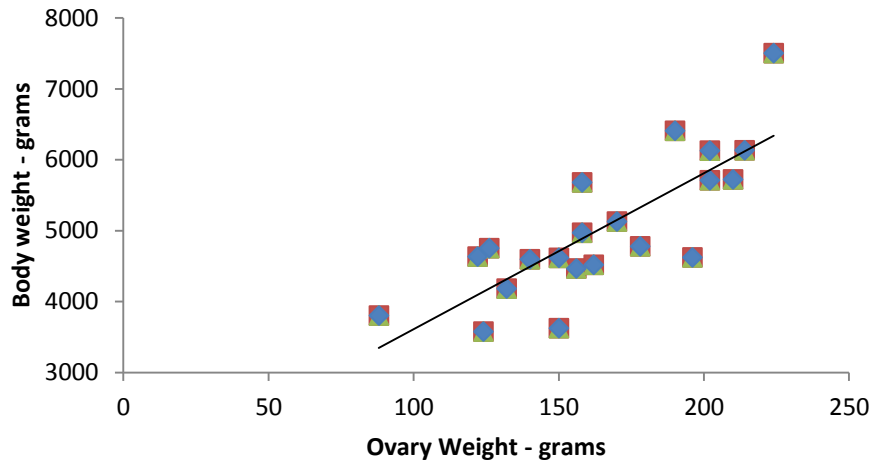
This plot shows the two functional relationships between the variables

**Figure 9****Plot of Body Verses Ovary Weight - Jimmy's Feature Samples**

The axes variables have been transposed to overcome a limitation of the Excel software – in reality ovary weight (here shown on the ordinate or Y-axis) would be a function on body weight (here shown on the abscissa or X-axis).



**Figure 10**  
**Plot of Body Verses Ovary Weight – samples of 1 August 2007**  
 The much lower body weights are indicative of their post-spawning condition.



The linear regressions for these two situations are:

*Jimmy's Feature data:*

$$\text{Ovary Wt} = -244.2 + 0.169 \text{ Body Wt}$$

*1 August 2007:*

$$\text{Ovary Wt} = 18.6 + 0.0290 \text{ Body Wt.}$$

While these data are of interest, with the limited data set at present available, it is not particularly useful to attempt to read into the data much beyond the nature of the trends. Interpretation will become more interesting once more data become available.

#### **4. LITERATURE CITED**

Patchell, G. Instructions for the collection of biological samples from orange roughy in the southern Indian Ocean. 51 – 59. In Shotton, R. (Comp.) 2006. Management of Demersal Fisheries Resources of the Southern Indian Ocean. Report of the fourth and fifth Ad Hoc Meetings on Potential Management Initiatives of Deepwater Fisheries Operators in the Southern Indian Ocean (Kameeldrift East, South Africa, 12 – 19 February 2006 and Albion, Petite Rivière, Mauritius 26-28 April 2006) including specification of benthic protected areas and a 2006 programme of fisheries research. FAO Fish. Circ. 1020. 90pp.