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Seasonal distribution and Condition factor of Clarias gariepinus from polluted Oluwa River, Nigeria

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Abstract: *The Condition factor (k) of the Clarias gariepinus species in Oluwa River, Nigeria was done. Samples were collected monthly over a two-year period from July 2010 to June 2012 and were identified using standard method. They were subjected to morphometric studies including determination weightand lengths. Condition factor was calculated in relation to sex and sizes. The mean condition factor for males exhibited a range of 0.81±0.03 – 1.97±0.33 (mean 1.34±0.10) while those of females exhibited a range of 0.64±0.00 – 2.00±0.21 (mean 1.31±0.09)and that for combined sexes ranged from 0.54±0.27 to 1.94±0.11 (mean 1.31±0.10). In relation to total length range (TLR), males had the highest condition factor at 34.00 – 36.90cm while the least was recorded in 70.00-72.90cm range. Females had the highest condition factor in the range 37.00-39.90cm and the least at range 70.00-72.90cm. For the combined sexes, highest condition factor was recorded in the TLR 37.00-39.90cm while the least was also recorded in the TLR 70.00-72.90cm. The mean 'k' indicated that male fishes were not in good condition in the months of July, August and November. Generally, male fishes and smaller sized fishes were found to be better suited to the environmental condition than the female and bigger fishes.*

Keywords: *Bitumen seep, C.gariepinus, Condition factor, Environment, Pollution, River*

I. Introduction

Most rivers and their resources are constantly threatened by socioeconomic factors that compromise environmental conditions by altering water parameters as well as health quality (Nilsson et al. 2005; Sabater and Stevenson 2010; Belenguer et al. 2014). As a result of this phenomenon, freshwaters have especially beendeprived of their common usage to man which includes, irrigation, recreation,fishing, drinking water supply among others (Dolédecand Statzner 2008; Jia and Chen 2013; Dahunsi et al. 2014). Biological indicators such as fishes are known to constitute veritable tools in the assessment of theecological quality of aquatic environments (Bohmer et al. 2004; Roset et al. 2007; Gabriels et al. 2010; Moya et al. 2011;Fonseca et al. 2011a and b; Ael et al. 2014).

Fish has been particularly identified as one of the best biological indicators for evaluating aquatic health, owing to its wide distribution, easy identification and the ability of providing integral assessment results (Karr et al. 1986) and this has led to several fish-based methods been developed and used in the assessment of large river health (Long and Walker 2005; Pinto et al. 2006; Pont et al. 2006; Tejerina-Garro et al. 2006; Zhu and Chang 2008; Kanno et al. 2010; Meixler 2011; Bergerot et al. 2008; Terra and Araújob 2011).

In fisheries science, the condition factor is used in order to compare the "fatness" or wellbeing of fish. And it is based on the hypothesis that heavier fish of a particular length are in a better physiological condition (Bagenal 1978). Condition factor is also a useful index for the monitoring of feeding intensity, age, and growth rates in fish (Oni et al. 1983). It is strongly influenced by both biotic and abiotic environmental conditions and can be used as an index to assess the status of the aquatic ecosystem in which fish live.

Both the condition factors and organ somatic indices are used as indicator of the wellbeing of individual organism. Previous researchers (Eqani et al. 2012, 2013) reported that the condition factor is an organism level response, with factors such as nutritional status, pathogen effect and toxic chemical exposure causing greater than normal and less than normal weights. Numerous other studies have examined the effectsof different environmental indices on the condition of inhabiting fish population in which many deformation and adverse effects have been reported and in relation to health(Colavecchia et al.2004, 2006;Shaw et al. 2006; Peters et al. 2007;Kalyoncu etal. 2009; Sharma et al. 2009; Kavanagh et al. 2014).

Le Cren (1951)reported that the evaluation of the condition factor can provide important information about the "well-being" of a species, indicating its recent feeding conditions (fat content) and degree of adjustment to the environment. The condition factor has been termed as the "isometric condition factor" by Vazzoler (1996) and it can vary with gonadal development and time of year, and also among different populations. These temporal and seasonal fluctuations of the condition factor are influenced by endogenous parameters (e.g., nutritional aspects, sex, and the state of gonadal maturation) or exogenous parameters (environmental factors) affecting a population (Rodriguez 1987).

Condition factors of different tropical fish species were investigated and reported by Bakare (1970), and similar studies particular to cichlid fish including, Siddique, (1977), Welcomme (1979), Fagade (1978, 1983), Dadzie and Wangila (1980), Arawomo, (1982) and Oni et al. (1983). These reports focused on the determination of changes in condition factor with season, fish length, sex and or reproductive factor of fish.

Condition factor has been used as index of growth and feeding intensity (Fagade, 1979). Condition factor decrease with increase in length (Bakare 1970; Fagade 1979) and also influences the reproductive cycle in fish (Welcome 1979). Some condition factors reported for other fish species include those of Alfred-Ockiya (2000); Hart (1997); Hart and Abowei (2007); Abowei and Davies(2009); Abowei et al.(2009).Considering the uncertainty of the seasonal distribution, reproductive output and condition of living of *Clarias gariepinus* in response to polluted nature of Oluwa River, we aimed to investigate some condition measures that might serve as pointers for the wellbeing and general health status of both sexes of the indigenous fish species in the river. As far as we are concerned, this is the first practical exploration studies of the condition factor of the fish in the river of study.

II. Materials And Methods

2.1 Study area

River Oluwa in Agbabu is located on the Okitipupa South-East belt of the bituminous sands field at latitude 06^0 29" to 06^0 45" North and 04^0 44" to 05^0 00" East of the Greenwich Meridian. Agbabu bitumen belt is made of the main Agbabu village inhabited by about 1,600 people beside other settlements such as Temidire Village. Farmers in this area deal mainly in fishing along Oluwa River, which flows through the whole land. Some of those living in the villages and hamlets live on the shallow surface water of the river as source of portable water. The major pollutant of Oluwa River besides domestic sources is bitumen seepage especially during the afternoon and mostly in the dry season when temperature is above 37^oC during when the bitumen occurs as a free flowing liquid flowing into the River.

2.2 Description of sampling Sites

Two sampling Sites A and B 1km apart were selected on Oluwa River. Site A is located upstream where there are high fishing activities and less domestic activities. Site B is located downstream where there are high domestic activities like bathing, swimming, washing of clothes and fetching the river water for drinking.

2.3 Collection of fish samples

Fishing was done during late night with the help of professional local fishermen. Gill nets about 12.192 m long and 1.828 m wide with a cork line at the top rope and metal line with the ground rope made locally of nylon were used for fishing. Two fishermen with the help of a wooden boat helped in the collection of fish samples from the two sampling Site. Fishing was done monthly over a two-year period starting from the month of July 2010 to June 2012. Samples were transported to the Ecotoxicology and fisheries Laboratory, LAUTECH in well aerated containers into which ice cubes were added to lower the temperature of the water before the commencement of further studies.

2.4 Morphometric studies of fish

Specie identification of the fish was done according to the FAO identification chart (Fischer and Bianchi 1984). Monthly catches of *C. gariepinus* were subjected to morphometric studies. The morphometry included determination of body weight (live) body length, Standard length and total length. Measurements were done with length measuring board and tape, while weight was taken using an electronic weighing balance after removal of excess water from the body surfaces.The total length was measured from the tip of the Snout to the tip of the caudal fin while the standard length was taken from the tip of the snout to the base of the caudal fin.

Condition factor (K)

Condition factor (K) was also calculated as:-

$$K = \frac{100W}{L^3}$$ (Midhat et al. 2013)

Where W = Weight in grams

L = length in centimeters

Sex ratio

Sexes were determined by visual inspection of the genitals and sex ratio determined.

III. Result

A total number of 293 specimens of *Clarias gariepinus* were collected during the study period. Peak mean weight was observed in April 2011 while the least mean weight was observed in July 2012 (Fig. 1). Out of the 293 fish sampled, 151 were collected between July 2010 and June 2011, making 51.53% of the total specimen collected. 142 *C. gariepinus* were collected between July 2011 and June, 2012 with a percentage of 48.40% of the total specimen.

The total length of the fish sampled throughout the study period ranged between 31.70-70.70cm with a mean value of 51.76±3.04cm (Table 1). The weight of the fish ranged from 100.00 - 2, 200.00g with a mean value of 1284.53±168.14g (Table 1). The length-frequency distribution of *C. gariepinus*, harvested throughout the sampling period in Oluwa River is represented in figure 2. The study revealed that a wide range of sizes were harvested throughout the study period. The size range with the highest occurrence was 43.00-45.90cm.

Bimodal size range distribution was observed at size range of 34.00-36.90cm, 52.00-54.90cm, 49.00-51.90cm, 58.00-60.90cm and 61.00-63.90cm (figure 2). The length- frequency distribution of male and female *Clarias gariepinus* sampled throughout the study period is represented in figure 3. Males had a clear mode at 37.00-39.90cm (MTL) while females dominated the 43.00-45.90cm and 46.00-48.90cm (MTL).

Condition factor was calculated in relation to sex and sizes and this is shown in tables 1, 2 and 3. The mean condition factor for males exhibited a range of 0.81±0.03 – 1.97±0.33 with a mean value of (1.34±0.10) while those of females exhibited a range of 0.64±0.00 – 2.00±0.21 with a mean value of 1.31±0.09. Condition factor for combined sexes exhibited a range of 0.54±0.27 – 1.94±0.11 with a mean value of 1.31±0.10.

In relation to total length range, males had the highest condition factor at 34.00 – 36.90cm while the least was recorded in 70.00-72.90cm total length range (Table 2). Females had the highest condition factor in the range 37.00-39.90cm and the least at total length range 70.00-72.90cm (Table 3). For the combined sexes, highest condition factor was recorded in the Total length range (TLR), 37.00-39.90cm while the least was also recorded in the TLR 70.00-72.90cm (Table 1).

The mean monthly Condition factor of male *C.gariepinus* for the twenty four months duration, ranged between 0.91±0.25-2.66±0.35 with a mean value of 1.55±0.10. The peak of condition factor in male was recorded in May 2012 while the least value was recorded in August (Table 4). However, females exhibited a range of 1.03±0.02-2.78±1.35 with a mean value of 1.46±0.07 (Table 5). The peak value for females was recorded in November 2011 while the lowest was recorded in September, 2010 (Fig. 1).The mean Condition factor (k) indicated that male fishes were not in good condition of the months of July, August and November (Table 4).

IV. Discussion

This study showed that *Clarias gariepinus* of various size ranges were found in Oluwa River. The fish species with the size range of 43.00-45.90cm were most abundant, followed by 37.00-39.90cm and 46.00-48.90cm with a percentage frequency of 13.31%, 12.28% and 11.94% respectively. This revealed that a wide range of sizes of the species is found in Oluwa River. This observation conformed with the submission of Fawole and Adewoye, (2004), they observed size range of 26.00-28.90cm and 32.0-34.90cm to be most abundant for *Clarias gariepinus* in Oba reservoir, an indication that a wide range of sizes of the fish species was found in Oba reservoir,

Seasonally, there are more fish specimens harvested during the dry season than the rainy season, with 47.09% of the total catch in rainy season while 52.90% of the total catch in dry season. The 52.90% total catch recorded in the dry season could be as a result of the fish species being benthic feeders and also because of the great reduction in the water volume during the dry season. The reduction in water volume will definitely reduce the available space of escape from cast net and gill net as well as traps used in catching the fish species in the river.

However, more fish species were sampled during the first year of the study (July, 2010- June, 2011) while there was a reduction in the population of the fish sampled in the second year (July, 2011- June, 2012). This may be as a result of the seepage of bitumen in the river which could be on the increase yearly. Another factor could be as a result of the anthropogenic activities of villagers on the river.

General decrease in condition factor with increasing length of the fish species connotes that increase in length of the fish species has no bearing on proportional increase in weight which is a confirmation of negative allometry results obtained in the length-weight relationship of the fish species under study.

Mean condition factor (r) recorded in this study for males fish species were higher (Table 2) indicating that males were in good condition, and their general well-being was better than the females fish species examined. The reason for this observation could be due to the fact that females expended a lot of metabolic energy that could have been used for body building, in egg laying and care of young ones.

The mean condition factor recorded in this study for males species is in agreement with the work of Fawole and Adewoye (2004) that reported higher mean condition factor (1.48) for males *Clarias gariepinus*

than that of females which was 0.98 in Oba reservoir Ogbomoso. Also similar work by King (1996) gave the condition factor of *Periophthalamus barbarus* in Iwo River for males and combined sexes as 1.19 and 1.01 respectively. This result also conforms to the value obtained by other researchers like Abowei (2009), with a value of 0.946 and monthly condition factor of 0.6-1.00; Ajayi (1982) reported a value between 0.77-0.81 for *Clarotes filamentosus* in Lake Oguta while Nwadiaro and Okorie (1985) reported a value of between 0.49-1.48 in Andoni River all within Nigeria

It was observed in this study that condition factor (k) values were high in the small sized fishes and it decreased in the larger fishes. This suggests that the relatively smaller sized fishes are better adapted to the ecological status of the polluted Oluwa River.

This observation could be as a result of feeding activities, sex difference, and change in season as well as gonad maturity level. Mgbenka and Eyo (1992) and (Vazzoler 1996) similarly attributed the decline in condition factor to the deposition of materials for gonad formation, which may lead to increase in weight and actual spawning which lead to reduction in fish weight respectively.

Furthermore, David et al. (2010) pointed out that the value of 'k' of a fish can be influenced by sex difference, changes in season, gonad maturity level, and stomach fullness as well as length-weight relationship of fish.Seasonal variations were also observed in this study, the highest mean condition factor for female fish species was recorded in November (onset of dry season) which possibly did not support the best month for reproductive activities due to significant decrease in the volume of the river water, owing to this females expended less energy in this month than the reproductive months (rainy months) April-September as observed in this study. The lowest 'k' value for females was observed in the month of September which corresponded with reproductive month of most Clariid fish species. Ezenwaji (2002) reported the lowest 'k' values for female *Clarias ebriensis* in the month of September in Anambra river basin. The highest mean condition factor for males was recorded in the month of May (onset of rising flood), males are not so busy during the reproductive months (April-September) and they may have gained more access to rich food supply, thus they expend lesser energy than female fish which uses more energy for body building in egg laying and care of young ones as submitted by Fawole and Adewoye (2004) and Davidet al.(2010). Condition factor has been closely linked with reproductive cycle for fishes in water bodies (Aboaba 1993; Fawole and Arawomo 1998).

V. Conclusion

The study has established the condition factor of the indigenous *Clarias gariepinus* fish on the basis of sex and size and in relation to the polluted ecological status of Oluwa River. Male fishes and the relatively smaller sized fishes are better suited to the environmental condition than the female and bigger fishes who recorded lower condition factor. Therefore, Oluwa River is currently not adequate for the wellbeing of female and larger fishes and measures should be taken to stop pollution activities in the river which is likely the cause of the inadequate condition of living recorded by the fishes.

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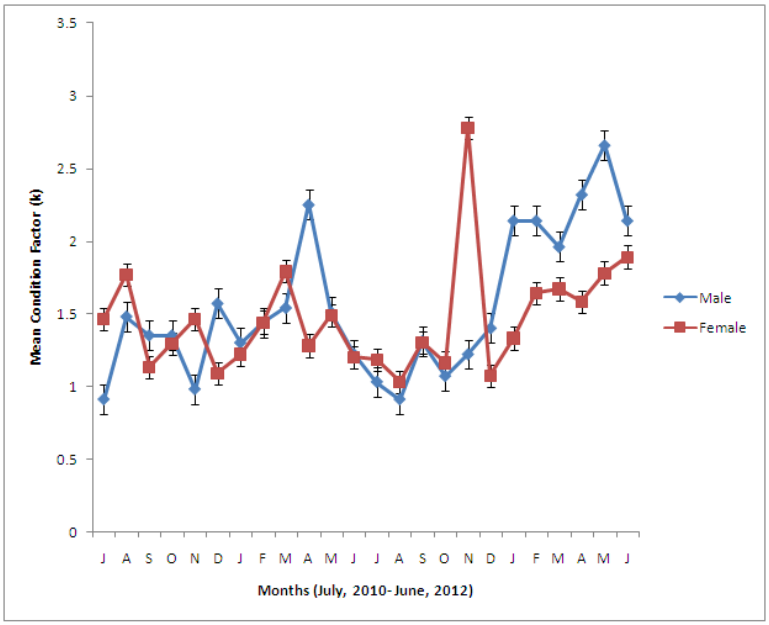

Figure 44: The mean monthly condition factor of Clarias gariepinus from Oluwa River

Table 1: Frequency of occurrence and mean relative condition factor of Clarias gariepinus from Oluwa River

TLR	Frequency	MTL (cm)	Mean weight (g)	MCF
31.00-33.90	12	32.71±0.17	342.50±47.42	1.65±0.27
34.00-36.90	25	35.60±0.17	503.20±57.79	1.87±0.22
37.00-39.90	36	38.40±0.12	658.89±32.87	1.94±0.11
40.00-42.90	31	41.16±0.14	689.03±32.66	1.52±0.07
43.00-45.90	39	44.05±0.14	807.44±45.20	1.37±0.06
46.00-48.90	35	47.73±0.15	1064.29±61.24	1.48±0.08
49.00-51.90	15	50.01±0.20	1142.67±95.63	1.32±0.12
52.00-54.90	25	53.24±0.17	1255.60±61.39	1.20±0.06
55.00-57.90	20	56.48±0.19	1663.00±58.41	1.31±0.03
58.00-60.90	15	59.02±0.20	1707.00±94.16	1.17±0.06
61.00-63.90	15	62.52±0.23	1976.67±64.61	1.11±0.05
64.00-66.90	14	65.24±0.25	1981.43±61.79	0.99±0.03
67.00-69.90	08	68.14±0.29	2125.00±75.00	0.92±0.03

70.00-72.90	03	70.47±0.12	2066.67±66.67	0.54±0.27
Total		51.76±3.04	1284.53±168.14	1.31±0.10

TLR = Total length range MTL = Mean total length MCF = Mean Condition factor

Table 2: Frequency of occurrence and mean relative condition factor of Male Clarias gariepinus from Oluwa River

TLR	Frequency	MTL (cm)	Mean weight (g)	MCF (K)
31.00-33.90	08	32.77±0.17	373.75±69.70	1.84±0.39
34.00-36.90	15	35.61±0.25	534.00±84.87	1.97±0.33
37.00-39.90	24	38.33±0.14	639.58±39.73	1.91±0.15
40.00-42.90	18	41.21±0.16	654.44±47.17	1.44±0.10
43.00-45.90	19	44.18±0.23	796.84±67.54	1.37±0.11
46.00-48.90	15	47.84±0.20	1101.33±115.22	1.54±0.15
49.00-51.90	5	49.74±0.32	1186.00±191.56	1.50±0.24
52.00-54.90	13	53.21±0.23	1213.84±82.76	1.17±0.09
55.00-57.90	09	56.67±0.26	1702.22±60.25	1.30±0.04
58.00-60.90	06	59.27±0.42	1524.17±179.07	1.05±0.11
61.00-63.90	05	62.59±0.41	1870.00±171.58	1.04±0.12
64.00-66.90	05	56.20±0.51	1844.00±79.28	0.92±0.03
67.00-69.90	02	68.50±0.48	1950.00±64.54	0.85±0.03
70.00-72.90	02	70.55±0.15	2000.00±0.00	0.81±0.03
Total		51.19±3.18	1242.15±153.87	1.34±0.10

TLR = Total length range MTL = Mean total length MCF = Mean Condition factor

Table 3: Frequency of occurrence and mean relative condition factor of Male Clarias gariepinus from Oluwa River

TLR	Frequency	MTL (cm)	Mean weight (g)	MCF (K)	Fecundity
31.00-33.90	04	32.60±0.44	280.00±10.80	1.26±0.14	1932.00±66.81
34.00-36.90	10	35.57±0.20	457.00±71.15	1.73±0.27	2595.00±548.93
37.00-39.90	12	38.50±0.24	697.50±59.23	2.00±0.21	5594.40±998.15
40.00-42.90	13	41.09±0.28	736.92±40.83	1.64±0.12	6347.07±826.34
43.00-45.90	20	43.92±0.15	817.50±62.07	1.37±0.06	6443.40±799.51
46.00-48.90	20	47.64±0.22	1036.50±65.68	1.43±0.09	10528.50±857.15
49.00-51.90	10	50.14±0.25	1121.00±114.14	1.24±0.13	10791.50±1610.44
52.00-54.90	12	53.28±0.27	1300.83±93.15	1.23±0.09	12962.16±1110.46
55.00-57.90	11	56.33±0.28	1630.90±95.83	1.32±0.09	16258.54±924.35
58.00-60.90	09	58.86±0.17	1828.88±88.64	1.24±0.06	16790.00±948.74
61.00-63.90	10	62.49±0.30	2030.00±47.45	1.15±0.05	17658.00±859.00
64.00-66.90	09	65.26±0.30	2057.78±76.57	1.03±0.05	19747.67±1503.16
67.00-69.90	04	67.79±0.30	2300.00±40.82	1.00±0.04	22420.00±2944.48
70.00-72.90	01	70.30±0.00	2200.00±0.00	0.64±0.00	15442.00±0.00
Total		51.69±3.29	1320.87±182.33	1.31±0.09	11822.16±1740.49

TLR = Total length range MTL = Mean total length MCF = Mean Condition factor

Table 4: Monthly Variation in the mean values of Weight, Length and Condition factor (k) of Male Clarias gariepinus from Oluwa River

Months	Total lenght (cm)	Standard lenght (cm)	Weight (g)	Condition factor
JULY '10	45.20 ± 3.90	39.98 ± 3.84	702.50±215.65	0.91 ± 0.25
AUG. '10	58.84 ± 5.57	52.96 ± 5.33	1776.00±82.32	1.48 ± 0.41
SEP. '10	44.54 ± 6.64	39.26 ± 5.76	856.00±308.84	1.35 ± 0.31
OCT. '10	52.45 ± 3.16	46.25 ± 2.89	1390.00±242.83	1.35 ± 0.05
NOV. '10	49.17 ± 4.71	43.43 ± 4.47	986.67±288.50	0.98 ± 0.09
DEC. '10	51.87 ± 3.64	45.77 ± 3.55	1512.85±243.62	1.57 ± 0.21
JAN. '11	51.25 ± 4.78	45.11 ± 4.77	1082.86±222.60	1.30 ± 0.28
FEB. '11	43.70 ± 2.40	37.64 ± 2.40	646.25±43.26	1.44 ± 0.17
MAR. '11	52.56 ± 4.86	45.90 ± 4.63	1400.00±219.58	1.54 ± 0.23
APR. '11	48.02 ± 5.62	41.17 ± 5.47	1394.00±244.82	2.25 ± 0.41
MAY '11	48.98 ± 3.09	42.56 ± 2.98	1144.00±186.91	1.51 ± 0.23
JUN. '11	48.00 ± 3.09	41.75 ± 3.30	862.50±110.63	1.22 ± 0.15
JUL. '11	36.07 ± 1.25	32.26 ± 1.22	345.00±34.70	1.03 ± 0.07
AUG. '11	45.29 ± 4.00	39.38 ± 3.74	624.29±198.28	0.91 ± 0.04
SEP. '11	51.57 ± 2.93	45.28 ± 2.79	1288.33±254.83	1.31 ± 0.07
OCT. '11	40.84 ± 1.34	35.51 ± 1.23	487.14±52.86	1.07 ± 0.03
NOV. '11	48.07 ± 3.09	42.57 ± 3.28	995.00±279.33	1.22 ± 0.12
DEC. '11	45.10 ± 3.85	40.50 ± 3.83	860.00±95.60	1.40 ± 0.30
JAN. '12	48.63 ± 3.73	41.92 ± 3.77	895.71±119.87	2.14 ± 0.24
FEB. '12	40.85 ± 2.45	34.25 ± 2.57	867.00±176.53	2.14 ± 0.24
MAR. '12	43.80 ± 2.92	37.42 ± 2.92	943.00±139.35	1.96± 0.29
APR. '12	45.40 ± 4.48	39.17 ± 4.55	1250.00±215.47	2.32 ± 0.41
MAY '12	41.10 ± 2.17	35.08 ± 1.98	1111.67±126.63	2.66 ± 0.35
JUN '12	40.82 ± 2.85	35.13 ± 2.84	920.00±158.79	2.14 ± 0.25

Table 5: Monthly variations in the mean values of Weight, Length and Condition factor of female Clarias gariepinus from Oluwa River

Months	Total lenght (cm)	Standard Lenght (cm)	Weight (g)	Condition factor
JULY '10	39.45±2.94	33.42 ±2.75	633.33 ±166.34	1.46 ± 0.29
AUG. '10	47.03 ± 4.70	40.91 ± 4.51	1165.71±189.99	1.77 ± 0.35
SEP. '10	40.92 ± 1.81	36.10 ± 1.32	540.00 ±77.50	1.13 ± 0.13
OCT. '10	50.54 ± 4.41	43.84 ± 4.04	1086.00 ± 214.56	1.29 ± 0.12
NOV. '10	51.28 ± 3.54	45.21 ±3.51	1321.11±214.06	1.46 ± 0.18
DEC. '10	56.84 ± 4.16	50.30 ± 4.26	1620.00±304.29	1.09 ± 0.10
JAN. '11	53.56 ± 3.84	47.59 ± 3.76	1381.43±261.57	1.22 ± 0.07
FEB. '11	48.09 ± 4.61	41.99 ± 4.17	1061.25±283.00	1.44 ± 0.16
MAR. '11	41.69 ± 1.73	35.37 ± 1.59	758.57±56.29	1.79 ± 0.20
APR. '11	59.92 ± 2.74	53.96 ± 2.43	2010.00±200.25	1.28 ± 0.09
MAY '11	50.25 ± 3.74	44.00 ± 3.74	1161.67±203.15	1.49 ± 0.34
JUN. '11	52.59 ± 2.94	46.32 ± 3.16	1160.00±184.23	1.20 ± 0.18
JUL. '11	51.80 ± 5.50	46.00 ± 4.00	1180.00±330.00	1.18 ± 0.03
AUG. '11	47.23 ± 3.19	41.59 ± 2.84	836.00±168.09	1.03 ± 0.02
SEP. '11	48.35 ± 2.99	41.92 ± 2.72	1006.66±212.00	1.30 ± 0.09
OCT. '11	44.12 ± 3.63	39.16 ± 3.16	778.00±231.76	1.16 ± 0.05
NOV. '11	49.60 ± 4.32	43.50 ± 4.27	1168.00±198.05	2.78 ± 1.35
DEC. '11	55.34 ± 3.15	50.22 ± 3.19	1348.00±160.82	1.07 ± 0.07
JAN. '12	49.86 ± 3.84	47.26 ± 4.28	1374.00±231.76	1.33 ± 0.17
FEB. '12	48.70 ± 3.07	42.51 ± 3.05	1312.50±225.26	1.64 ± 0.15
MAR. '12	49.10 ± 4.58	42.48 ± 4.43	1272.00±244.32	1.67 ± 0.19
APR. '12	52.62 ± 3.41	46.58 ± 3.40	1570.00±193.48	1.58 ± 0.15
MAY '12	53.93 ± 2.83	47.83 ± 2.78	1890.00±106.93	1.78 ± 0.27
JUN '12	46.18 ± 3.13	40.56 ± 2.91	1276.00±202.70	1.89 ± 0.18