

# Seasonal Morphometrics of Gonads in Air Breathing Fish *C.Gachua* (Ham.1822)

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## ABSTRACT

The present study was carried out during the period of different phases of reproductive cycle in *C.gachua* i.e. preparatory, pre-spawning, spent and post-spawning. Morphometrics of the gonads i.e. the gonadal dimensions observed month wise for a complete year span. The ratio of the avg. Length and weight of the **ovary** is recorded maximum during July (3.8cm: 9.5gm) closely followed by August (2.8cm: 7.4gm). The same is recorded the least in the month of December (1.0 cm: 2.0 gm). It clearly shows that *C.gachua* spawns once in a year i.e. between July-August. It was observed that the testis of *C.gachua* attains its maximum length in the month of July (1.5 cm) closely followed in August (1.3 cm) and is least in the month of October to December (0.3 cm). The **length: weight** ratio of the species also recorded maximum during July (23.7cm: 56.6 gm) and is minimum during December (14.5cm: 32.8gm). Similarly avg. length: avg. weight of **testis** was observed maximum during July (1.5 cm: 2.1 gm), closely followed by August (1.3cm: 1.2 gm). The same ratio was observed the minimum during the month of Nov- Jan (0.2cm: 0.2mg). The same result was also observed in *C.gachua* by Khanna and Sanwal, 1971. December is the post spawning period (spent phase) of the species.

**KEYWORDS:** Morphometrics, gonads, gonadal dimensions, spawning

## INTRODUCTION

Reproduction is a vital process provided to all living individual by the nature itself to maintain the race. The reason behind the selection of *C.gachua* as the species of this research work, is being its important food fish, its easy availability in Indian peninsular region and being it's one of the most suitable *channa* species for aquarium due to its beautiful coloration and small size (Talwar and Jhingran, 1992). Even though it is widely distributed in Asia, it has declined drastically (vulnerable) in India (CAMP,1998) and endangered in some Asian countries like Singapore (Lim and Ng,1990). Although, it is economically important, information on the reproduction physiology and histomorphology of gonads of *C.gachua* in captive condition remain limited. Reproductive studies of teleost require knowledge of the stages of the gonadal development on the seasonal basis. The term morphometrics means the measurement of dimensional relationship of the body

weight, length and sizes of the gonads or any organ (Roy, P. K and Munshi, J. S. D., 1996). This study is done basically to know the different phases of its reproductive life which is differentiated in Immature phase (Resting phase), Matured phase (Pre-Spawning phase), Spawning phase and Spent phase. We know well that *C.gachua* is a seasonal breeder, the morphometrics of the fish and its gonads are very much dependent on the seasonal changes. Both male and female undergo remarkable cyclic morphological and histological changes before attaining full maturity and becoming ripe, called maturation of gonads. The expulsion of the gametes from the body to the surrounding water is called spawning. It results in fertilization. Fish spawns during a specified period which depends upon various factors. Such studies on different fishes have been studied before by various scientists. Spawning takes place in between March and June in *Mystus seenghala* (Sathyaneshan,1962),

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from April to September in *Clarius batrachus* (Lehri,1968), from July to September in *Channa punctatus* (Belsare,1962). This topic has been selected to go through the morphometrics of the gonads of *Channa gachua* in an elaborate way.

**Material and Methods:** The live specimen of *C. gachua* were collected from river Ganga, Bhairwa pond of T M B U campus as well as from the different pools and ditches of the neighboring areas of Bhagalpur, Bihar. They were brought to the laboratory weighed, measured and anesthetized and then dissected to take out their gonads. The gonads were studied in each case for their morphometry, which were noted down and then studied. The maturing stages of the male and female were classified according to Biswas (1993) and computed monthly to ascertain the breeding season. The overall frequencies of the stages were also estimated. Spawning season was observed between June to August.

## Results and Discussion:

### OVARY

A twelve month long study was conducted with regular collection of *C.gachua* (5 female specimen per month). During January to December, the evaluation of length – weight and width of the ovary of the species were recorded as 57.4 cm, 24.5 gm and 3.6 cm respectively in the month of July. Whereas

maximum weight, width and length were recorded in July i. e. 62.6 cm, 3.9 g, 26.6 cm respectively. Minimum length (28.5 cm) weight (14.5 gm) and width (2.1 cm) were recorded in December month. Detailed results were depicted in **Table I**. The avg weight and length of the ovary of *C.gachua* was recorded maximum in July as 9.5 gm and 3.8 cm respectively. The same were found the least in the month of December as 2.0 gm and 1.0 cm respectively. These results have been shown in **Table II**. The present study documents the changes in the gonadal developments (ovary) of *C.gachua*. Growth of fish in weight reflects the reproductive cycle, as the gonads mature they increase in weight which adds to the total weight of fish. Thus the results supports that the rainy seasons (June-July-August) plays an important role in the reproductive period of *C.gachua*.

Similar results were recorded in *C.punctata*, Al Mahmud et al. (2016). stated that *C.punctata* attains total length of 18.5 cm -18.2 cm. Reddy (1979) reported its first maturity at a length of 12.0 cm in Guntur river. Prasad et al. (2011) revealed that *C.punctata* attains first maturity at a length of 12.5 cm in river Varuna in India. These results were contradicted by the results found by Choudhary (2004), who recorded 50% maturity of *Channa barca* at 20-30 cm for female and 25-30 cm in male.

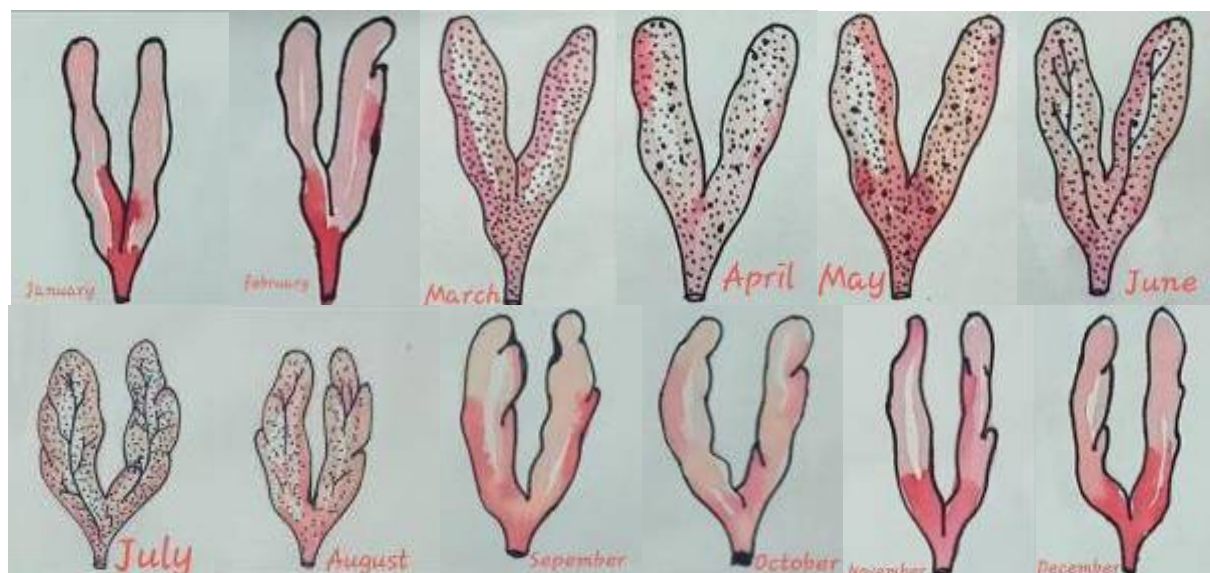


**Fig.:- Seasonal Changes in Ovary of *C.gachua***

### TESTIS

In the present study (a total of 5 male specimens per month) of *C.gachua* were used for the study of fish morphology (weight, length, and width) and weight and length of testis at different months (Jan to Dec).

The body weight of male *C.gachua* was recorded minimum in March (26.2 gm) and maximum in July (60 gm). From January to March, fish weight vary from 26.2 gm to 46.2 gm whereas during April to June it increases from 35.6 gm to 50.6 gm. Maximum weight was recorded in July i.e. 60 gm and weight decreased from August to December. Fish length and width also recorded maximum in July. Detailed results are depicted in **Table III**. The average wt, length and width of fish was recorded maximum in the month of July as 56.6 gm, 23.7 cm and 3.2 cm respectively. Whereas the minimum of the same was recorded during the month of December as 32 gm, 14.5 cm and 2.2 cm respectively. At the same time the testis morphometrics i. e. weight and length were recorded maximum in July 2.1 gm and 1.5 cm respectively. The same was recorded minimum in the month of Nov-Dec as 2.2 gm and 0.3 cm respectively shown in **Table IV**.



**Fig.: -Seasonal Changes in Testis of *C.gachua*.**

Similar results were found by Hossain et al. (2015). He observed that the highest GSI values in the month of July because that time the spawning period of *C.punctata* also. The GSI value was recorded high in *C.orientalis* during June to Aug-Sep( Zin et al., 2011). *C.punctata* spawning period falls between June to September (Htay Htay Aung, Mie Mie Sein, 2019). It is dissimilar result from my findings. Some environmental factors and pollution also change the physiology of the fish.

Cyclic changes in the gonads have been examined in a few species viz. *Channa maurulius* (Hamilton,1822), by Parameswaran and Murugesan,1976), *C. striata* by Haniffa et al. 2000, *C.lazera* by Richter and van den Hurk, 1982, in *C.punctata* by Srivastava and Srivastava, 1998), in *C.macrocephalus* by Mollah (1982).

**Table I: Showing morphometrics of fish body and Ovary of female *C.gachua* (January to December)**

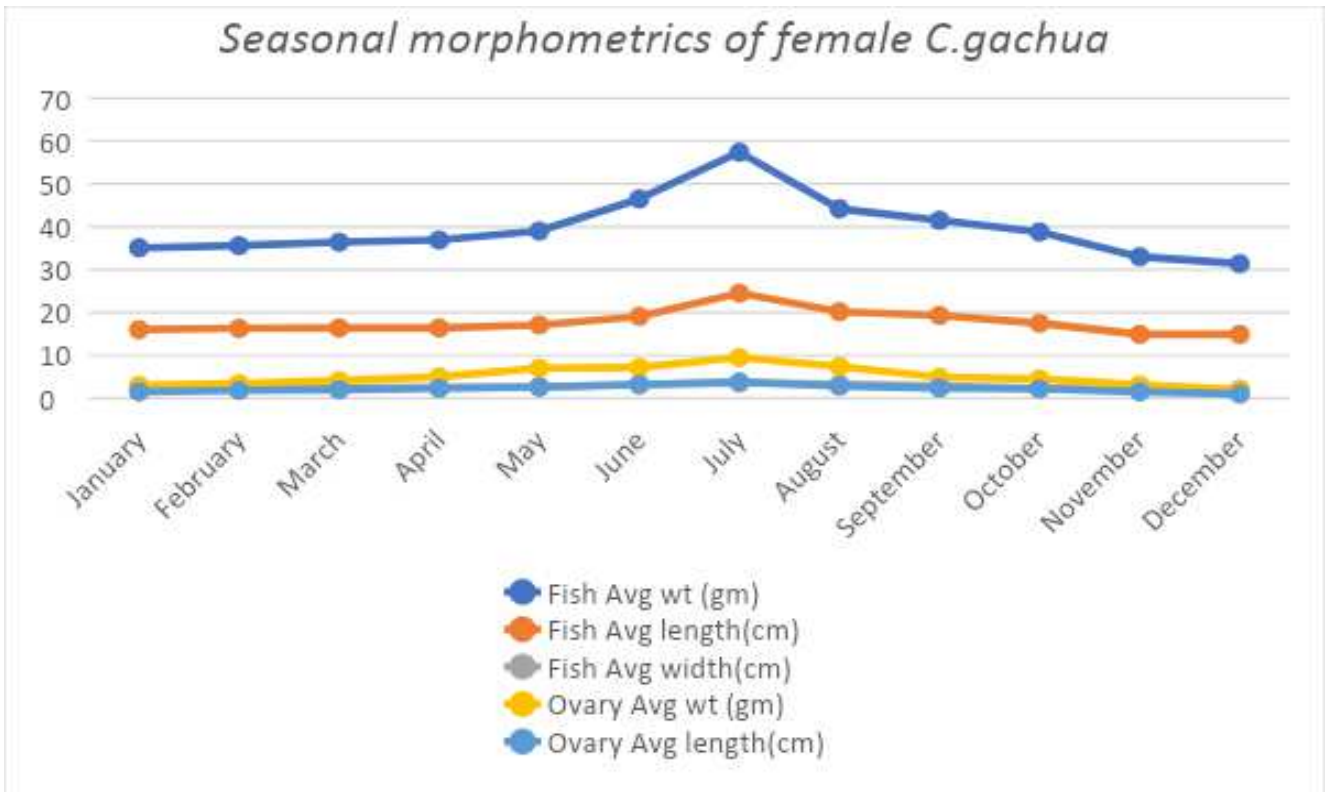
Month	No. of specimen	Fish wt (gm)	Fish length (cm)	Fish width (cm)	Ovary wt(gm)	Ovary length (cm)
January	1	35.5	16.2	2.5	2.0	1.8
	2	34.7	15.8	2.2	1.9	1.2
	3	35.1	16.0	2.4	1.9	1.4
	4	35.3	16.1	2.4	2.0	1.6
	5	34.9	15.9	2.3	2.2	1.5
February	1	35.9	16.5	2.6	3.2	1.9
	2	35.6	16.3	2.4	3.1	1.8
	3	35.5	16.2	2.3	3.1	1.6
	4	36.2	16.5	2.5	3.2	2.2
	5	35.2	16.2	2.4	3.1	1.5
March	1	36.4	16.5	2.5	4.1	2.0
	2	37.0	16.6	2.5	4.1	2.2
	3	37.3	16.9	2.6	4.2	2.5
	4	35.4	15.7	2.3	4.1	1.6
	5	36.2	16.4	2.4	4.0	1.7
April	1	36.5	16.3	2.4	4.8	2.0
	2	37.2	16.5	2.3	4.9	2.5
	3	36.7	16.3	2.5	5.4	2.1
	4	37.6	16.7	2.6	4.9	2.6
	5	36.9	16.4	2.4	4.9	2.3
May	1	39.0	17.0	2.6	7.0	2.2
	2	38.4	16.8	2.7	7.1	2.6
	3	37.9	16.5	2.5	7.4	2.4
	4	38.6	17.2	2.8	7.5	2.8
	5	41.2	17.8	2.9	8.0	3.0



June	1	40.5	18.0	3.2	9.2	3.1
	2	46.5	17.6	2.9	9.1	2.9
	3	35.8	17.3	3.3	9.8	3.3
	4	44.6	19.1	3.2	9.5	3.2
	5	55.3	23.5	3.5	10.2	3.5
July	1	57.4	25.3	3.6	3.6	3.8
	2	56.8	24.5	3.8	3.8	3.7
	3	49.9	20.5	3.2	3.2	3.5
	4	60.5	25.6	3.8	3.8	3.9
	5	62.6	26.6	3.9	3.8	4.1
August	1	44.5	20.3	3.4	3.4	2.8
	2	43.8	20.0	3.3	3.3	2.6
	3	44.2	20.2	3.4	3.4	3.1
	4	44.1	20.8	3.5	3.5	3.0
	5	42.8	19.8	3.2	3.2	2.5
September	1	42.8	19.7	3.0	3.0	2.6
	2	41.3	19.3	3.0	3.0	2.5
	3	42.1	20.0	3.1	3.1	2.4
	4	40.2	18.9	2.9	2.9	2.2
	5	41.5	19.0	2.7	2.7	2.3
October	1	40.4	18.3	2.6	2.6	2.4
	2	39.6	18.0	2.4	2.4	2.3
	3	38.8	17.5	2.3	2.3	2.2
	4	38.2	17.1	2.3	2.3	2.2
	5	37.2	16.9	2.2	2.2	1.9
November	1	34.8	15.5	2.9	2.1	1.7
	2	33.5	15.0	2.6	2.0	1.6
	3	32.6	14.9	2.2	2.0	1.6
	4	31.2	14.4	2.5	1.9	1.5
	5	33.0	14.7	2.3	2.0	1.1
December	1	33.2	14.5	2.4	2.1	0.9
	2	34.6	14.8	1.9	2.2	1.0
	3	31.4	15.4	2.2	2.3	1.2
	4	29.6	15.2	2.0	2.2	0.8
	5	28.5	14.9	2.5	2.1	1.1

**TABLE II: Monthly Avg changes in Ovarian morphometrics**

Month	Fish Avg wt (gm)	Fish Avg length(cm)	Fish Avg width(cm)	Ovary Avg wt (gm)	Ovary Avg length(cm)
January	35.1	16.0	2.3	3.0	1.5
February	35.6	16.3	2.4	3.4	1.8
March	36.4	16.4	2.4	4.1	2.0
April	36.9	16.4	2.5	5.0	2.3
May	39.0	17.1	2.7	7.0	2.6
June	46.5	19.1	3.2	7.2	3.2
July	57.4	24.5	3.6	9.5	3.8
August	44.2	20.2	3.3	7.4	2.8
September	41.5	19.3	2.9	4.9	2.4
October	38.8	17.5	2.3	4.5	2.2
November	33.0	14.9	2.0	3.1	1.5
December	31.4	14.9	2.1	2.0	1.0



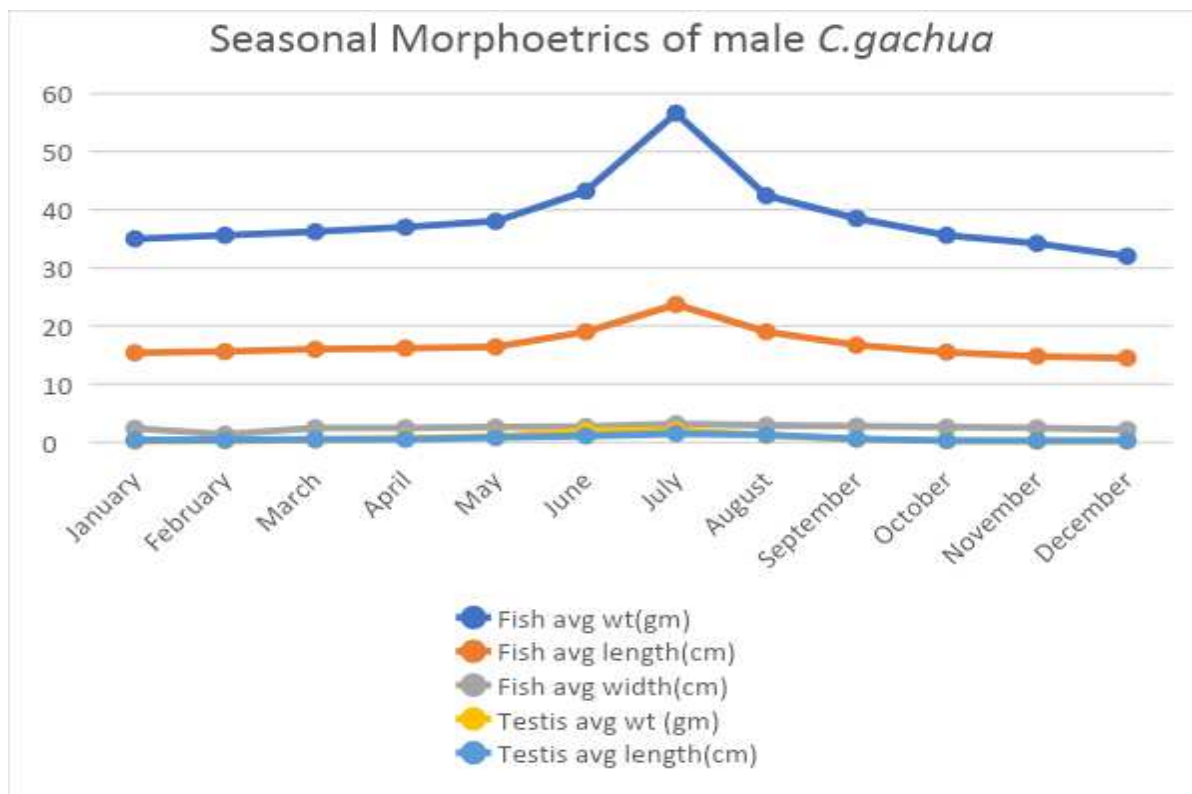
**Table III: Showing morphometrics of fish body and Testis of male *C.gachua* (January to December)**

Month	No. of Sample	Fish wt (gm)	Fish length (cm)	Fish width (cm)	Testis wt (gm)	Testis length (cm)
January	1	35.4	16.0	2.6	0.2	0.4
	2	34.6	15.4	2.1	0.2	0.3
	3	35.0	15.6	2.4	0.3	0.4
	4	35.2	15.2	2.6	0.2	0.5
	5	34.8	14.8	2.3	0.1	0.4
February	1	35.8	15.7	2.6	0.4	0.4
	2	35.6	15.2	2.4	0.4	0.4
	3	35.4	15.5	2.3	0.3	0.5
	4	36.0	16.0	2.6	0.4	0.4
	5	35.2	15.6	2.1	0.4	0.5
March	1	36.4	16.2	2.6	0.4	0.4
	2	46.2	24.0	3.0	0.5	0.6
	3	36.2	16.0	2.5	0.5	0.6
	4	26.2	17.0	2.0	0.4	0.4
	5	36.0	16.1	2.4	0.4	0.5
April	1	37.4	16.4	2.8	0.7	0.6
	2	36.6	16.0	2.3	0.6	0.5
	3	35.8	15.8	2.1	0.6	0.4
	4	37.0	16.2	2.5	0.7	0.6
	5	38.2	16.6	2.8	0.7	0.6
May	1	40.2	16.8	2.8	1.0	0.9
	2	38.0	16.4	2.6	1.0	0.8
	3	35.6	16.0	2.4	0.9	0.7
	4	36.0	15.8	2.4	0.9	0.8
	5	40.2	17.0	2.8	1.2	1.0
June	1	43.2	20.0	2.6	2.0	1.2
	2	40.6	18.0	2.8	1.9	0.9
	3	38.4	15.6	2.5	1.9	0.8
	4	50.6	22.4	3.2	2.5	1.4
	5	44.2	19.0	2.7	2.1	1.1

July	1	57.0	24.0	3.1	2.3	1.6
	2	56.2	23.7	3.2	2.2	1.5
	3	56.6	24.0	3.3	2.3	1.5
	4	60.0	24.3	3.4	2.5	1.6
	5	53.2	22.8	3.0	2.3	1.4
August	1	44.0	19.2	3.0	1.2	1.4
	2	41.6	18.8	2.8	1.0	1.3
	3	40.4	18.7	2.8	0.9	1.2
	4	42.4	19.0	2.9	1.1	1.4
	5	43.6	19.3	3.1	1.1	1.3
September	1	41.3	16.9	2.7	0.8	0.8
	2	36.0	16.5	2.6	0.6	0.7
	3	38.4	16.2	2.8	0.5	0.6
	4	38.5	16.7	2.9	0.5	0.7
	5	38.3	17.2	3.0	0.4	0.6
October	1	36.2	15.8	2.6	0.2	0.4
	2	35.4	15.5	2.6	0.2	0.3
	3	35.6	15.2	2.5	0.4	0.3
	4	32.0	14.5	2.5	0.2	0.3
	5	38.8	16.5	2.8	0.3	0.3
November	1	36.6	15.8	2.9	0.4	0.4
	2	35.4	15.7	2.6	0.3	0.3
	3	34.2	14.8	2.2	0.3	0.3
	4	33.4	14.1	2.5	0.2	0.3
	5	32.0	13.8	2.3	0.4	0.4
December	1	33.0	14.6	2.4	0.3	0.4
	2	31.8	14.3	1.9	0.2	0.3
	3	32.4	14.5	2.2	0.3	0.4
	4	32.8	14.4	2.0	0.2	0.3
	5	34.0	14.8	2.5	0.3	0.3

**TABLE IV: Monthly Avg changes in Testis morphometrics.**

Month	Fish avg wt (gm)	Fish avg length (cm)	Fish avg width (cm)	Testis avg wt (gm)	Testis avg length (cm)
January	35.0	15.4	2.4	0.2	0.4
February	35.6	15.6	1.4	0.3	0.4
March	36.2	16.0	2.5	0.4	0.5
April	37.0	16.2	2.5	0.7	0.5
May	38.0	16.4	2.6	1.0	0.8
June	43.2	19.0	2.7	2.0	1.1
July	56.6	23.7	3.2	2.1	1.5
August	42.4	19.0	2.9	1.2	1.3
September	38.5	16.7	2.8	0.5	0.6
October	35.6	15.5	2.6	0.3	0.3
November	34.2	14.8	2.5	0.2	0.3
December	32.0	14.5	2.2	0.2	0.3



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