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CONDITION FACTOR AND GONADOSOMATIC INDEX: DIFFERENTVARIABLES CORRELATES THE GROWTH AND REPRODUCTION OF MYSTUS CAVASIUS

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Abstract
Mystuscavasius have high nutritional value and mostly used by common people of the area. The main aim of this communication is to establish the seasonal variations in condition factor, reproductive cycle along with the weight of fish. The correlation between them states that, how the well being of fish is correlated with the maturity of gonads and reproductive phases of the fish, Mystuscavasius.The female specimens of Mystuscavasius were collected from Chambal River for a period of one year. The total weight and total length of fish was taken and then sacrificed to remove ovary. The gonadosomatic index was determined by taking ratio of gonad weight to the weight of fish. The condition factor is used to determine the wellness of fish by taking ratio of total length and total weight of fish.The highest mean monthly condition factor was recorded in February and the lowest mean monthly condition factor for M. cavasius recorded during May followed closely by October. The gonadosomatic index of Mystuscavasius was increased significantly in May (6.06 ±0.09) and it reached its peak point in month of June (7.97±0.14). During post spawning season (October-November), there was a gradual fall in the gonadosomatic index value (4.25±0.005). The observations from the study indicates that the correlation coefficient between condition factor and gonadosomatic index was observed maximum (r = 0.8649) during June, which was the peak maturity period of the species and also indicate the well being of the fish and the minimum value (r = 0.646) in January which was preparatory phase of reproductive cycle of fish. The condition of fish by all mean measures was satisfactory.
Keywords: *Condition factor, gonadosomatic index, Mystuscavasius and Chambal River.*

Introduction

The condition is variable and dynamic measure of well being of an individual fish and indicated growth of fish in all the three dimensions. An average condition of each population varies on seasonal as well on yearly basis in between males and females, developmental stage of gonads and age of the fish. An average condition of each population varies on monthly as well on yearly basis in between males and females, developmental stage of gonads and age of the fish.Condition factor values may also vary with fish age and in some species with sex.The value of condition factor 'K'is influenced by age of fish, sex, season, stage of maturation, fullness of gut, type of food consumed, amount of fat reserve and degree of muscular development. Gonadosomatic indexis frequently applied to determine the spawning frequency of fishes. The development of gonads can be represented by an index called gonadosomatic Index. The gonadosomatic index is widely used by the biologist to assess the gonadal state including the maturity and periodicity of spawning and predicting the breeding season of the fish. The gonadosomatic index is particularly helpful in identifying the days and seasons of spawning as the ovaries of gravid females swiftly increases in size just prior to spawning. The together study on condition factor and

gonadosomatic index in different species were studied by several authors viz.,Okafor (2011), Mir et al. (2012), Hossain et al. (2012) and Dar et al. (2012).The present study was conducted to examine the seasonal variations in condition factor and reproductive cycle including the gonadosomatic index of Mystuscavasius. The correlation between these two different variables indicates the maturation of gonads, phases of reproductive cycle effects the growth and well-being of Mystuscavasius.

Materials and Methods

The female specimens of Mystuscavasius were collected from Chambal River for a period of one year with the help of local fisher by using cast net. The total weight and total length of fish was taken. The fish species were sacrificed to remove ovary and weight of ovary was also taken.The condition factor is used to determine the wellness of a fish by using total length and total weight of a fish. It was estimated by taking ratio of length and weight. Condition factor of fish was calculated by using following formula:

$$\textbf{Condition factor or 'K'} = \frac{W}{L^3} \times 100$$

Where,

W = weight of fish,

L = length of fish,

K = condition factor coefficient

The weight of fish and gonads were taken to determine the gonadosomatic index of fish. The gonadosomatic index was calculated by using the following formula:

$$\textbf{Gonadosomatic index} = \frac{\text{Weight of ovary}}{\text{Weight of the fish}} \times 100$$

The correlation between condition factor and gonadosomatic index was determined with help of software (Microsoft office Excel).

Results

Condition factor

The condition factor of *Mystuscavasius* was calculated for a year *i.e.,* from September, 2011 to August, 2012 on monthly basis by taking ratio of weight to length of the fish. The condition factor of fish was varied from 1.50±0.05 to 1.99±0.09 (shown in table 1 and fig.1). The highest mean monthly condition factor was recorded in February and the lowest mean monthly condition factor for *M. cavasius*recorded during May followed closely by October. The condition factor was increasing from October (1.51±0.37) to January (1.90±0.08) and it reaches its highest point in the month of February (1.99±0.09). It gradually fell down from March (1.94±0.16) to May (1.50±0.05) while it was slightly increasing during June (1.61±0.08) and July (1.62±0.12) which happen to be the peak spawning season of the fish. It was again reduced after spawning in August.

Gonadosomatic index

The gonadosomatic index of *Mystuscavasius* from Chambal River was studied from September 2011 to August 2012. The gonadosomatic index of fish was varied from 3.04±0.08 to 7.97±0.14 (shown in fig.2). The gonadosomatic index of *Mystuscavasius* was increased significantly in May (6.06 ±0.09) and it reached its peak point in month of June (7.97±0.14).

Table. 1 Seasonal variation in the gonadosomatic index, weight of ovary of *Mystus cavasius*

Months	Gonadosomatic index Mean±S.E	Weight of ovary Mean±S.E
September	4.70±0.17	2.73±0.15
October	4.25±0.08	2.28±0.08
November	4.26±0.07	2.21±0.07
December	3.12±0.07	1.66±0.05
January	3.04±0.08	1.63±0.06
February	3.63±0.15	1.96±0.11
March	4.51±0.09	2.48±0.08
April	4.72±0.05	2.63±0.05
May	6.06±0.09	3.51±0.11
June	7.97±0.14	4.85±0.12
July	6.63±0.25	4.05±0.20
August	5.90±0.31	3.56±0.21
Mean	4.89±0.42	2.79±0.28

Correlation between condition factor and gonadosomatic index

A correlation existed between condition factor and gonadosomatic index of fish which was shown by regression equation presented fig. 3 (a-l). During the peak maturity the fish obtained its maximum weight due to increased weight of the gonads. The condition factor after the month of March (r = 0.8069) slightly increasing in the month of May (0.8594) and reaches its peak value in the June (0.8649) when the weight of the fish and gonads was highest. The observations from the study indicates that the correlation coefficient between condition factor and gonadosomatic index was observed maximum (r = 0.8649) during June, which was the peak maturity period of the species and also indicate the well being of the fish and the minimum value (r = 0.646) in January which was preparatory phase of reproductive cycle of fish. After the preparatory phase the correlation coefficient value between condition factor and gonadosomatic index of fish slightly increases from r = 0.662 in February to r = 0.8594 in May. After May it reaches its peak point in June when the value of correlation coefficient (r = 0.864) was recorded highest and again declining from July (0.8133) to August (0.7329) and followed by September (r = 0.770) increases (fig.3 -a– l). It may be inferred that condition factor of the fish are very much closely related to each other and depend upon each other.

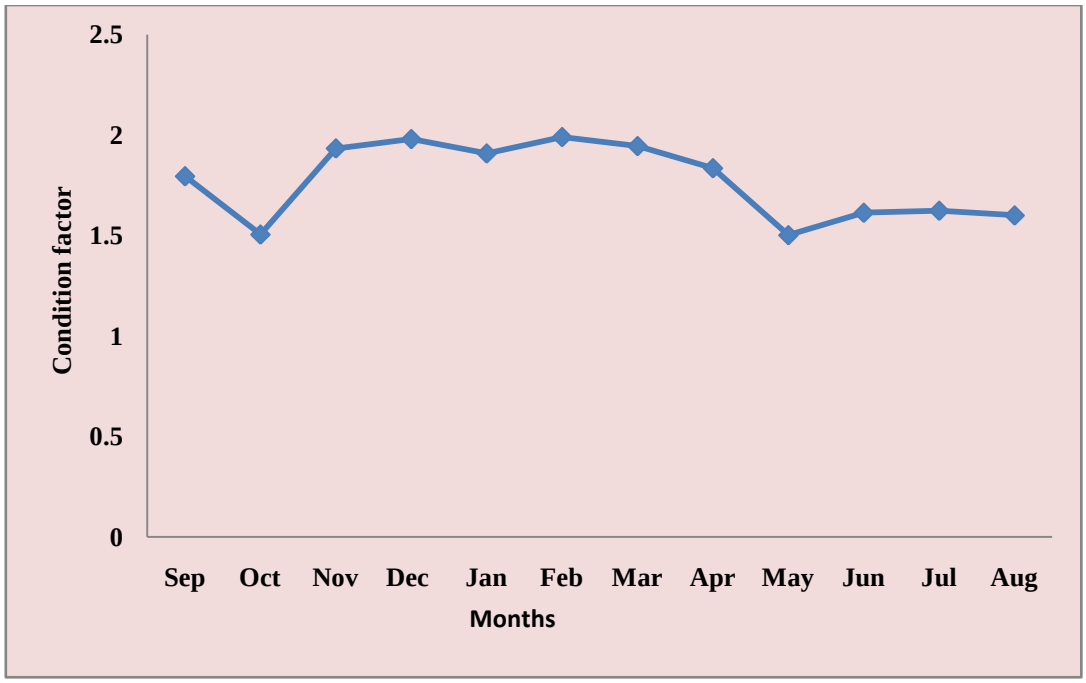


Fig. 1 Seasonal variation in the condition factor of *M.* cavasius

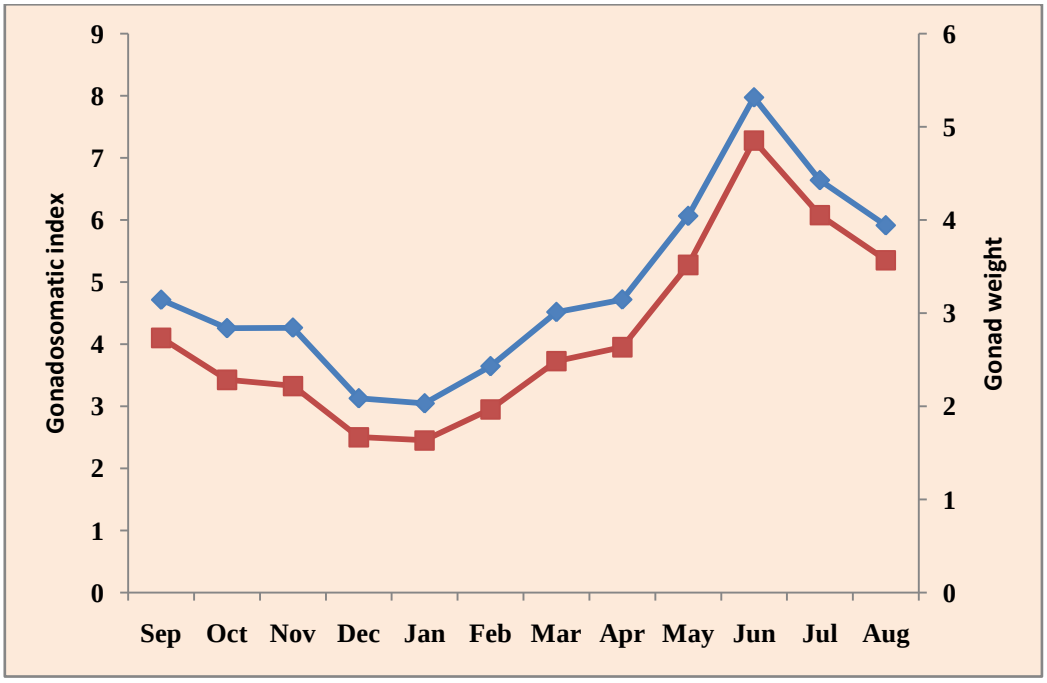
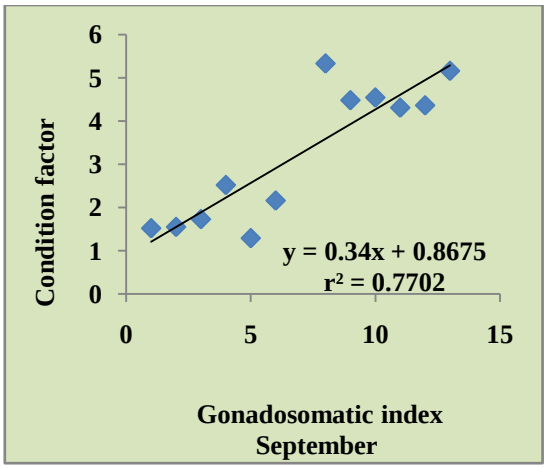
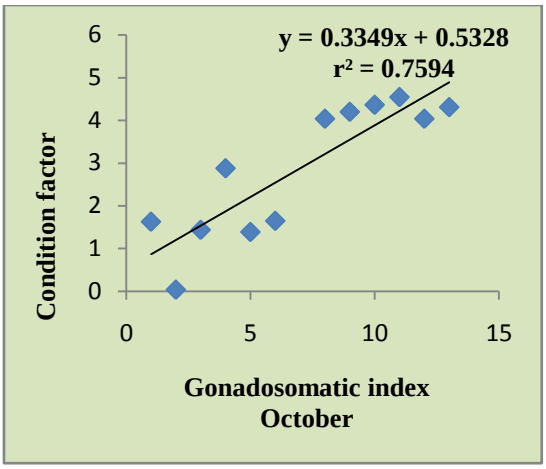
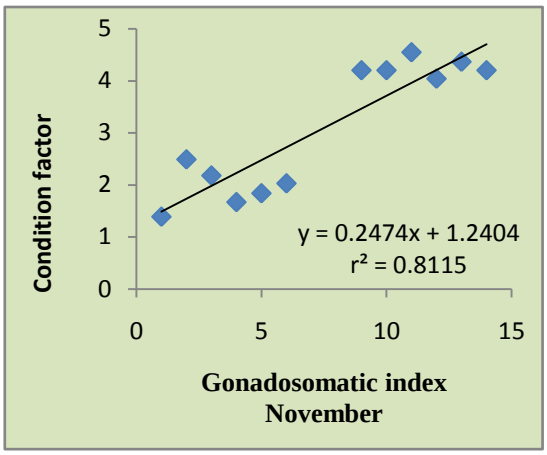


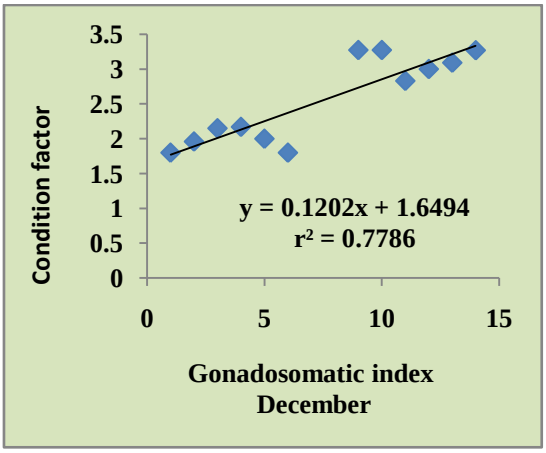
Fig. 2 Seasonal variations in the gonadosomatic index and gonad weight


Condition factor
y = 0.34x + 0.8675
r² = 0.7702
Gonadosomatic index
September

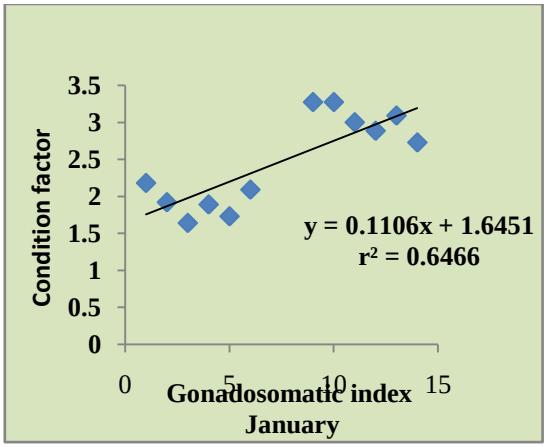

y = 0.3349x + 0.5328
r² = 0.7594
Condition factor
Gonadosomatic index
October

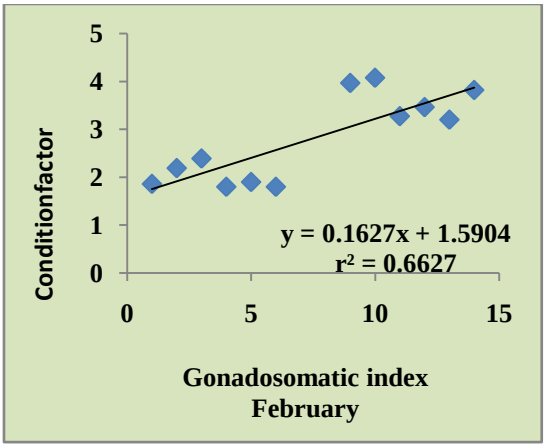
(a) **(b)**


Condition factor
y = 0.2474x + 1.2404
r² = 0.8115
Gonadosomatic index
November

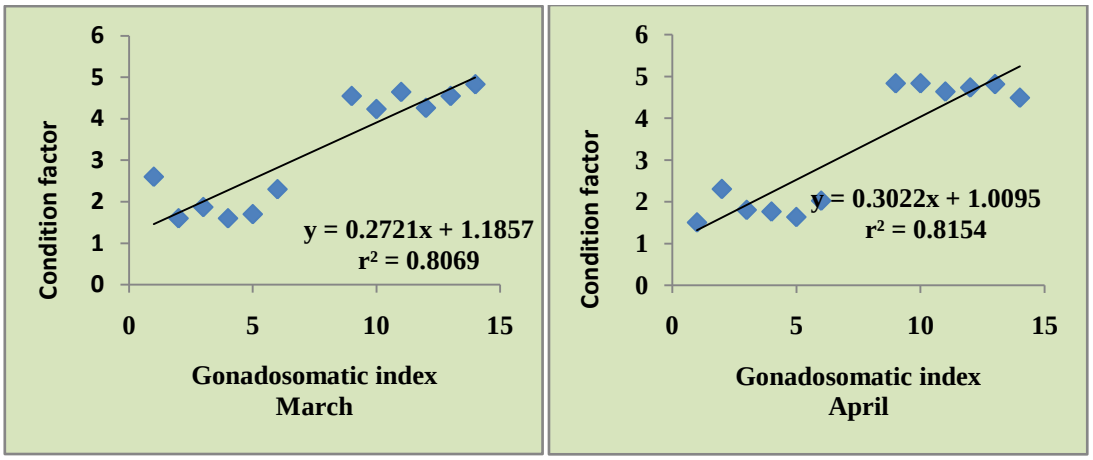

Condition factor
y = 0.1202x + 1.6494
r² = 0.7786
Gonadosomatic index
December

(c) **(d)**

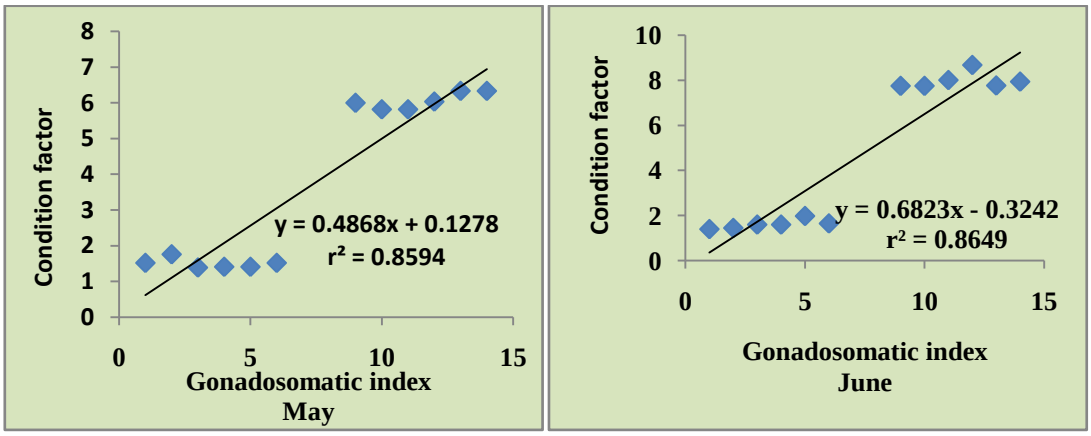

Condition factor
y = 0.1106x + 1.6451
r² = 0.6466
Gonadosomatic index
January


Conditionfactor
y = 0.1627x + 1.5904
r² = 0.6627
Gonadosomatic index
February

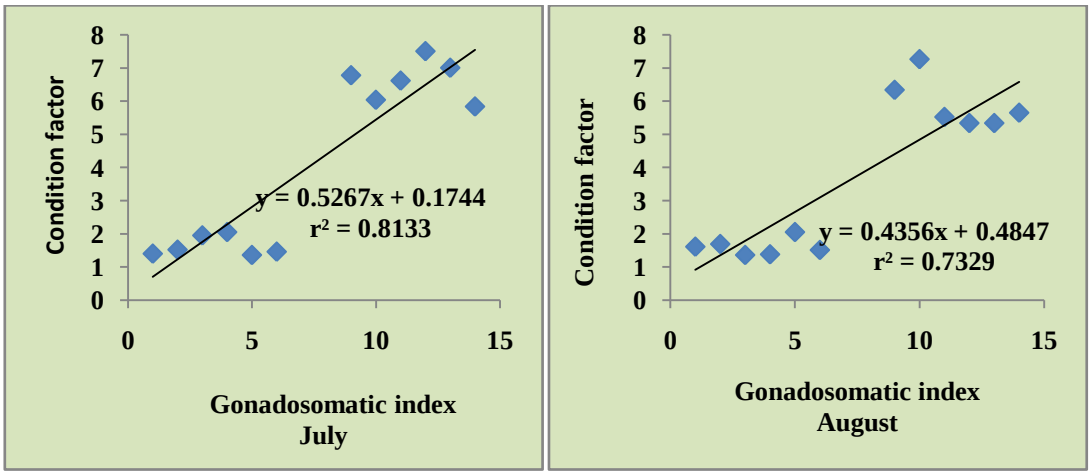
(e) **(f)**



(g) (h)



(i) (j)



(k) (l)

Fig. 3 (a– l) Graphs showing the correlation between condition factor and gonadosomatic index of *M.* Cavasius

Discussion

The condition factor 'K' is to basically quantify the condition of fish which is being influenced by several factors including age and sex stage of maturation, fullness of gut, type of food, consumed amount of fat reserve and degree of muscular development and the season. The condition factor showed fluctuations in relation to the reproductive cycle of fish and this is well documented by (Saliu, 2001 and Narejoet al., 2002). The condition factor of *Aristichthysnobilis*recorded as lowest due

to spawning, spent phase, and low feeding intensity (Mahapatra and Datta, 2004). Condition factor in Epinephelusdiacanthus has increased from stage I to stage III of oocyte development (Rao and krishana, 2009). The relative condition factor of Schizopygeesocinus has shown fluctuations due to maturity and spawning of the fish (Dar *et al.*, 2012). Mir *et al.* (2012) have found that the condition factor had an overt variation with highest value during the breeding season. *Puntiusticto* has shown a relationship between the condition factor to the weight, body size and fecundity of the fish (Hossain *et al.*, 2012). The condition factor of *M. cavasius* fell down during spawning phase (July to August). It gradually increased during post-spawning phase (September to October). Gonadosomatic indexis frequently applied to determine the spawning frequency of fishes. The development of gonads can be represented by an index called gonadosomatic Index. Seasonal variations in the value of gonadosomatic index have been made by several workers in different species (Laleye*et al.*, 2006, Olurin and Savage, 2011, Xia Yin Zing *et al.*, 2012, Nandikeshwari and Anandan, 2013 and Gupta and Banerjee, 2013).The highest value of correlation coefficient between condition factor and gonadosomatic index was r = 0.864 in the month of June (pre-spawning phase). During spawning season there were great reduction of mature ova in fish due to which weight of the gonad and fish was decreased in comparison to the cube of its length so the condition factor of fish species was also decreased but after the spawning phase, the gonad size regains gradually and the weight of fish was also increased slightly so the condition factor of fish improves slightly.

Conclusions

The study on the condition factor of *M.* cavasiusreveals the goodness of the fish species. This study has concluded that the condition factor of *M.* cavasiuswas increasing from October to December and reached its maximum value during February and it decreased again from April to August. The study of gonadosomatic index indicated a peak maturity period of the fish. The highest value of gonadosomatic index of *M.* cavasius was observed in the month of June which was the peak maturity period of the gonads of *M.*cavasius.The condition factor has shown a positive correlation with the length, weight, gonadosomatic index. The correlation between condition factor and gonadosomatic index hadfell down from pre-spawning phase to spawning phase and after spawning it regains its condition value.

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