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INDIGENOUS TECHNIQUE TO ACHIEVE MAXIMUM SURVIVAL AND MATING BEHAVIOR OF STINGRAYS UNDER CAPTIVITY

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INTRODUCTION

The pale-edged stingray *Dasyatis zugei* (Muller and Henle) of family Dasyatidae is abundantly distributed along West Bengal coastal area (Manna & Goswami, 1985; Goswami, 1992; Chatterjee *et al.*, 2000). Being one of the major attractions for the visitors, it is displayed regularly in the aquarium at Marine Aquarium & Regional Centre, Zoological Survey of India, Digha. But, the survival success of this species under captivity was very poor. They could survive at the most for 8-10 days and sometimes overnight mortality was also recorded. Very little is known about the biology of most skates and rays—including stingrays—because they have been largely overshadowed by their more infamous relatives, the sharks. There are at least 96 species of stingrays worldwide (families Dasyatidae and Urolophidae combined), of which around 30 species from 8 genera are common in the Indian coasts (Talwar, 1984; Jhingran, 1997; Talwar *et al.*, 1994).

Some information about the mating behavior of elasmobranchs comes from captive individuals which has revealed that in several species of elasmobranchs, males are always aggressive and often bite females during the courtship and mating period (Springer, 1967). Male sharks, for example, bite the pectoral fins of females during the breeding period (Dempster & Herald, 1961; Clark, 1963; Taylor, 1971; Klimley, 1980; Castro *et al.*, 1988). Skates (Libby & Gilbert, 1960; Price, 1967) and rays (McCourt & Kerstitch, 1980; Tricas, 1980; Reed & Gilmore, 1981) display similar type of behavior during mating.

MATERIALS AND METHODS

The commonly available sting ray species in the locality *Dasyatis zugei* (Muller and Henle) was used

in the experiment (Fig. 1). The overall experiment was divided into two groups. First, the experimental group of sting rays after carefully removing sting immediately after collection and second, control group consisting of moderately sized (30-45 cm disc size) 10 individuals. The stings were removed immediately after collection on location itself. One tank of 10' × 5' × 5' exclusively allotted for the experiment and two groups of experiments were conducted separately. Normal rate of feeding i.e. 0.5% of total body weight were provided on alternate days throughout the experiment with chopped meat of clam, prawns and fishes. Any unspent feed remains in tank were siphoned out after few hours of feeding. The environs of tanks viz., temperature, pH, dissolved oxygen and salinity were routinely monitored and kept constant to avoid any other physiological impact while experimenting. The experiment was conducted separately in different batches of three replicates each in post-monsoon season when the stingrays were reproductively active. The experiment was conducted during September-December of 2006.

RESULTS AND DISCUSSION

Comparison of survival rate of experimental stingrays with control ones shows that at the end of experiment (i.e. 30 days) 63% stingrays survived. However, the control set stingrays could survive up to 8th day of experiment. On the 22nd day of experiment, a pair of female gave birth to 6 juveniles which were kept separately to avoid mortality. The comparison of survival rate of the test set with the control set of stingray is shown in Fig. 2.

During breeding season, female stingrays were chased and copulated by males (Oldfield, 2005a; 2005b). The first ever mating behavior of stingrays was explained in southern stingrays *Dasyatis americana* by Chapman *et al.*, (2003). In stingrays, fertilization occurred at 43 months, and birth at 46 months of age. Size at maturity for males was estimated 20-35 cm disc with and for females 24-32 cm disc. width. Gestation was thought to be a little over 3 months. Males would mate with more than one female (Chapman *et al.*, 2003). In the present paper, the cause of low survival rate was studied in the form of one simple experiment through critically observing them in captivity. No specific observation could be made during day time and normally, mortality has recorded the next morning. This created some doubt about what happens in the night particularly to this species? During night, the species were observed quite aggressive, chasing each other and copulating. And the same pair was observed dead next morning. The dead specimen when carefully observed was found to have some wounds on the body which might have been caused due to sting and bites. It was observed during the collection that many fishermen remove the stings as soon as they collect the fish as the sting is very poisonous and fatal. This could have happened with these fishes. After removing the sting the fishes were survived for more than a month and the cause of death was due to other reasons. Study on freshwater ray shows that males

frequently bite females during the mating period but most male biting do not result in copulation. In bites that do not lead to copulation, males bite the posterior (or occasionally the medial) portion of the females' disc but females often free themselves from these bites. In bites that precede copulation, males bite the anterior portion of the females' disc and females do not struggle to free themselves. Thus, females may exert some form of choice when they are bitten (Brockman, 1975; Capape & Zauli, 1995; Capape, 1993; Young, 1993). During experiment, few baby rays which were delivered in aquarium tanks could be able observed (Fig. 3). In captivity, conception occurred generally at low temperature i.e. in winter. The captive born juveniles' disc measured up to 10 cm.

CONCLUSION

During the present study, it was also observed that the stingrays often chase each other during their active reproductive phase. They often bite each other and operates sting while copulating which leads to serious wounds on their body. Sometimes, these injuries lead to mortality. This type of mating behavior is also observed in other stingray species. When the sting was removed during the experiment, the fishes bite each other but this does not lead to death as sting has been removed. Hence, this technique may prove ideal for further breeding practices and behavioral studies under captivity.

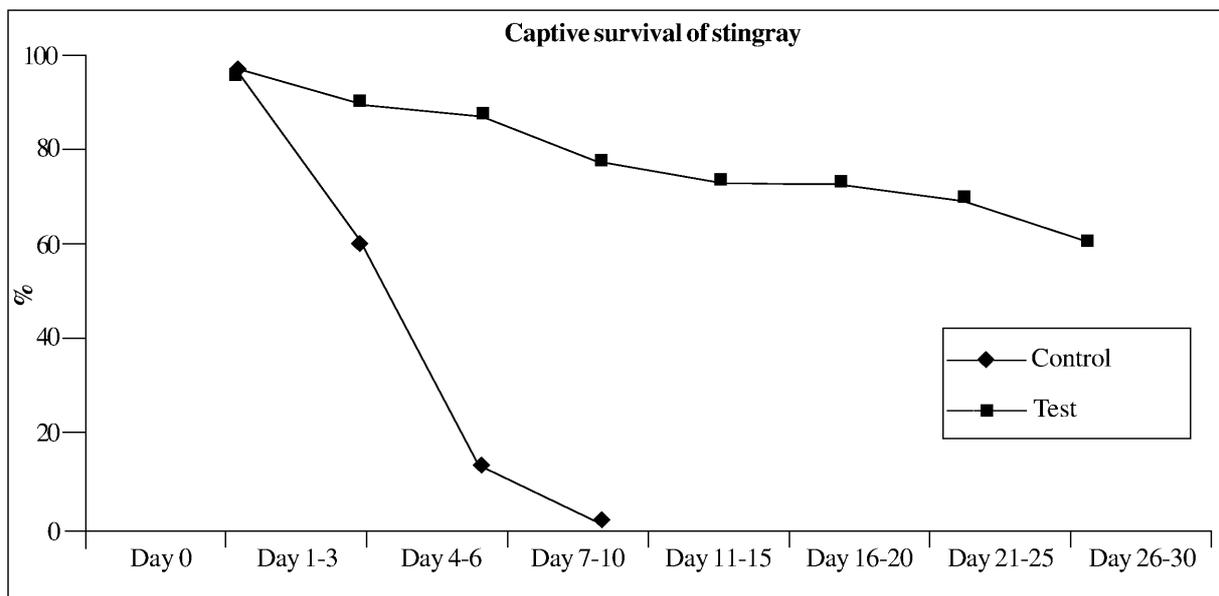


Fig. 2 : Survival rate of stingray under captivity.

SUMMARY

Keeping of sharks and rays under captivity as an exhibit is quite common in public aquaria in India and elsewhere. But, maintenance of such species under captivity is a big problem due to its mating behavior and possession of poisonous sting. The fishes were often found either severely injured or dead on the subsequent days of their stocking. The condition becomes worst when they operate their poisonous spine also during mating. The paper deals with the study of the mating behavior of pale-edged stingray *Dasyatis zugei* (Muller and Henle) using an indigenous technique to achieve maximum survival under captivity. After carefully removing the sting, the fishes survived for longer period with a survival rate (> 60%) at the end of 30th day of experiment, whereas, the control fishes with sting could be survive not more than 8 days. It was also observed that in some cases they gave birth to juveniles in the experimental period. Hence, removal of sting technique can be adopted for obtaining prolonged survival of stingrays under captivity as well as while breeding them.

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Fig. 1 : *Dasyatis zugei* (Muller & Henle)



Fig. 3 : Newly born pups of stingray.

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