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Sanguinus oedipus in a Habitat of Brotherly Love

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ABSTRACT: This observational study analyzes the social dynamic and agonistic behavior between the two youngest males in a captive troupe of cotton-top tamarins, Sanguinus oedipus, found at the Central Florida Zoo and Botanical Gardens located in Sanford, Florida. The troupe consists of a breeding pair, two sets of twins, and a set of triplets—totaling nine individuals. The study focuses on the second-youngest and youngest males in the troupe and how they interact with each other. S. oedipus possess certain social and communication behaviors. The main behaviors observed in this study are vocalizations and movements indicating aggression between the two males. This study concludes the cause of aggression is due to competition and lack of space. The patterns of agonistic behavior indicate either the second youngest would be pushed out or the youngest would leave the troupe if in the wild. Being confined in a zoo enclosure makes the needed separation impossible. An additional enclosure is constructed during the study to lessen the already existing aggression. This measure works for a short time before hostile interactions increase in frequency again.

KEYWORDS: Saguinus oedipus; S. oedipus; cotton top tamarin; behavior; communication; aggression
INTRODUCTION

The purpose of this study is to determine the cause of previously-occurring aggression between the second youngest (Ted) and youngest (Mini) males in a troupe of nine captive cotton-top tamarins, *S. oedipus*, found at the Central Florida Zoo and Botanical Gardens located in Sanford, FL, how they interact with each other, and the cause of specific aggressive behavior demonstrated between them. Determining the cause of aggression will suggest the actions necessary to mitigate or reduce this behavior. Of the two, Ted is the primary individual that exhibits unprovoked aggression towards Mini. For his part, Mini is rarely observed initiating aggression. I conclude that the aggressive behavior is a simple matter of competition and space.

In the wild, blatant attacks are rare since individuals are able to leave their own troupe to join another (Neyman, 1977), which can lessen or prevent aggression within the troupe. In captivity, overt aggression is common and is directly related to spacing issues (Moyihan, 1970).

*S. oedipus* belong to the New World monkey family *Callitrichidae*. They are found in a very restricted area of northern Colombia, South America. *S. oedipus* typically inhabit deciduous forests but have adapted to secondary forests because of deforestation (Cawthon, 2005). Due to habitat loss and the pet trade, their numbers have dwindled, and they are now confined to national parks and reserves that have been established for the purpose of research and conservation (Savage, 2018). The International Union for Conservation of Nature and Natural Resources (IUCN) Red List classifies *S. oedipus* as critically endangered with 6,000 individuals remaining (Savage & Causado, 2014).

Habitat

When this study began in January 2018, the *S. oedipus* troupe in question was housed in a hexagonal enclosure that measures 2.7m x 3.9m x 2.7m (Enclosure A, Figure 1). Two older sets of twins and a younger set of triplets had been born to the breeding pair, totaling nine individuals in Enclosure A. An expansion was added during the study measuring 2.4m x 2.4m x 2.4m (Enclosure B, Figure 1).

Communication

*S. oedipus* utilize auditory, chemical, and visual communication to convey messages. Communication is primarily auditory and chemical since their natural environment of tropical dry forests is heavily vegetated, which hinders most visual communication from a distance (Snowdon & Soini, 1988). *S. oedipus* have over 38 vocalizations (Savage, 2018) and several movements (Moyihan, 1970) to express their intentions. Since the troupe in question is captive, Enclosures A and B do not directly imitate their natural habitat of dry tropical forests. Nevertheless, the captive *S. oedipus* troupe in this study relies heavily on vocalizations even though their habitat does not resemble the wild.

Acoustic Communications

The vocalizations of focus in this study are twitters, trills, loud sharp notes, long rasps, and broken rasps, as described by Moyihan (1970), which are associated with agonistic or hostile intentions (Table 1).

<table>
<thead>
<tr>
<th>Type</th>
<th>Characterization</th>
<th>Use</th>
<th>Association</th>
<th>Level of Hostility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twitter</td>
<td>Squeaks or short whistles. A high or short call that ascends or descends steeply.</td>
<td>In response to potential predators or intra-specific disputes.</td>
<td>-</td>
<td>Least hostile</td>
</tr>
<tr>
<td>Trill</td>
<td>A rapid series of short notes with a rise and then fall.</td>
<td>In response to any disturbing animal.</td>
<td>Escape response.</td>
<td></td>
</tr>
<tr>
<td>Loud Sharp Note</td>
<td>A scream. Similar to a trill, but louder.</td>
<td>In response to a predator or violent intra-specific disputes.</td>
<td>A “hiss” escape.</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Description of acoustic communications described by Moyihan (1970).
The movements of focus in this study are silent freeze, head down posture, crown smoothing, crown raising, and a displacement behavior as described by Moyihan (1970) (Table 2). A displacement behavior encompasses any unritualized display, a behavior that is not normal for *S. oedipus*, that develops from a nervous mannerism.

### Visual Communication

The movements of focus in this study are silent freeze, head down posture, crown smoothing, crown raising, and a displacement behavior as described by Moyihan (1970) (Table 2). A displacement behavior encompasses any unritualized display, a behavior that is not normal for *S. oedipus*, that develops from a nervous mannerism.

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<tr>
<td>Type</td>
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</tr>
<tr>
<td>Head Down Posture</td>
</tr>
<tr>
<td>Crown Smoothing</td>
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<tr>
<td>Crown Raising</td>
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**Table 2. Description of visual communications described by Moyihan (1970).**

This observational study was conducted with a troupe of *S. oedipus* found at the Central Florida Zoo and Botanical Gardens located in Sanford, Florida. This troupe consists of a codominant breeding pair, two older sets of twins, and a younger set of triplets. Table 3 summarizes the names, ages, and identifying characteristics of each individual. The focal subjects of this study are Ted and Mini. Ted is the oldest in the triplet and is easily identified by the scars on his forehead (Figure 3a) and by being the smallest member of the troupe. Mini is a little harder to identify with only a small lip deformity, resulting in his mouth looking slightly open at all times (Figure 3b).

### MATERIALS AND METHODS

This observational study was conducted with a troupe of *S. oedipus* found at the Central Florida Zoo and Botanical Gardens located in Sanford, Florida. This troupe consists of a codominant breeding pair, two older sets of twins, and a younger set of triplets. Table 3 summarizes the names, ages, and identifying characteristics of each individual. The focal subjects of this study are Ted and Mini. Ted is the oldest in the triplet and is easily identified by the scars on his forehead (Figure 3a) and by being the smallest member of the troupe. Mini is a little harder to identify with only a small lip deformity, resulting in his mouth looking slightly open at all times (Figure 3b).

**Table 3. Members of *S. oedipus* at CFZ. Adults are over 24 months of age, sub-adults are between 12 and 24 months, juveniles are between six and 11 months, and infants are zero to six months (Caperos et al, 2011).**
Observations were conducted from January to April two to three times a week for twelve weeks, totaling 23 surveillance periods. The duration of each surveillance lasts between one and two hours (mean: 1.70 hours). At the start of this study, all troupe members were observed with anything of interest being written down. Penned observations ranged from something as simple as pulling a leaf through the cage to play with it to very hostile interactions among individuals.

After week one and before Enclosure B was constructed, a GoPro video camera and microphone were set up in front of Enclosure A to record observation periods. When a behavior of interest occurred, the time of occurrence was noted so it could be located in recordings for analysis at a later time.

The terms attack, fight, and wrestling will be used interchangeably but all these terms indicate body-to-body contact with varying degrees of aggression. Any other contact made between Ted and Mini will be specified.

RESULTS

Twitters are the vocals heard most often. It is considered an indication that a more hostile interaction is imminent. Twitters often escalate into trills, and trills into physical movements, such as a chase or fight (Figure 4). If impact is made, then trills, loud sharp notes, and long rasps are the primary vocalizations heard. Broken rasps are heard infrequently only during extremely violent wrestling. Vocalizations rarely escalate above a long rasp, but broken rasps occur in a few instances (Figure 4). If an attack does not occur, vocalizations escalate to trills and, rarely, a loud, sharp note until appeasement or retreat is made.

Figure 3. (a) Main subject Ted can be identified by the scars on his forehead.

Figure 3. (b) Main subject Mini can be identified by his lip deformity

Figure 4. Chart indicates total frequency of vocalizations made by main subjects during observation periods.
Twitters are often accompanied by both submission and dominant behaviors. After vocalizations are made, an attack usually starts with Ted lunging at Mini and making contact, usually by placing a hand on Mini (Figure 5), which leads to a chase or fight. The interaction ends when one or the other stops advancing and retreats.

In Pre-Enclosure B and Post-Enclosure B, Ted is not observed approaching Mini, only twittering towards him. The distance of Mini from Ted does not matter, only that Mini is within Ted’s sight. Generally speaking, if Mini is seen, Ted first performs behaviors and movements that indicate a threat is nearby. Behaviors include silent freeze, head down/crouching, and crown smoothing. If Mini does not retreat in response to the behaviors and vocalizations performed, Mini physically approaches Ted, which causes Ted to perform aggressive and dominant behaviors along with intensifying his vocalizations. These behaviors and vocalizations include crown raising, readying his body into a lunge position, face-to-face vocalizing displays, and twitters that escalate into trills (Figure 4). A face-to-face vocalization is characterized by Ted grabbing Mini’s head, placing his face to Mini’s, and trilling or sometimes producing a loud, sharp note.

**Post-Enclosure B**

Once Enclosure B is opened, there was a dramatic decrease in agonistic behavior (Figure 7). The amount of physical interactions decreased, but the total amount of interactions stayed the same with vocalization interactions increasing (mean Pre-Enclosure B: 7.08 fights; mean Post-Enclosure B: 0.40). Only one fight was observed in the first two weeks after Enclosure B was opened. By observation 15, the fights subside and aggressive interactions ended in a chase or aggressive vocalizations. Nevertheless, the duration of each chase or vocalization interaction increased before one individual retreated. The exact duration of the prolonged interactions was not recorded.

Towards the end of the study, the prolonged interactions became more hostile once the “newness” of Enclosure B wore off. By observation 21, fights started occurring again (Figure 7). Ted had since developed a displacement behavior observed only a few times where he would crouch and rub his nose back and forth on the substrate he is sitting on. This pattern was originally observed when he started to seclude himself from the others, which was first observed during observation 20.

In a few instances, Ted was seen “hiding” from Mini. He ducked behind a conspecific or moved to a place as to not be seen by Mini when Mini was nearby. While “hiding” behavior was being performed, Ted peeked from his hiding spot to see where Mini was. If Mini was too close, Ted started to twitter and crouch to prime for attack and retreat.

**Frequency of Vocalizations and Aggression**

![Graph showing the frequency of vocalizations and aggression](image)

**Figure 5.** Chart indicates total number of times Ted and Mini are observed vocalizing and initiating aggression in both Pre-Enclosure B and Post-Enclosure B.

**Pre-Enclosure B**

When the family was confined to Enclosure A, a fight occurred at least once every time an observation was conducted (mean: 7.1 fights) (Figure 6). The greatest number of attacks observed is 19 times during one observation period. Hostile vocalizations are heard most often in association with fights and rarely in the absence of physical contact. It was soon evident that Ted is the source of the vocalizations and attacks (Figure 5). This pattern does not change once Post-Enclosure B opens.

**Figure 6.** Chart indicates number of fights observed per observation for the first 13 observation periods before Enclosure B opens. A downward trend is seen due to construction starting at observation 5, which causes the troupe to become easily distracted or interrupted in their normal behaviors. For example, there is heavy construction being conducted during observation 10.
CONCLUSION

All aggressive behaviors exhibited by Ted seem to be random and unprovoked. There was no obvious sign of aggression towards Ted, such as Mini initiating an interaction, yet he acted in a very contradictory manner when Mini was nearby. Ted displayed submission vocalizations and behaviors only when Mini was close, but quickly portrayed hostile intentions and movements when they were closer together.

According to Dr. Savage, a researcher of *S. oedipus* for over 30 years, Mini appears to be the aggressor, and she points out that Mini does not need to perform any displays to be intimidating to Ted (Savage, pers. comm.). Since they are brothers, they are likely competing for the dominant male position between them. This is why Ted reacts in such an exaggerated way towards only Mini: Mini’s presence is enough of a stimulus for Ted to counteract the behavior and defend himself or submit. Dr. Savage also indicated that Ted started secluding himself as a way of self-preservation by taking extra measures to remove himself from troupe interactions.

The goal of this study was to determine the motive behind the agonistic behavior between Ted and Mini. The results conclude the aggressive behavior is a simple matter of competition and space. In the wild, a troupe of *S. oedipus* occupies a rather large territory and are able to join another group if needed (Neyman, 1977). A habitat consisting of two enclosures that measures roughly 2.7m x 3.9m x 2.7m (Enclosure A) and 2.4m x 2.4m x 2.4m (Enclosure B) may not be enough space for nine adult *S. oedipus* members.
REFERENCES


