

INFANTILE CALLS OF SILVERY MARMOSETS (*CALLITHRIX ARGENTATA MELANURA*) DURING THE FIRST TEN WEEKS

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Marmosets and Tamarins are unusual among the Primates in having a monogamous reproductive strategy with considerable involvement in rearing of young by the father and other offspring (EPPEL, 1975; KLEIMAN, 1977). In family groups that show this social organization, the ontogeny of communication and interaction of youngsters with members of the group is very important. Moreover, it has been shown that in family groups of Silvery Marmosets (*Callithrix argentata*), the loss of vocal communication has a much stronger effect than that of physical or visual one, probably due to the fact that it is used to maintain or reestablish the cohesion of the group in the wild (OMEDES, 1984).

Although some studies on the ontogeny of communication of other species of the family Callitrichidae have been published, very little is known on *Callithrix argentata*. OMEDES (1981) and BUCHANAN-SMITH (1984) studied the development of visual behaviour and OMEDES (1981) of vocal behaviour. In this study it was found that Silvery Marmosets use a highly complex and extensive repertoire for vocal communication, and to describe it, sound units were defined as Elements, and Elements uttered either singly or in close succession as Calls. Apart from the 24 Calls emitted by adults, infant Silvery Marmosets used another one that was named GECKER.

The aim of this work is to study the relationship between the ontogeny of GECKER and the few other Calls infants uttered during the first 10 weeks after birth and the development of their social behaviour.

The specimens used in this study were kept in the Zoology Department of the University College of Wales, Aberystwyth. All the animals lived in groups composed of the adult breeding pair and up to three successi-

ve sets of their offspring. Their husbandry is described by STEVENSON & POOLE (1976).

Five infants were studied for 10 weeks after birth during 166 hours. Their vocalizations were recorded with a Nagra IV-L and data on their interactions with other members of the family were collected using time point sampling and check sheets divided into 15-second intervals. Spectrographic analysis was carried out on chosen Calls with a Kay Sona-Graph 7029-A. Different Calls and Behaviours, defined by OMEDES (1981, 1981 (1983)), were totalled and their frequency per hour calculated.

The GECKER Call consists of a series of Elements which are present in adults and their intermediate forms, uttered in quick succession. These Elements, defined by

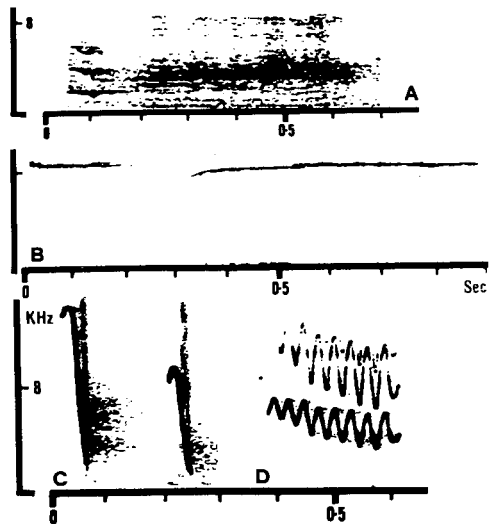


Fig. 1. Adult Elements: A. Ngä; B. Phee; C. Tsak; D. Trill.

Elementos de adultos: A. Nge; B. Fi; C. Tsak; D. Trino.

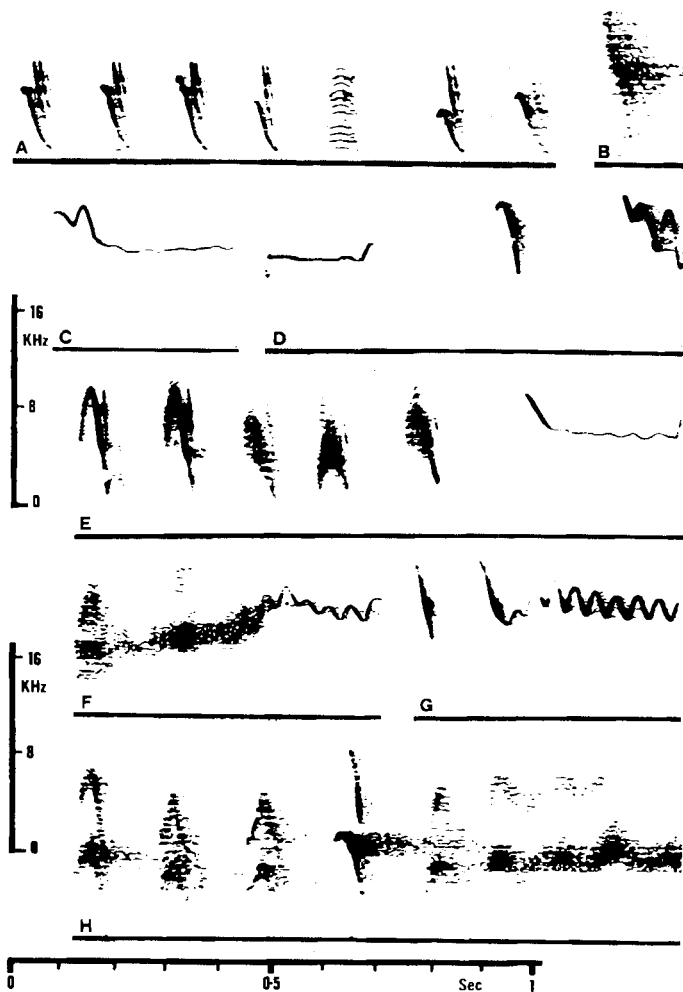


Fig. 2. Components of GECKER Calls: A. Tsak series (day 1); B. Intermediate between Tsak and Ngä (week 2); C. Intermediate between Trill and Phee (day 7); D. GECKER with Trill (week 2); E. Transitions from Tsak to Ngä to Tsak (week 3); F. GECKER ending in high frequency Trill; G. Tsak series ending in Trill (week 4); H. Intermediate forms between Ngä and Tsak, one Tsak and modulated Ngä (week 10).

Componentes de la Llamada GECKER: A. Serie de Tsaks (día 1); B. Intermedio entre Tsak y Nge (semana 2); C. Intermedio entre Trino y Fi (día 7); D. GECKER con Trino (semana 2); E. Transición de Tsak a Nge a Tsak (semana 3); F. GECKER acabado en un Trino de alta frecuencia; G. Serie de Tsaks acabada en Trino (semana 4); H. Formas intermedias entre Nge y Tsak, un Tsak y Nge modulado (semana 10).

OMEDES (1981) are: "Ngä" (fig. 1A), squeal sounding with tonal bands of energy that are possibly harmonically related; "Phee" (fig. 1B), whistle-like sound of constant frequency and very variable duration; "Tsak" (fig. 1C), short and loud sound that consists of a rapidly decreasing fundamental frequency; "Trill" (fig. 1D), Element with frequency modulated fundamental and of variable duration. The duration and composition of a GECKER Call varies according to the age of the individual and its situation when the Call is made, figure 2A-H shows some examples

of components of GECKER Calls. GECKER Calls can last up to 4-5 minutes.

NGÄ, PHEE, TSAK and TRILL are made up by one or more "Ngä", "Phee", "Tsak" and "Trill" Elements respectively (fig. 3 A-D).

All these Elements and those that compose GECKER Calls differ with adult ones in how often they are heard, in the irregularity with which Elements are patterned, in the higher pitch of most Elements and in the existence of intermediate forms between some of the Elements and Calls.

GECKER Calls are mainly uttered by

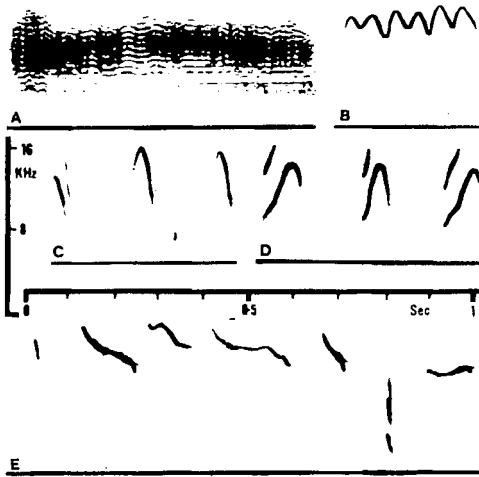


Fig. 3. Infant Calls: A. NGÁ (week 2); B. TRILL (day 7); C. TSAK (day 7); D. PHEES of various forms, mixed with one TSAK (day 1).

Llamadas de crías: A. NGE (semana 2); B. TRINO (día 7); C. TSAK (día 7); D. FIS de formas variadas, mezclados con un TSAK (día 1).

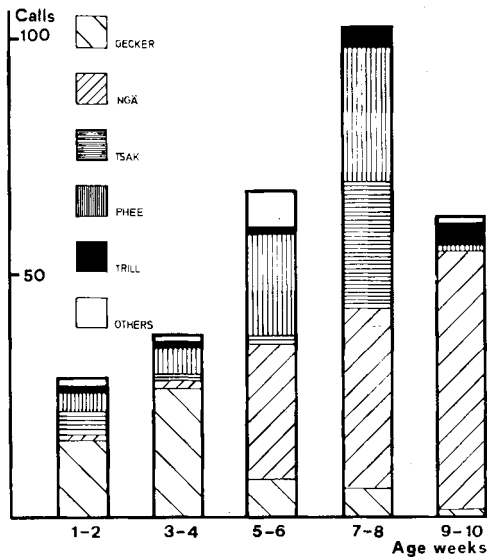


Fig. 4. Number of Calls per hour during the periods comprising weeks 1-2, 3-4, 5-6, 7-8, and 9-10.

Número de Llamadas por hora durante los períodos que comprenden las semanas 1-2, 3-4, 5-6, 7-8 y 9-10 (GECKER, NGE, TSAK, FI, TRINO y otros).

infants while being transferred from one member of the family to another, or when they are rejected. Around the age of 4-5 weeks, infants, which are becoming very active, begin to be ignored when emitting GECKER Calls. From this age, GECKER is basically composed of a series of soft "Phees" and high pitched "Ngäs". During week 6, GECKER Calls become mainly "Ngä" and the resulting Call is used to show submissiveness to older animals.

For the first four weeks, at least 50% of the total Calls emitted are GECKER. After the fourth week TSAK, NGÁ, PHEE and TRILL are uttered on their own at a progressively higher frequency and GECKER eventually decreases (fig. 4).

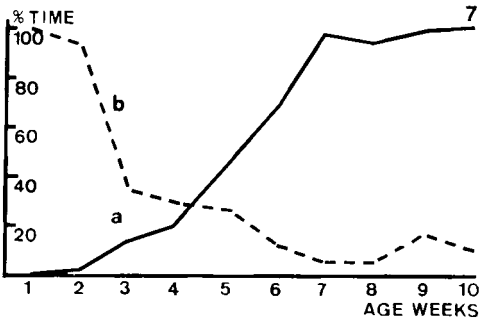
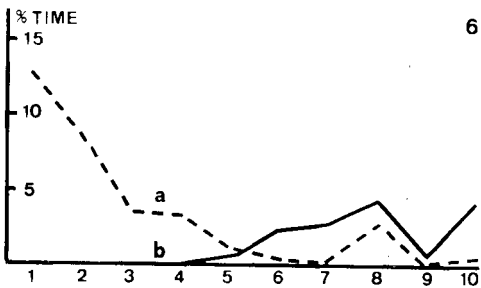
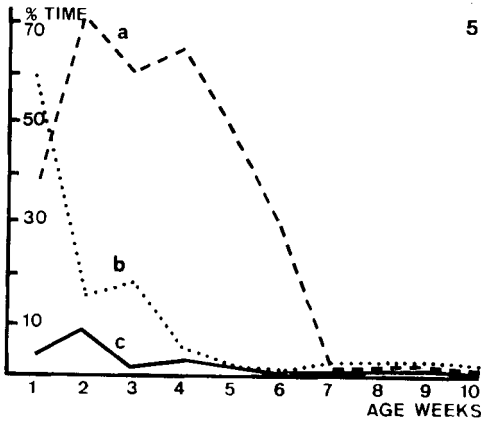
The Call rate is very low on the first two weeks after the infant is born and reaches an optimum by weeks 7-8 (fig. 4).

Around the fourth and fifth weeks, infants are carried less by other members of the family (fig. 5). It is also during this age that they start to ingest solid food and that the suckling frequencies begin to decrease consistently (fig. 6). Play movements first appear as well around this time. Four to six week old twins wrestle with each other (social play) while emitting TSAKS and mixtures of NGÁ and TRILL Calls.

Figure 7a shows the amount of time infants spend off adults' back, and figure 7b the proportion of this time in which they are uttering GECKER or NGÁ.

The vocal and behavioural repertoires of *Callithrix argentata melanura* are very complex and moreover, the meaning of a Call or a Display which is used in more than one context, varies depending on the situation in which it is made (OMEDES, 1981, 1981 (1983)). It is not surprising, then, that infant Silvery Marmosets use mainly their infantile Call GECKER, until the age they start gaining independence.

The existence of an infantile Call composed by adult-like Elements was recorded in Marmosets by SNOWDON (1978) who stated that there appears to be a sort of vocal practice where one can find



Figs. 5-7. 5. Percentage of time infants were carried by other members of the family: a. Father; b. Mother; c. Subadult or juvenile sibling. 6. Percentage of time spent: a. Suckling; b. Feeding. 7. a. Percentage of time spent off; b. Percentage of the time off in which infants uttered GECKER or NGA Calls.

5. Porcentaje de tiempo en que las crías eran transportadas por otros miembros de la familia: a. Padre; b. Madre; c. Hermano/a subadulto o juvenil. 6. Porcentaje de tiempo: a. Mamando; b. Comiendo; 7.a. Porcentaje de tiempo sin ser transportados; b. Porcentaje del tiempo que no eran transportados en que emitían GECKER o NGA.

immature versions of adult vocalizations which have an imperfect match to the adult Calls and which are given in inappropriate juxtaposition. MASATAKA (1982) reports also the existence of infantile Calls during the first weeks in *Callimico goeldii*. It appears that this "babbling" phase may be of importance in the acquisitions of adult forms of vocal structures and possibly in the learning of appropriate circumstances for adult vocalizations (SNOWDON et al., 1983).

Although some authors argue that infants are mainly responsible for the growth of independence in Primates, it is not simply a product of gradual decrease in care from caregiver but more likely it involves changes in both caregivers' and infants' behaviour and it develops from the interchange of the two (LOCKE-HAYDON, 1984).

The changes in infant behaviour (carried-off, suckling-feeding, etc.) shows that Silvery Marmosets acquire most of their future independence in a very short period of time, that is between weeks 4 and 6; which agrees with the data presented by BUCHANAN-SMITH (1984).

This period seems to be earlier than the corresponding one in other species of Marmosets: *Callithrix jacchus* 6-10 weeks (LOCKE-HAYDON & CHALMERS, 1983), *Callimico goeldii* 7-9 weeks (MASATAKA, 1982 and *Saguinus o. oedipus* 9-10 weeks (CLEVELAND & SNOWDON, 1984).

Although the Call GECKER is heard very little after this period, infants spend the following two weeks emitting the highest number of Calls per hour, which shows that they call more as they spend increasing amount of time off adult's back. INGRAM (1975) reported that on the contrary, Common Marmosets call more during the first week and it gradually decreases as they grow older, which suggests that the process of acquiring independence is more stressful in Silvery Marmosets.

Vocal communication is thus closely interrelated with social behaviour during early stages of ontogeny and as the animal social life becomes more elaborate, so do its

vocalizations, since the need arises to use specific Calls for each situation.

ABSTRACT

Marmosets have a monogamous reproductive strategy that involves all members of the family; the ontogeny of communication and interaction of youngsters with members of the group is thus very important. The vocalizations and behaviour of five *Callithrix argentata melanura* infants during the first ten weeks after birth were recorded, and the Calls they emitted analyzed spectrographically. Five Calls form the main part of their vocal repertoire: the infantile Call GECKER and NGÄ, PHEE, TSAK and TRILL. All Elements composing these are irregular and imperfect versions of some of the adult ones. Around the age of 4-6 weeks, when infants are acquiring their independence, GECKER nearly disappears and the other Calls are uttered at a progressively higher frequency. The peak of Call Rate coincides with the first two weeks that infants are spending most of their time off adults' back. Vocal communication is closely interrelated with social behaviour during early stages of ontogeny, since the need arises to use specific Calls for each situation.

Key words: *Callithrix argentata melanura*, Ontogeny, Calls, Independence.

RESUMEN

Llamadas infantiles del tití plateado Callithrix argentata melanura durante las primeras 10 semanas de edad.— Los titís y tamarines (familia Callitrichidae) muestran una estrategia reproductora monógama que implica a todos los miembros de la familia, por lo que la ontogenia de la comunicación de las crías y su interacción con padres y hermanos es sumamente importante. Se han estudiado las vocalizaciones y comportamiento de cinco crías de *Callithrix argentata* durante las 10 primeras semanas. En este período, cinco Llamadas constituyen la mayor parte de su repertorio vocal: la Llamada infantil GECKER y NGE, FI, TSAK y TRINO. Todos los Elementos que componen estas Llamadas son versiones irregulares e imperfectas de los correspondientes en adultos. Durante las semanas 4-6, en que las crías empiezan a adquirir independencia, GECKER deja casi de oírse y las demás llamadas empiezan a usarse cada vez más frecuentemente. Durante las dos semanas siguientes, las crías ya pasan la mayor parte del tiempo sin ser llevadas por otro miembro de la familia y el número de Llamadas emitidas cada hora alcanza su máximo. La comunicación vocal está pues estrechamente rela-

cionada con el comportamiento social durante los estadios tempranos de la ontogenia y a medida que la vida del animal se vuelve más elaborada, lo mismo ocurre con sus vocalizaciones, ya que surge la necesidad de usar Llamadas específicas para cada situación.

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