

HARVARD UNIVERSITY
THE BIOLOGICAL LABORATORIES
16 DIVINITY AVENUE
CAMBRIDGE 38, MASSACHUSETTS

10 July, 1964

Dear Martin:

I have finally finished your Sonographs of Callicebus ~~z~~ it was a bigger job than I had expected it to be.

The principal problem was with certain sounds like the grunt which are both very low-pitched and very brief. Griffin's toy will go down to quite low frequency levels, but it does this by changing ~~gg~~ ~~xxxx~~ speeds of some of its devices, and so has to compensate in time - in short, to analyse a very low sound one is stuck with a condensed time scale in which the length of the Sonograph paper increases from the usual 2.4 secs to 8 secs. A very brief sound then becomes almost a simple point - you see its frequency, but no other characteristics. (Oddly, by the converse of the above, very high-pitched sounds are analysed on an expanded time scale, and the various trills etc about which you were so worried are really magnificent - you can see all sorts of beautiful detail.)

On the whole, after a good deal of fiddling, I think we've come out quite well. Most of the sounds were not difficult to analyse; wherever there was any difficulty for any reason, I tried to do a number of different types of analysis - or, rather, I tried to use a variety of different frequency and time scales. I'll send some interpretation along with the analyses and tape (they'll go registered, for which I'll have to wait until Monday).

I've burned up about \$8 worth of paper on the job, but we can compensate for this if I'm doing further work for you. The postage I'll try to get the MCZ to pay - maybe by sending it in Mayr's name.

I don't know if we'll run into a problem with brief, low-pitched sounds on many of your species. I've checked out the literature I have from the Sonograph Co. on the model I'm going to order, and, so far as I can be sure, it looks likely to be a considerable improvement. It's normal analysis will be 2.4 secs of sound at from 85 up to 8,000 cps, but it can apparently expand this same up to 4kc instead or give a scale up to 850cps (and maybe expand this to 425cps) with a special pug-in filter I can obtain for it. These 4 basic choices would apparently all use the 2.4 sec time scale, and, if so, are preferable to Griffin's machine. I did find his 2,500 and 1,500 scales useful and won't be able to match them on my machine. All his scales are linear, however, and I can apparently use a logarithmic scale on mine - nice because it better approximates what an animal hears and so should be more meaningful (I don't know what the f range of this log scale is). Finally, for extremely brief calls there is a method by which I shall be able to expand the time scale by 3 times, although I doubt if this will be necessary.

HARVARD UNIVERSITY
THE BIOLOGICAL LABORATORIES
12 OLYMPIA AVENUE
CAMBRIDGE 38 MASSACHUSETTS

10 July, 1947

Dear Sir:

I have recently finished your manuscript on Cellular and am glad to hear that you are working on it.

The work on the cellular level is very interesting and I am glad to hear that you are working on it. I am sure that your findings will be of great value to the field. I am looking forward to reading your paper.

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in about 10 days: Dept of Biology, University of Pennsylvania, Philadelphia, Pa., 19104

HARVARD UNIVERSITY
THE BIOLOGICAL LABORATORIES
16 DIVINITY AVENUE
CAMBRIDGE 38, MASSACHUSETTS

14 July, 1964

Dear Martin:

Herewith the tape and Sonagraph tracings. I've copied the tape and retained a copy, so if this parcel is lost I'll eventually get a query from you and be able to start over. Also, I should be able to check things for you without you risking mailing the master tape again. The copy, however, will be less perfect than the original, particularly in the frequencies over about 8 kc, since there is an inevitable loss of fidelity in producing any copy. I'm very sorry about the last sequence on your tape; I fear it's largely destroyed. This happened as follows. Griffin's tape recorder has a speed error, so I use my Nagra to feed into the Sonagraph. The Nagra is a field machine and has a system of rollers designed to hold the tape steady in any position of the recorder - these don't function, however, as the free tail end of the tape passes through - they usually act to crimp or even break this tail. Hence I put tails of leader tape on my material, and forgot I hadn't instructed you to do this. Fortunately, the last sequence was one you subsequently had me mark "skip" as it repeated earlier material, so the loss isn't as bad as it might have been.

I've made some interpretations right on the Sonagraph traces themselves, particularly on the first ones. I think you're now experienced enough with these that I've given you sufficient information, but write if you don't understand something. A lot of echo shows up, usually fairly weakly, and it would help in future if you can deaden the walls and ceiling of your recording area. (Some of what I've thought to be echo may be a second animal in synchrony - you'll be able to tell this by listening carefully to the tapes, I didn't always check this possibility; there are some beautiful cases of synchrony, E.g. #V)

I have used a number of different frequency and time scales. For every individual Sonagraph make sure you note what I've marked. Many sections have been done over on different scales to clear up some points. As I explained in my earlier letter, to examine low frequencies I have had to condense time, so that you can't always determine the shape of a note, but in most cases I've managed to get you some indication of this one way or another. Things done at different scales may appear to give different information for the reason that the sound filter being used has different characteristics (which in some cases I've marked down); in general the frequency width of a sound will appear to be greater when I've used a scale that analyses to high frequencies. Occasionally I compensated for this by using an entirely different filter (described as a "narrow band pass" filter) which has other undesirable characteristics but which will show you how narrow some of those broad black smudges should, in fact, be. Study of these will help you make your interpretations - if I were you I'd go through the entire set before I sat down to try to work on any one in detail.

Let me know what you think of them. Best regards to all.

John

THE BIOLOGICAL LABORATORIES
18 VERNY AVENUE
CAMBRIDGE, MASSACHUSETTS

11 July, 1951

Dear Mr. [Name obscured]:

I have received your letter of the 27th and am glad to hear that you are interested in the work of the Biological Laboratories. I am sorry that I cannot give you more information at this time, but I will be glad to discuss the matter with you in person if you are in Cambridge.

The work of the Biological Laboratories is primarily in the field of genetics and the development of the fruit fly, *Drosophila melanogaster*. We are interested in the inheritance of various traits and the role of chromosomes in this process. We also study the development of the embryo and the role of various genes in this process.

If you are interested in this work, I would be glad to discuss it with you in person. I am sure that you will find it very interesting.

Sincerely,
[Name obscured]

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

I am sure that you will find it very interesting.

304 Main Street
Etna, New York
September 16, 1964

Dr. Martin Moynihan
Canal Zone Biological Area
Drawer C
Balboa, Panama Canal Zone

Dear Martin:

By now you should have received the spectrograms of Callicebus. If not, they should reach you shortly. I mailed the recorded tape strips on the 11th.

The "grunt" appeared to resolve fairly well. I was interested in the human-like resonance bars. The resonance was audible on half-speed playback as a rising then lowering pitch. The fundamental frequency remained constant at about 220 cycles per second--calculated from the number of vertical beat lines per second.

The "sneeze" was as expected, an abrupt sound covering the whole range of frequencies under analysis as white noise. You can see the relative time the various frequencies reached the microphone as a slanted line on the spectrogram.

The project on avian vocalizations which I discussed with you this summer has been approved by my committee (C. G. Sibley, Bruce Wallace, LaMont Cole). Therefore, I would like to outline it, as you requested, as a possible proposal for a Smithsonian Fellowship. //Basically, I would be studying the ecology of avian vocalizations, i.e., the forces of the physical and biological environments selecting for or against certain sound characteristics.

Factors of the physical environment such as vegetation density, temperature and humidity and topography control the carrying qualities of sound. Generally, there is a certain range of frequencies within which optimum sound propagation is attained for each habitat. Data for certain avian sounds indicate a correlation between frequency and form of vocalization and optimum sound propagation for a particular physical environment. In a general way, this habitat-sound correlation has been mentioned in many scientific and popular articles. However, no data has been obtained pertaining to possible selective factors for sound characteristics.

The biological aspects of avian sounds have been studied, but never in relation to the physical environment. It is my hypothesis that in a particular environment, certain sounds are selected for due to the physical limitations of the environment. Then, within the parameter of the physical limitations, the biological parameters of anatomy and inter- and intraspecific competition, etc., operate to mold the species-specific vocalizations.

10. 11. 1952

Dear Mr. ...
I have received your letter of the 10th and am glad to hear from you.
The matter is being dealt with as a matter of priority.
I will get back to you as soon as possible.
Yours faithfully,
[Signature]

September 16, 1964

The anatomical aspect of this project is one of interest, I believe, because of the taxonomic association with syringial structure. The sound-producing structure of the "primitive" passerines may be a function of selection to produce "habitat adapted" sounds. The types of sound that the Dendrocolaptids, Furnariids, and Formicariids produce might not necessitate elaborate musculature. Yet these sounds are more adapted for the forest environment than "complex" sounds produced by an "advanced" anatomy.

My "line of attack" to the problem is to measure the sound propagation characteristics of selected habitats using test tapes of different frequencies and sound structure made up in advance. Also, I want to utilize recorded natural sounds in propagation measurements. Then, after deducing what frequencies propagate best, worst, and are directional or non-directional, an analysis of what is actually found in different habitats will be made. I also plan to study syringial anatomy from a functional standpoint, looking for correlation with sound produced and habitat sound-selection.

I am hoping to be able to study this problem in the tropics for two reasons. For the resident species there is a lifetime in one, almost constant, habitat for selection to operate. Further, the "primitive" passerines are more numerous in or confined to the tropics. Thus I feel that a study such as I propose would produce more useful data on tropical birds than on temperate. //

I hope all is going well. I shall be looking forward to your reply.

Sincerely,

Eugene S. Morton

Eugene S. Morton



UNIVERSITY of PENNSYLVANIA

PHILADELPHIA 19104

The College
Department of Biology

JOSEPH LEIDY LABORATORY
OF BIOLOGY

7 Sept., 1964

Dear Martin:

Glad to get your recent letter, although somewhat disturbed that you mentioned, but did not catalogue, some recent unpleasantness. Sometimes I wish you weren't such a genius at saying nothing personal in a letter - I do hope that whatever this was has meant no personal hardship for you or for the Rubinoffs. How are they making out, incidentally? Glad to hear you've got Stan Rand, I know you will be extremely pleased with him. When does he arrive?

Sue and I had a delightful Mexican holiday, blessed by the most incredibly perfect weather I've ever had on a trip. We took 3 days from the border to wander slowly down the eastern side to Mexico City through the spectacular eastern slopes of the Sierra, spent only 3 days in the City then went up and camped on Mt. Popocatepetl; climbed up to about the lower limit of snow (somewhat over 14,000' at that time, I think). Went on down to the east coast again at Veracruz, then made a long loop up past M. City to the Central Plateau and came north through the deserts, collecting cacti to breed back here, finally came out at Laredo and dropped down to McAllen Texas to finish some observations on Tyrannus couchii, our new kingbird. (We'd designed parts of the trip to look at its habitats in Mexico and had found it still somewhat vocal even tho' in the post-breeding season. Surprisingly, or perhaps not so, we got what may be evidence of introgressive hybridization with T. melancholicus, although our data are too scanty to prove this. We got good T. couchii vocalizations as far south as we got - near the end of its range - and these are very different in form from T. mel, as well as being slower and at about $\frac{1}{2}$ the pitch of the latter. We also got, although not certainly from the same individuals, use of the simplified T. mel patterns, but at the pitch of T. couchii, and slowed to its speed (ie. they sounded like T. mel tapes played at $\frac{1}{2}$ speed). These vocalizations would be redundant in that population as we heard the T. couchii equivalents. Must someday return in breeding season.)

In Texas, however, we both came down with dysentery, Sue quite severely. She is still not fully recovered after about 15 days, but is very greatly improved. I'm at present sweating out the preparation of some lectures. Have been talking with Martin Cody and shall confer with MacArthur when he returns (in a week or so) about the towers they want - shall see if we can straighten out the issue; Cody at least knows exactly where he wants a tower. He'll be down after Christmas.

Before I continue, here are some notes I made for you in a mixed flock on Mt. Popo in the pines around our campsite (about 13,000'). Forest mature, probably Pinus hartwegi, rich bunch grass understory, grazed by cattle (not severely). Flock in both pines (of which there were rather few young ones) and grass (ie., on ground). The most

(over)

vocal and active species were:

Parus sciateri - apparently several families

Sitta pygmaea - about 2 families, a very vocal nuthatch,

Also active in the trees, but not noisy, were one or 2 families of Olive Warblers, Peucedramus taeniatus, 2 Colaptes cafer, 1 or 2 Dendrocopus scalaris, (and occasional Stellar Jays, Cyanocitta stelleri, which may not have been in active association with the flock). Two Brown Creepers, Certhia familiaris, probably were part of the flock, but were sufficiently unobtrusive that I didn't always locate them when examining the flock. A single Dendroica graciae was apparently out of the species range (?) and so not a usual part of such a flock.

Active on the ground were a couple of families each of:

Junco phaeonotus - not noisy

Oriturus superciliosa - I think (Blake's Mexican guide can be infuriating in the field, but I can't imagine what else these big sparrows could have been); often very noisy. Both species occasionally went into the lower branches of smaller trees, up to heights of 10-15' or so.

We wanted to climb, so I didn't make extensive studies on the group to see who was attractive to whom, but the noisiness of the chickadees, nuthatches, and sparrows is suggestive. I mention the flock primarily because it is rather more elaborate than the chickadee/nuthatch flocks I'm accustomed to up here. It came and went through our campsite about 3 times in 4 hours. All of the species in it should have been resident on the mountain.

Delighted to hear that the sound spectrographs are, indeed, useful to you, and that the species is, as it appeared to me, hideously complex. You can imagine how I felt while actually running those things off, trying to get out the various nuances by one means or another. I hope your friends can get at the low frequency stuff better than I could; they can probably fiddle with their machine.

I see that I'm late in replying to your request that I look over your drawings of them - naturally I'll be happy to, do send them along. And let me know if the GE people get better resolution, as I may be able to learn some techniques from it. The machine I used was a Kay Electric Co., Missilyzer - presumably the same as their model. I suspect we might better look into the problem of "echos" in careful detail (if not now then in the future), since if one individual can introduce this effect at will into his own voice he may well be using it to modify his message. Cases where you suspect "fuzziness" of being real I might try to resolve with a narrow band filter. As far as this business of the pictures being entirely of harmonics of unseen fundamentals, this is something I think I've probably mentioned to you before, but is without any ethological significance that I can see. Presumably the actual vocal chords of the animals vibrate at much lower frequencies than the ones we hear (or see), and these frequencies set up harmonics in the animal's resonating system which then selects certain of these for amplification. When the Sonograph shows a fundamental and harmonics these are really a resonance fundamental and its harmonics. (In tyrannids, incidentally, I sometimes see a bird shift its emphasis from one harmonic to another, occasionally de-emphasizing the resonance fundamental without de-emphasizing one or more of its harmonics - God only knows how.)

My grant came through about 4 days ago and my first action was to telephone Kay Electric and place an order. The machine I'm after is designed to analyse the range 85-8,000cps, which is fine for tyrannids.

By playing a 7½ips tape at 15ips I can analyse the range from about 45- 4,000 cps, although the time axis will be compressed by ½. More important~~ly~~, though, I have also ordered a newly developed attachment which enables one to select any one-tenth of the vertical frequency scale (say, 85-800cps, or 800 to 1600) and magnify it to the size of the full spectrograph. By playing tapes at ½ speed I could instead look at the ranges 85-1600, 1600 to 3200, etc. In other words, although it may require more than one run to picture any given sound, this looks as if it may be our ultimate weapon - it should give us anything we want. (Ultrasonics can also be handled by simply slowing the tape playback - the problem is to get the original recordings, as you know.)

That news is good, but here's the rub. Delivery is "promised" as within 6 to 8 weeks (ie., late October, if they live up to their promise). Delivery of the special gadget to select any tenth for scale magnification will take an estimated 4 weeks longer (late Nov. or so). Now the ~~young~~ marmosets are, I hope, fairly high-pitched, so hopefully we shouldn't need the magnifier for them. I'd be happy to work on the tapes the instant the machine is available, and, if it comes on time, this could be soon enough for your December lecture. On the other hand, it gives us damn little leeway. (Aha, checking your letter I see that this is not a lecture but a book - which might give us more leeway.?) Two alternatives come to mind: 1) Griffin might let a technician do the job on his machine, but I doubt it - he specified me for the job originally, and trusts almost nobody else with the beast; 2) Cornell has, or at any rate, once started a Sonagraphing service at \$1 a shot - I used this for my thesis and they sure did amazingly crummy work. In a pinch, though, if the service still is operating ... Maybe your original Navy contact or your GE friends can help, but failing them I suspect I'm your best bet. I'm really quite happy to do the work for you, only wish I could promise to meet your deadline. I suspect I can meet it, and can make frantic phone-calls to Kay Electric from early October on to try to speed up delivery.

Technician: I budgeted \$2,500 in my grant for a part-time assistant and wrote a very tight grant which gives no leeway to shift funds about unless I forgo some equipment. With offers from you and MacArthur to use this person part time I can see totalling 3,500 (I'd not want either of you to contribute more than 500 as I don't imagine you'll have that much for the person to do - although I might sometime need some help from you for Sonograph maintenance) which would be a sufficient salary for a technician at Harvard. Lo and behold, tho', this University has a Personnel Service which sets pay scales - and I'd have to offer \$4800. Out of the question - but I'll find some way around, over or under this ruling; while squabbling about it here, I'm going to count on \$550 from you (500+ 10% for Soc Security, etc). Shall report on it as soon as I can.

I wonder if I dare try smuggling from Foto International - the thought of "cheap" Nagra's falls heavily on my sensitive ears. And a Sennheiser mike - wow; I got one approved in this grant, so shall be buying one, they do seem to be nearly ideal. Sorry my Cambridge dealer never came thru' on the Nagra - he's always been most reliable in dealings with me.

I'll check with a friend (Dick Phillips) as I think he had a student last year who was working with the hearing abilities of parrots. This ultra-sonic stuff of yours is a bit discouraging.

Is your problem with the long "song" phrases in Callicebus the same song problem as in birds - why the seemingly unnecessary complexity? Are these displays functionally equivalent? I have 2 not necessarily exclusive thoughts based on the tyrannids.

- 1) Complexity is being favoured for 2 ends (species and individual recognition) and there is no (?) countering selection pressure - hence the process carries on under its own momentum;
- 2) The "dawn song" of T. tyrannus contains units which, in a way, represent the entire vocabulary of the species, arranged in a highly fixed order. This may be illusionary. It may be that a kingbird when "singing" has highly mixed emotions - to some degree all of his buttons are pushed, but he can't do anything about it (as he's usually singing in predawn darkness, or when extremely frustrated). It may be a sure-fire way of identifying the species - other individuals are supplied with a complete vocabulary organized into a pattern, with variations in the pattern giving ~~species~~ individual identity. The redundancy

would be tremendous, but would permit absolute identification in any sonic environment.

I don't find any of these explanations really satisfying. Are we asking the equivalent question to "why does this beetle have 60 spots of white on his elytra and not 59, 61, or 30?"

Best regards to all. Susan sends her greetings to you, the Rs, and Stan, if he's arrived.

as ever,
John

304 Main Street
Etna, New York
12 October, 1964

Dr. Martin H. Moynihan
Canal Zone Biological Area
Drawer C
Balboa, Panama Canal Zone

Dear Martin,

Thank you for your letter of October 5th. I am waiting expectantly for word from your Washington office concerning my proposal.

I visited Bruce Tatge in Schenectady last week and did ask him about the monkey recordings. He said they would be run through the analyzer "soon". I will prod him gently if need be but you should hear from him within two weeks.

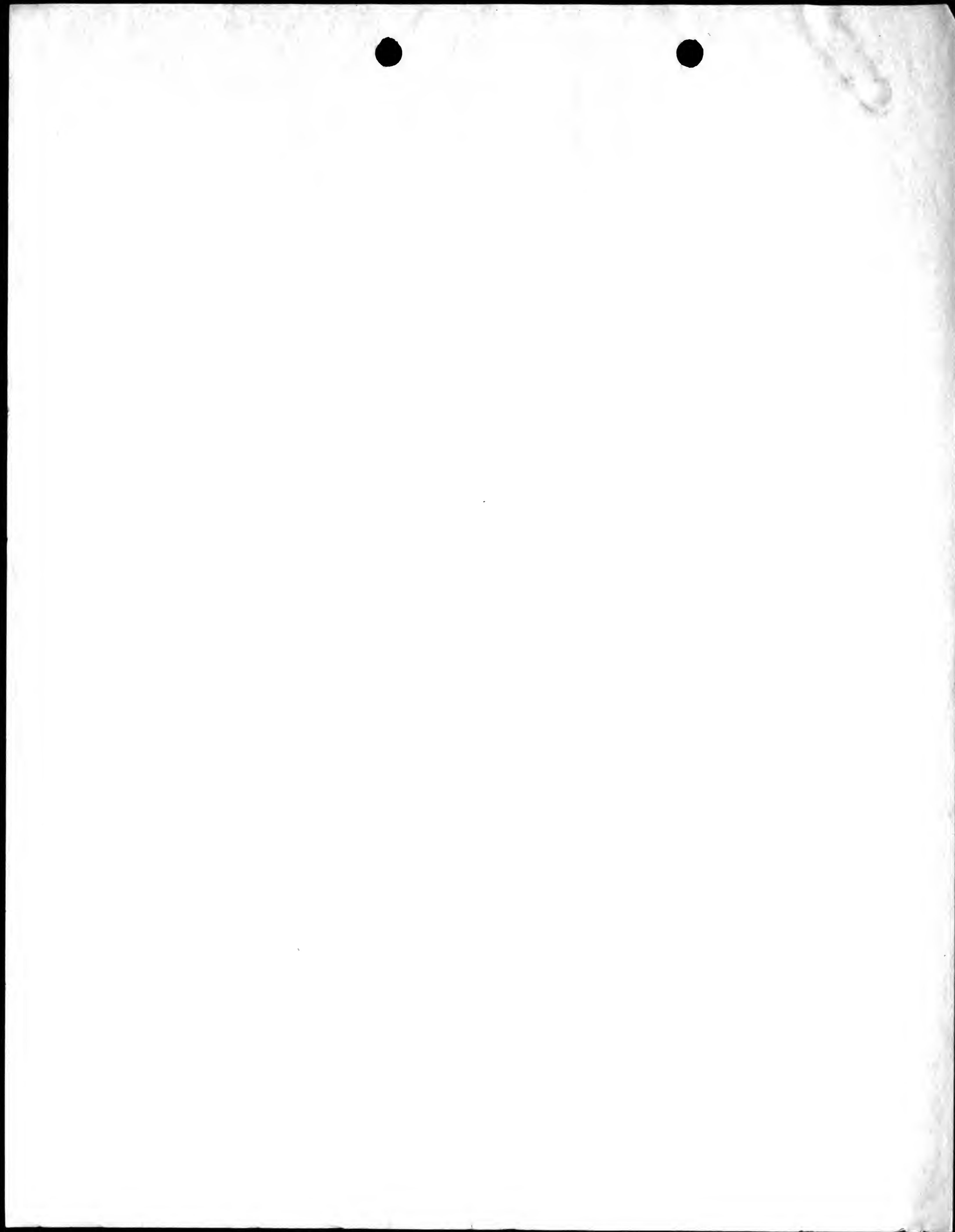
The cable amplifier for the Sennheiser microphone contains a "bass-rolloff" switch. This is essentially a low pass filter cutting out, partially, frequencies of 100 cps down. To obtain a flat response without the bass-rolloff keep the bar nearest the red spot.

Oh yes! Please forgive my neglecting to mark the sonographs frequency scale. I usually put it on the back but I must have forgotten to stamp them. Full speed on the vertical scale - .5 cm/kc; on the horizontal, 2.24 seconds. Half speed then, is 1 cm/kc and 1.12 sec.

I hope all is going well. I will write to you upon hearing from Washington.

Best regards,
Gene Morton

P.S. please forgive writing - typewriter is temporarily out of condition.



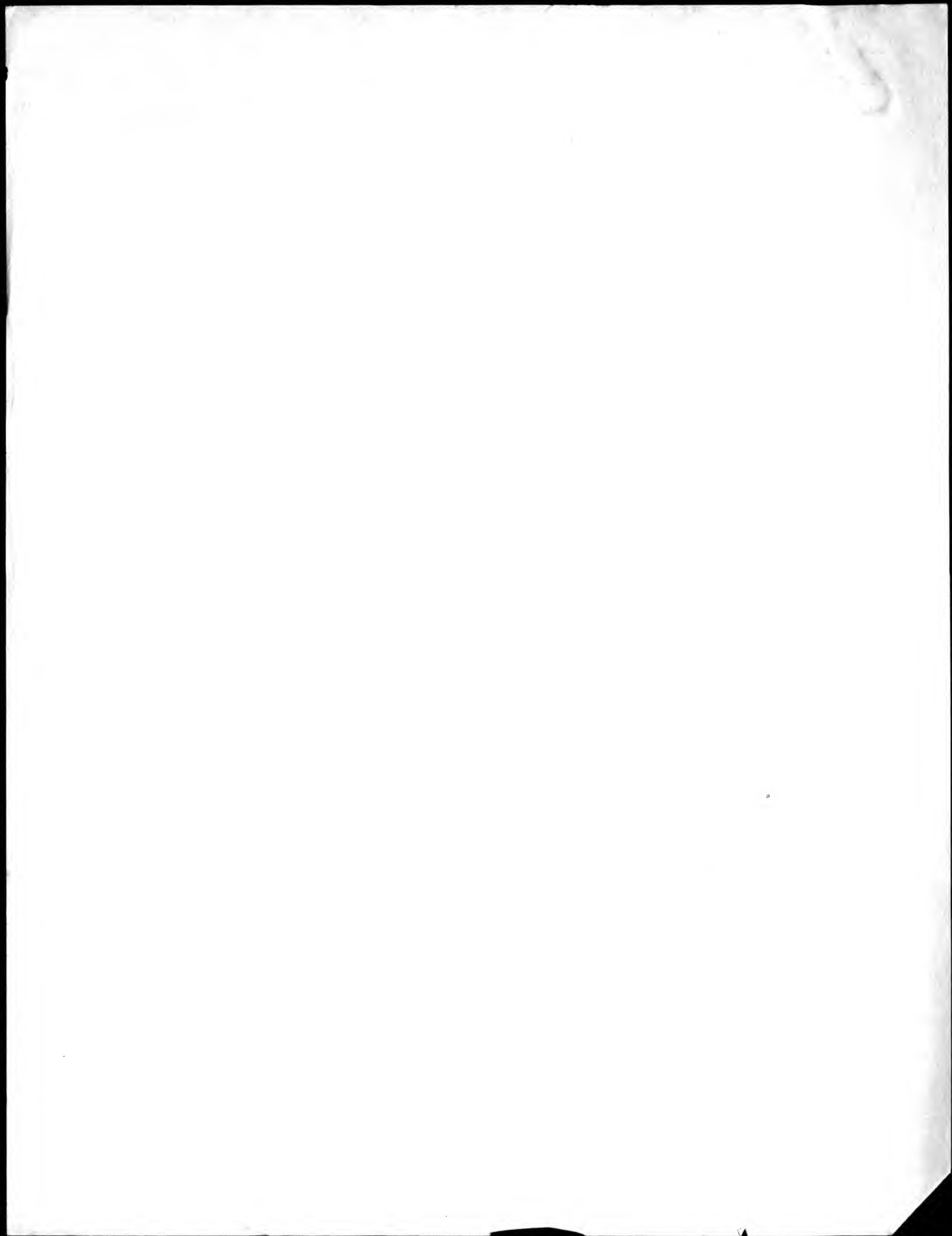
SOCIAL ORGANIZATION OF CALLICEBUS

William A. Mason

Delta Regional Primate Research Center

Callicebus is a small diurnal South American monkey, roughly similar in size to Aotus, the night monkey, to which it bears a superficial resemblance. Callicebus moloch ornatus, the subspecies which I am observing is distinguished by a deep suburn mantle that covers the throat and chest, white gloves, and a striking white band across the forehead which contrasts sharply with a black face and chestnut red crown.

The present results are based on the first six months of a projected one year field study in the Llanos of Eastern Colombia. The area consists of natural grassland or savannah and additional thousands of acres of artificial pastures which have been cleared in recent years. Nevertheless, a substantial number of forested areas remain as narrow galleries along the rivers and in the form of islands surrounded by savannah. Many of these contain stable populations of Callicebus and other monkeys (Alouatta, Cebus, Saimiri, Aotus).



Three such islands, ranging in size from approximately 3 to 17 acres, were selected for study. At one time all were part of the same large forest but they were isolated from each other in 1950 when large sections of the forest were cleared. The study areas were left as a water conservation measure, and so far as can be determined the monkey population has been virtually undisturbed for nearly 15 years.

The largest of the three forests, Socay, has been studied intensively since May 1964. The total population of Socay Forest is 28 monkeys, living in nine small groups of from two to four animals each. In the three- and four-animal groups it is clear in most cases that only two of the animals are fully mature.

The nine groups making up the population of Socay Forest constitute a community. Each group has frequent contact with its immediate neighbors and they, in turn, have relations with more remote groups. In this fashion a network is created in which each group either directly or through one or more intermediaries is in communication with each of the other groups in the forest. Furthermore, even those groups which are seldom, if ever, in visual contact may communicate directly through the elaborate vocalizations



which play such a prominent part in the social life of Calliobus.

As an approach to the social life of the monkeys in Socay Forest it will be helpful to start the day with a single group. Each family unit occupies a definite and fixed area which contains both its food and lodge trees. The Calliobus family retires at dusk to a tree thickly overgrown with vines in which it spends the night.

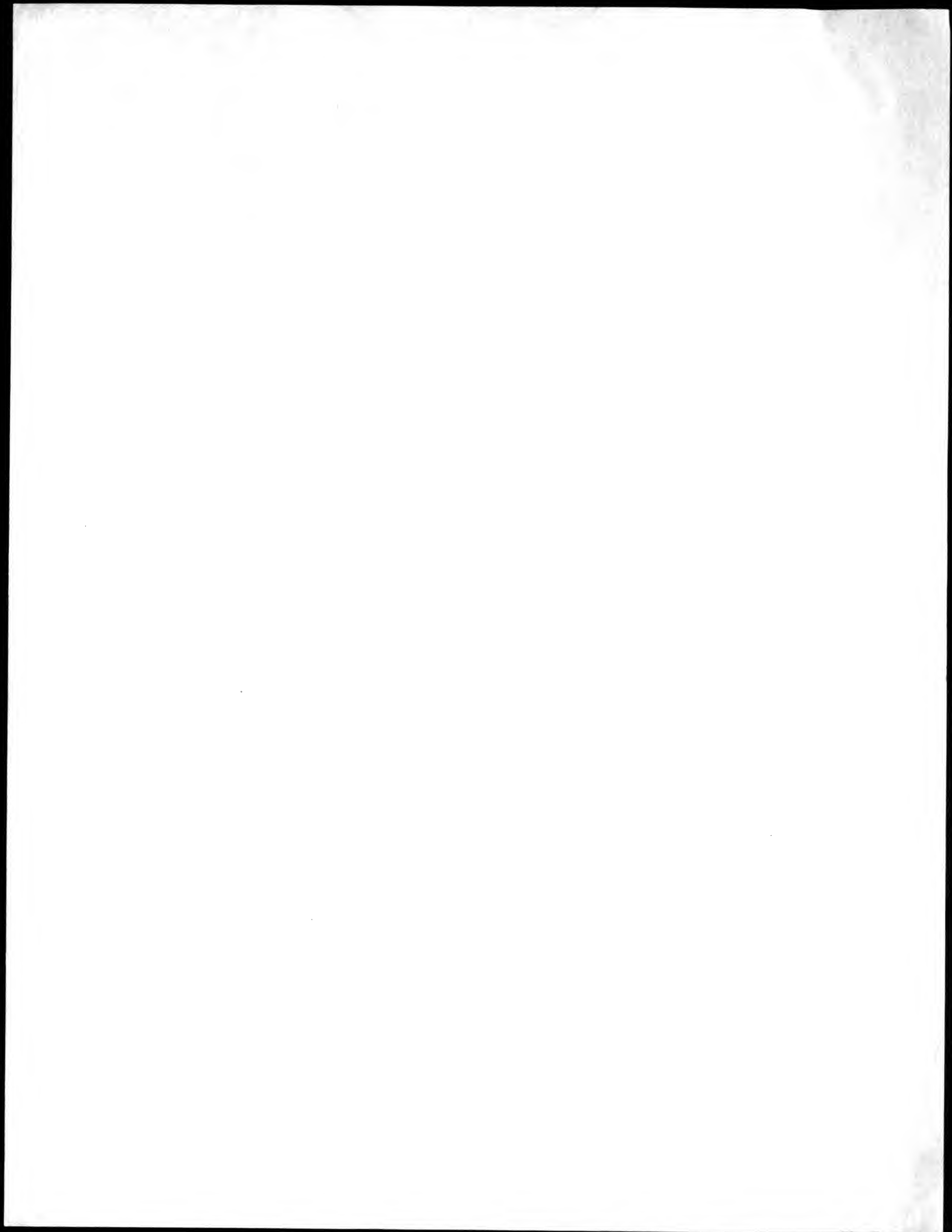
The day begins at the first hint of dawn. Usually the initial signs of life are faint stirrings, the sounds of urination and defecation, followed by one or two morning vocalizations, probably by the adult male. Frequently, this is followed by a longer series of calls in which both adult and sub-adult animals participate. The call is elaborate and the arrangement of its several components varies considerably from one occasion to the next. Calling characteristically begins with a series of ascending u-sh notes which increase rapidly in tempo and intensity. At the end of each pair of notes there is a sharp chuck or squeal. This form of calling may continue for 20-30 seconds and is often terminated by a series of rather slow, emphatic o-o-o-o sounds. All vocalization may cease at that point or the entire sequence may be repeated.

In anywhere from a few minutes to half an hour after the first call,



the group leaves the lodge tree and begins to feed.

Groups from neighboring areas frequently meet as they move toward their food trees. These are not chance encounters, nor do they seem to be the result of attraction to a common food source. The animals actively converge toward each other and meet in the same cluster of trees day after day, usually at the boundaries of their territories. Slide _____ shows the areas in which these encounters most frequently occur. As the opposing pairs approach, each animal draws closer to its mate. Characteristically, male and female sit with sides pressed together facing the opposing pair in an adjacent tree. The male of one pair begins to make the same low-pitched moans that were heard as the day began. As he vocalizes he presses closer to his mate and often looks toward her and touches her; and she together with the members of the opposing pair may join with him in a sustained call. During vocalization both members of the pair may stand on all fours and face the opposing pair. Often they seem to swell to half again their normal size as the result of arching their backs, stiffening or bowing of the limbs and piloerection. The animals shake vigorously with the effort of calling and the impression of tension and agitation is often strengthened as the animals sway their

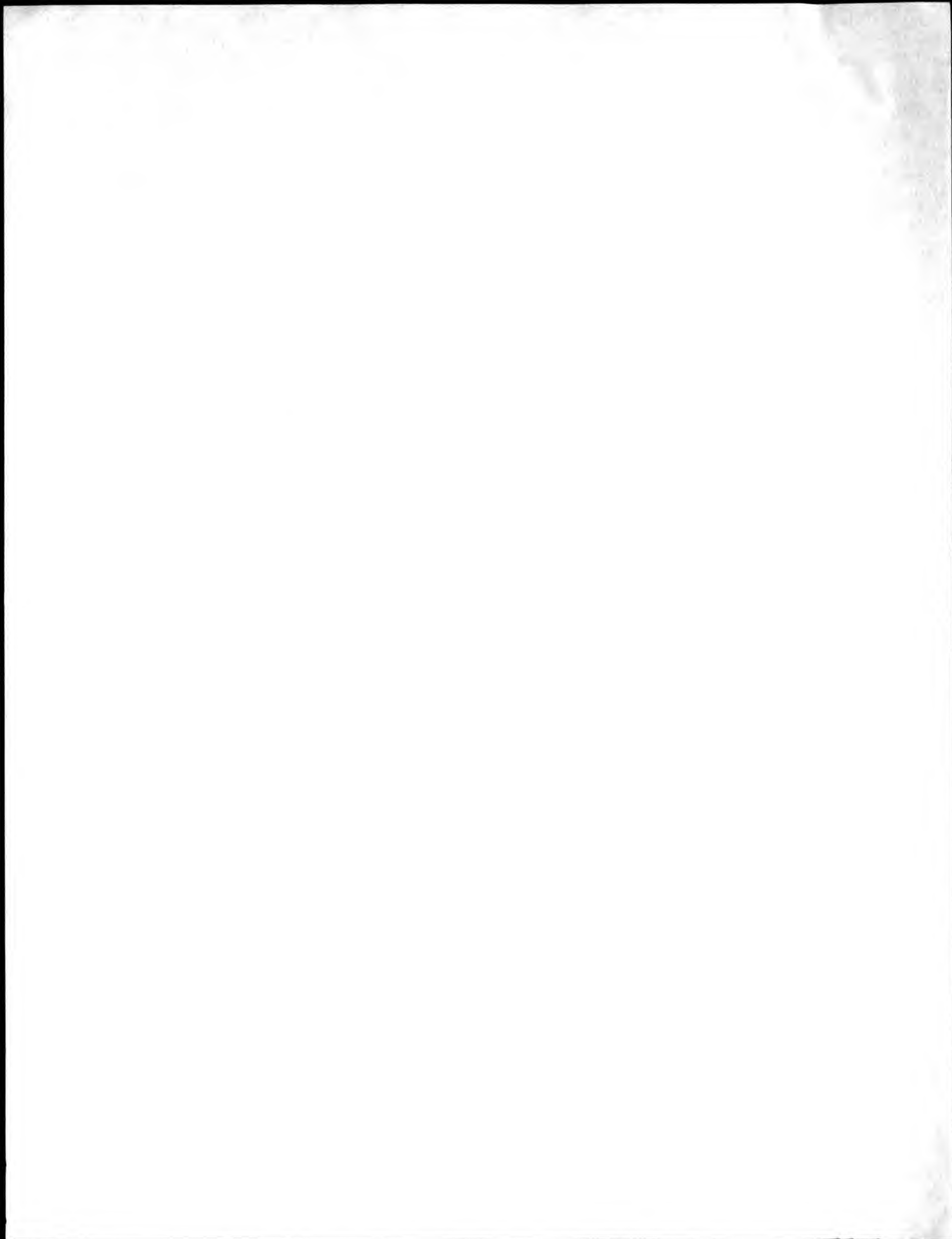


tails rhythmically as they call.

The vocal interchange may continue without pause for 5 minutes or longer.

At times only one animal or one pair will call; often, however, all animals call in concert. The large volume of sound is surprising in view of the relatively small size of the animals; on a quiet day calling easily carries for a mile.

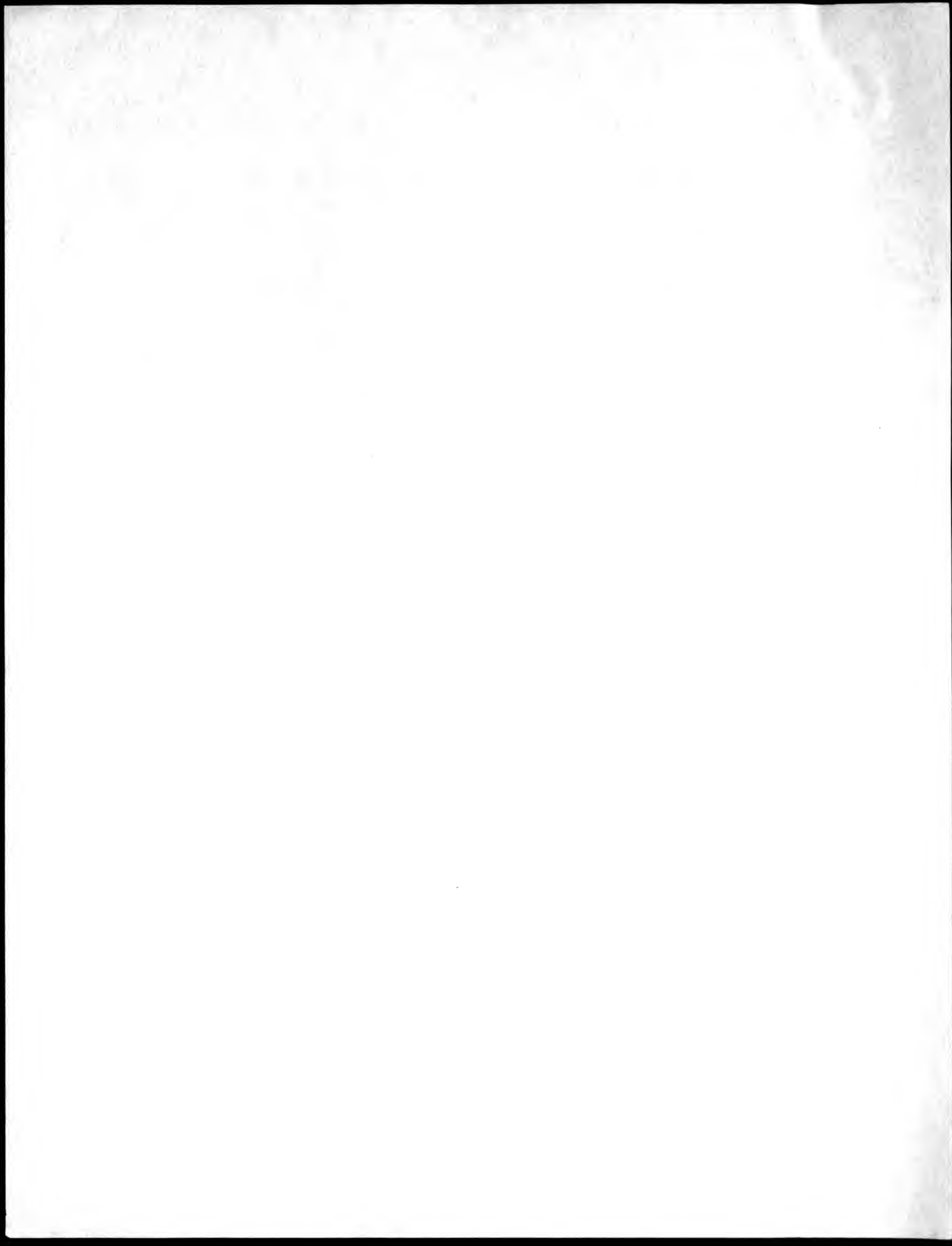
While they call, the opposing pairs often edge closer together; individual animals leap forward or up a few feet, then suddenly, with no apparent forewarning, a male dashes toward the opposing pair. He may withdraw at once whether there is a counter-rush or not, or the rush may develop into an extended chase, in which most often only the males appear to be involved. During a chase the customary pathways are abandoned and the monkeys race across the tops of the trees, make perilous crossings, descend to a few feet above the ground, and sometimes fall or leap to the forest floor where pursuit continues until the fleeing animal finds a vine or a slender tree and scampers up. Rarely is an animal caught and even when this happens the consequences are not severe. There is no extended fight; the pursuer pushes and slaps at its victim, may bite him once or twice, there are a few squeals and it is over. The chase is not an invariable climax to the meeting between



groups. At times one or more of the participants seem to lose interest and begin to feed, or simply sit quietly. Often both members of the pair sit side by side with their tails twined. Although this is a frequent pattern for the Callicebus it is more often seen during the midday rest period or in the evening as the animals settle down for the night.

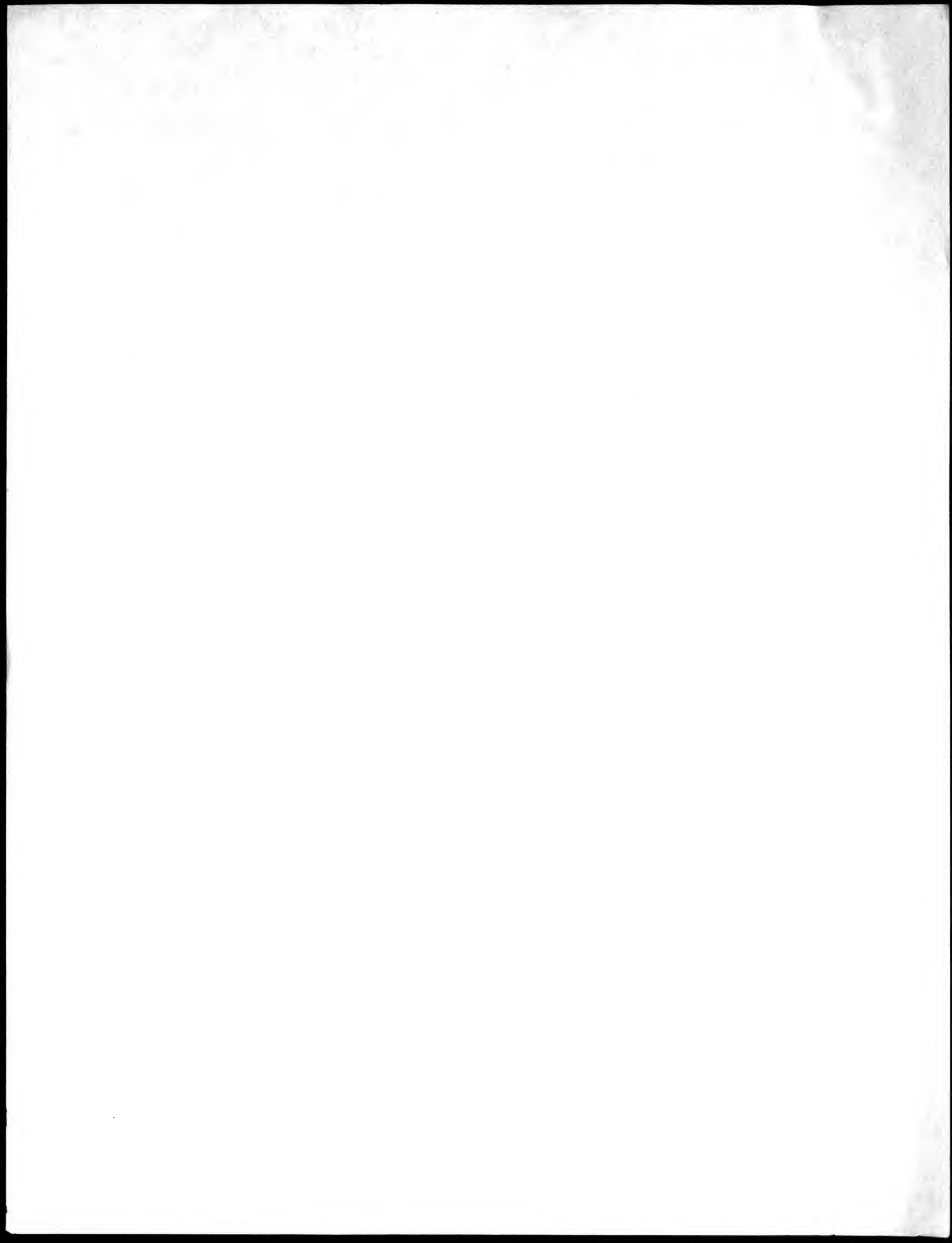
Another response which is sometimes associated with the interchanges between groups is chest rubbing. Callicebus appears to have a small patch of glandular tissue over the chest which may be implicated in this response. The animal loosely grasps a branch with its hands and pushes itself slowly forward allowing the hands to slide while the feet remain fixed. Often it pauses at the end of a push and appears to sniff or mouth the area it has just rubbed. The entire sequence is often repeated 5 to 10 times. Although this could be a form of territorial marking, it does not always occur in boundary areas. Furthermore, I have yet to see one animal respond to a limb marked by another.

The entire episode from the first meeting of the groups until they go their separate ways may occupy less than five minutes to as much as half an hour or more. Typically, all parties resume feeding.



After the early-morning face-to-face encounters have ended and the animals have returned to the cores of their respective areas there sometimes occurs a remarkable vocal pattern. This is a short call and sounds very much like the gobbling of a turkey. Its most peculiar feature, however, is not its sound quality, but the fact that it is uttered simultaneously by several groups. I believe the call is usually produced by the males, although females occasionally join. Typically, a single animal in one group begins the call. Within a fraction of a second it is taken up by other animals in different groups, and the calling passes rapidly through the forest as a kind of chain reaction. Each burst of call ends abruptly in less than 10 seconds, but the call is usually repeated at frequent intervals for 5 minutes or more.

At first I thought that the early morning encounters and the vocal chain reactions were similar to the territorial disputes that have been so carefully described for birds. I do still believe that the defense or maintenance of territory is an important element in these activities, but other factors are definitely involved, and this is particularly evident when the female is sexually receptive. Under these circumstances instead of fleeing from the

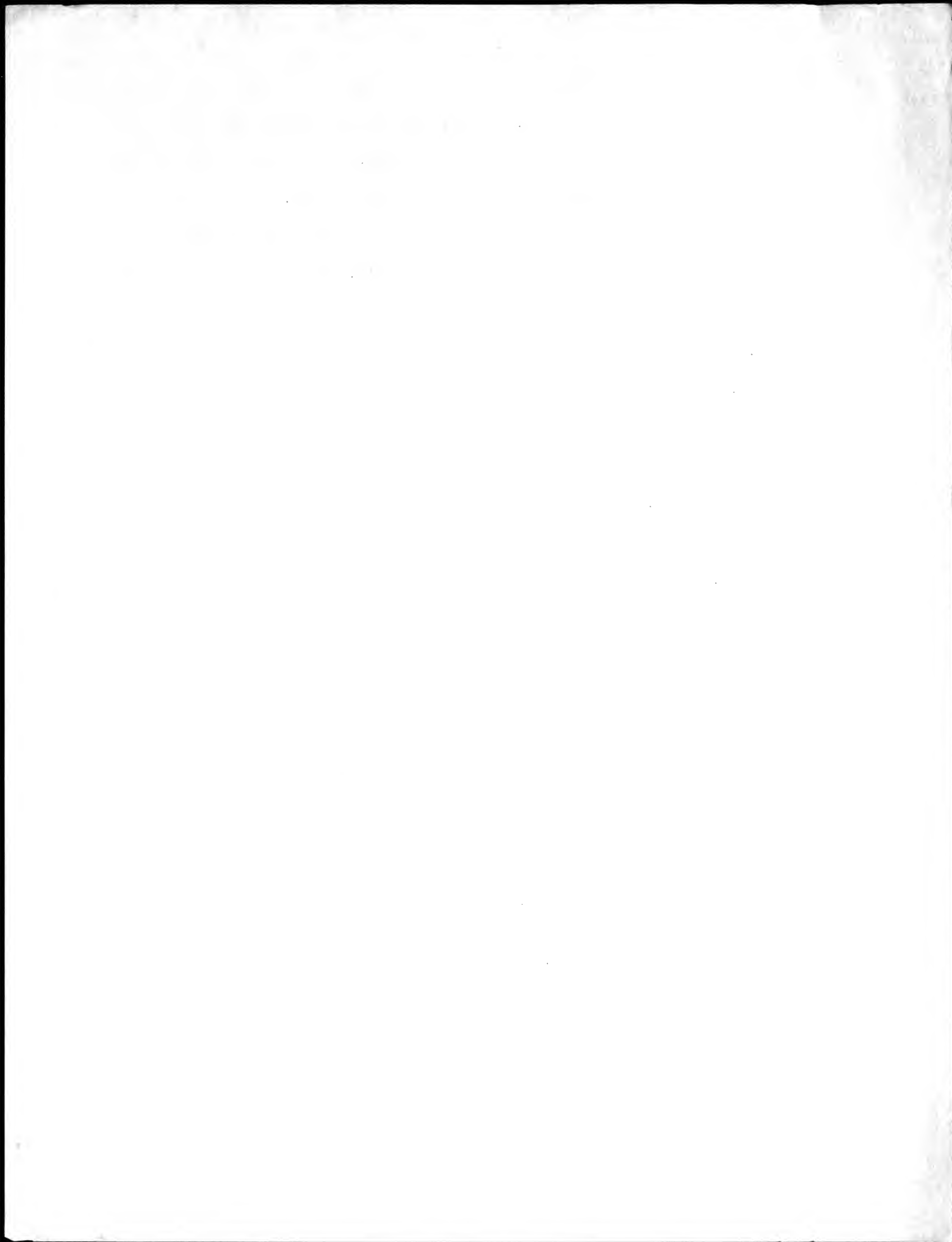


onrush of the opposing male, as she usually does, she may sit quietly as he approaches or even approach him. Mutual genital inspection may follow or they may begin to copulate without preliminaries, or at least attempt to do so before her mate countercharges and interrupts the act. At the same time that the female is showing an obvious interest in neighboring males she may be indifferent to the sexual advances of her mate. The next three photographs were taken during a long episode in which the male repeatedly solicited the female. The slides show the male reaching toward and manipulating the female's genitals. During this same episode oral contacts and incomplete mountings were also common. In spite of the persistence of her mate, the female twice fled from him, but was overtaken before she had joined the male from the neighboring group. On this and other occasions I have seen the male restrain his mate as she attempted to move away from him. This is illustrated in the next slide.

Although it is possible that the female may remain with the neighboring male, she probably does not. An episode that I observed recently perhaps best illustrates the typical situation. A male and female of neighboring pairs approached each other, copulated, then separated, the male moving off while the female returned to her customary partner. Although her mate had twice rushed the pair as they attempted to copulate, he showed no unusual reaction to the female upon her return.

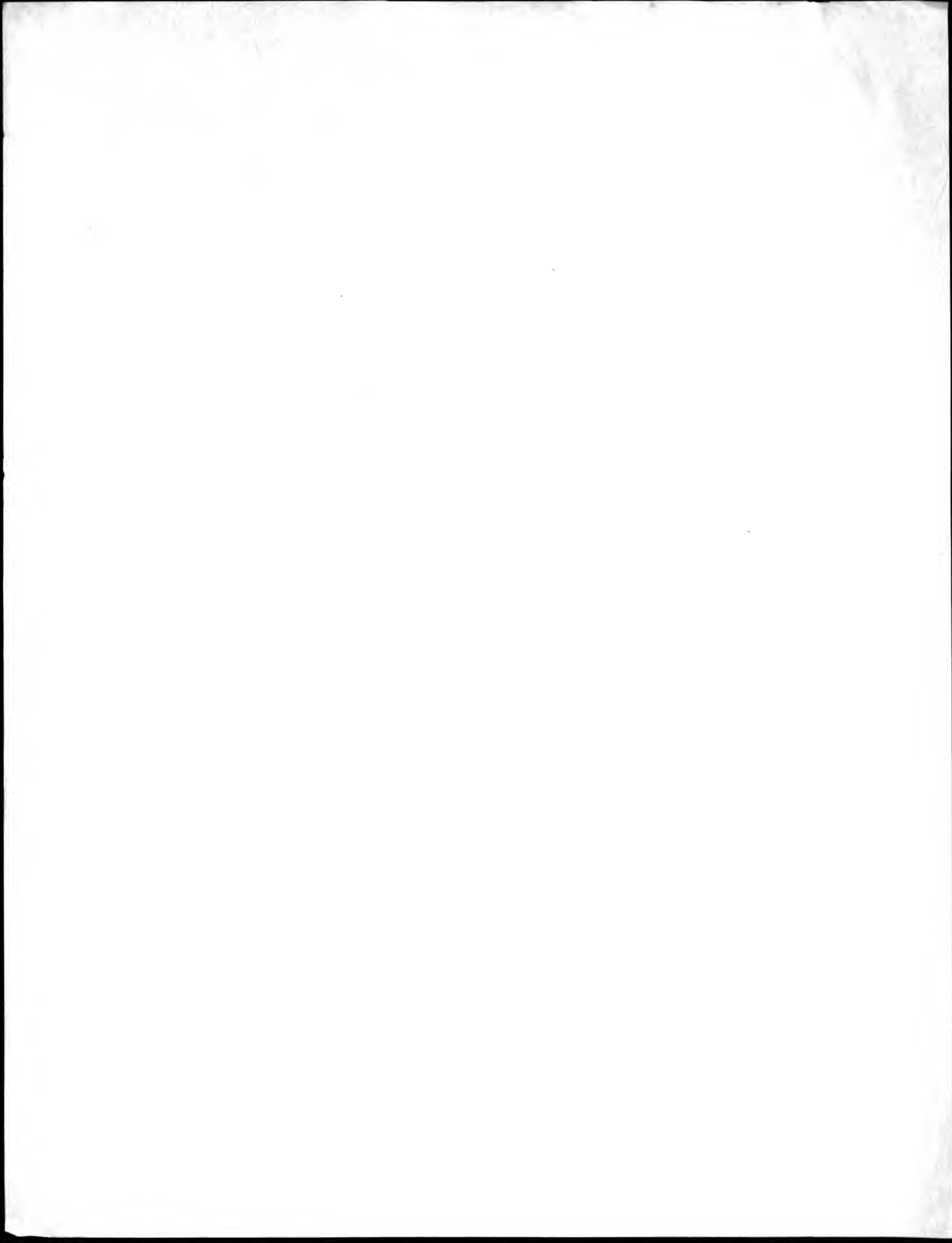
There are many other indications that in spite of the sexual attraction of both male and female to members of neighboring groups, the bond between mates is strong and enduring. Although I cannot identify most animals individually, in those pairs in which I can there has been no evidence of a change since my first contacts. Ordinarily the members of a pair follow each other closely and are usually found within a few feet of each other during feeding and rest periods. Generally speaking, the attraction is mutual.

Either



sex may follow the other and leadership changes frequently throughout the day. Often when one animal has finished feeding it will sit at the edge of the food tree and wait until its mate approaches before moving on. Grooming, nuzzling or manual contact, and sitting for long periods of time with sides pressed together and tails twined provide further evidence of the breadth of social ties. Finally, it should be noted that when the animals become separated and lose contact, there are various signs of distress, particularly whining vocalizations which if ineffective may lead to more elaborate calls. Although the young animals are closely associated with the adults at most times, there are indications in some groups that juvenile animals are occasionally the target of adult aggression.

Although the populations of two remaining smaller forests have not been studied intensively, some interesting contrasts with the pattern described for Hoday Forest are already evident. One forest contains five Callicebus monkeys and a single male squirrel monkey; the other contains at least 5 and probably six Callicebus monkeys. In both forests the animals are organized into a single group. Individuals may be scattered throughout the forest during feeding, but move together on at least some occasions and



and appear to occupy the same ledge tree at night. Furthermore, although these groups vocalize at dawn and more rarely at other hours of the day, the amount of vocalization appears to be much less than in the larger forest, even if one allows for the fact that a smaller number of animals is involved.

The source of these differences is not clear. In Soco Forest there is a strong suggestion that the basic social unit is the pair with one or two associated young. Furthermore, there are indications that juveniles are under some pressures from adults that may eventually force them out of the group. In the groups of 5 and 6 animals found in the smaller forests, the thesis that the basic social unit is the pair with associated offspring of the preceding two years is tenable only if one further assumes that twinning has occurred. This seems improbable. An explanation in terms of the density of population might also be considered. In all forests, however, animal density is approximately the same (2 animals per acre).

There have been no births in any of the three forests for the past 5 months. This fact together with a sharp rise in sex behavior during July, August and early September suggests that reproductive behavior may be seasonal in this area. It will be of considerable interest to observe the effects of



the arrival of young on social organization, particularly in the three-
and four-animal groups of Sessy Forest.



Second Callicebus Tape for Spectrograms

I Barbacal. Pair co. First down song (minus preliminary Moaning notes). Magna-ferm heater 15" per sec

Would it be possible to get spectrograms of the whole song on this section? I know its a lot - but it would be extremely useful to me

Quint. also
cut out
every 1/2 sec
int. Rem.

II Barbacal. Four more-or-less-noncommittal, indifferen-
tiated, "song" notes. Quite Quint-like. Obviously very low
intensity

I would like to get two or three of these notes, in natural
sequence (so that I can show the intervals between them)

III Barbacal. Brief low-intensity song phrase. As near to
typical Gobbling as anything I got at Barbacal I should
like to get the whole phrase.

IV Barbacal CHN2

This section starts out with one single note, and then
has several double notes (--- --- --- etc)
I should like to get a couple of the "doublets")

V Barbacal CHN2

This section starts out with one single note, and then
has two series of 3 notes each. I should like to get both
the latter

(2)
II Barro Colorado 1A ♂ (inside, with audio)

One burst of 2 rather low pitched notes, uttered close together, in fact pumping rhythm. I should like to get all 3 of these notes

III Barro Colorado 1A ♂ (outside)

This stretch is tricky. It begins with a brief lowered long phrase by some animal(s) in the distance. Then there is an equally lowered phrase by an animal near the mike. There is some overlap between the phrases of the different animals. I would like to get the complete phrase of the near animal, without the phrase of the other(s) in the background. If this is not possible, I would like to get the complete phrases of all the animals.

IV Barro Colorado 1A ♂ (outside)

Sneeze - Moan - then a peculiar mixture of Moans & "Chuck" Notes. I should like the Sneeze plus the next 6-8 Notes

V Barro Colorado 1A ♂ (outside)

There is one soft high pitched trill on this section which I would like to get

VI Barro Colorado 2A ♀ (outside)

One Trill

VII Barro Colorado 2A ♀ (outside)

One Trill

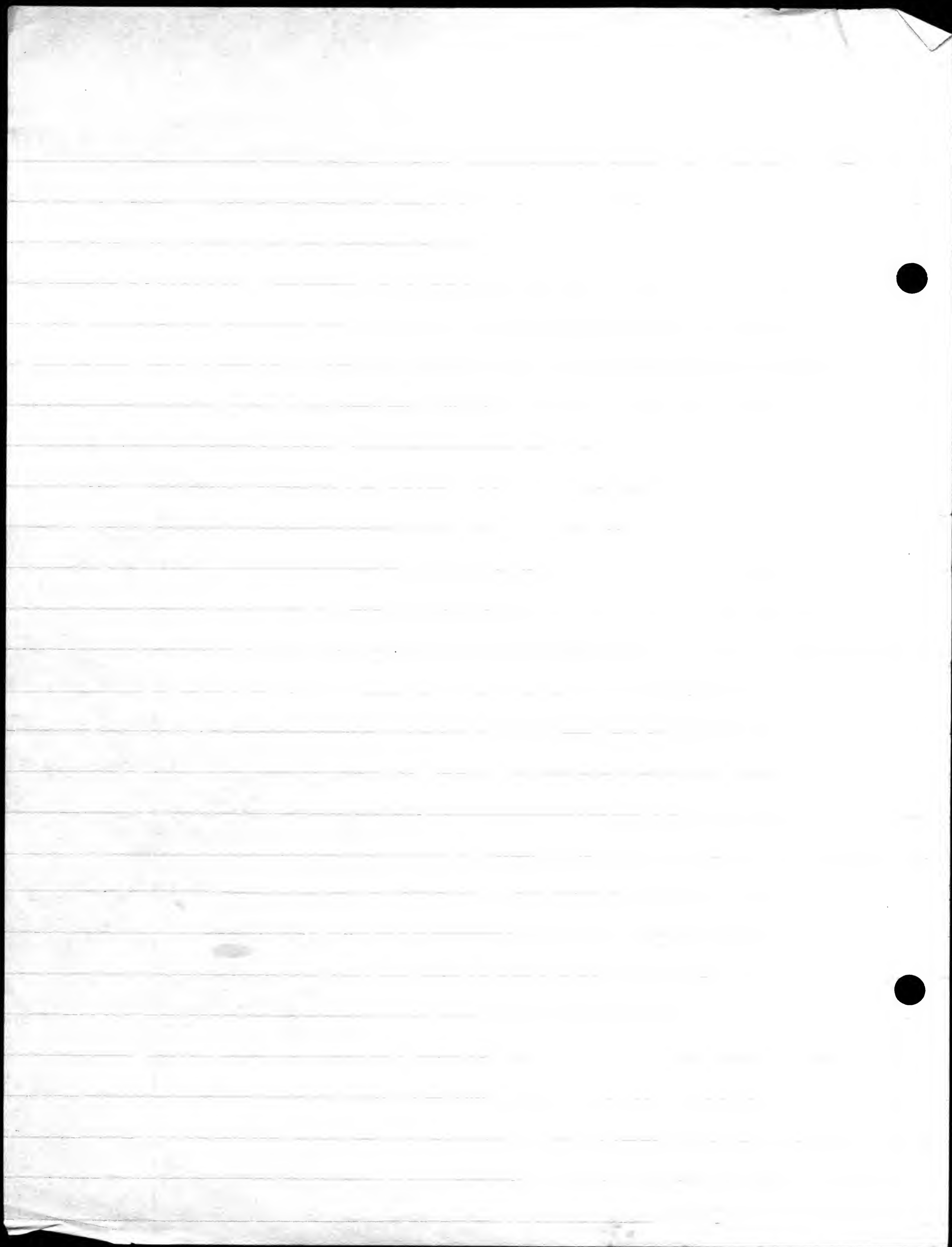
XII Barro Colorado 1A ♂ (inside)

Series of low notes uttered very rapidly one right after the other, at beginning of long song phrase. I should like to get as much of the rapid notes as possible (containing the first 4 or 5).

There are a couple of soft notes in background at very beginning. Ignore these.

Everything done at 15", with Nagra Tape Recorder and Leubner's microphone

M



✓ I Dawn Song Barbareal

2 "undifferentiated" Quits (8)

1 Syllabic Resonating Note
(BM + chuck) (10)

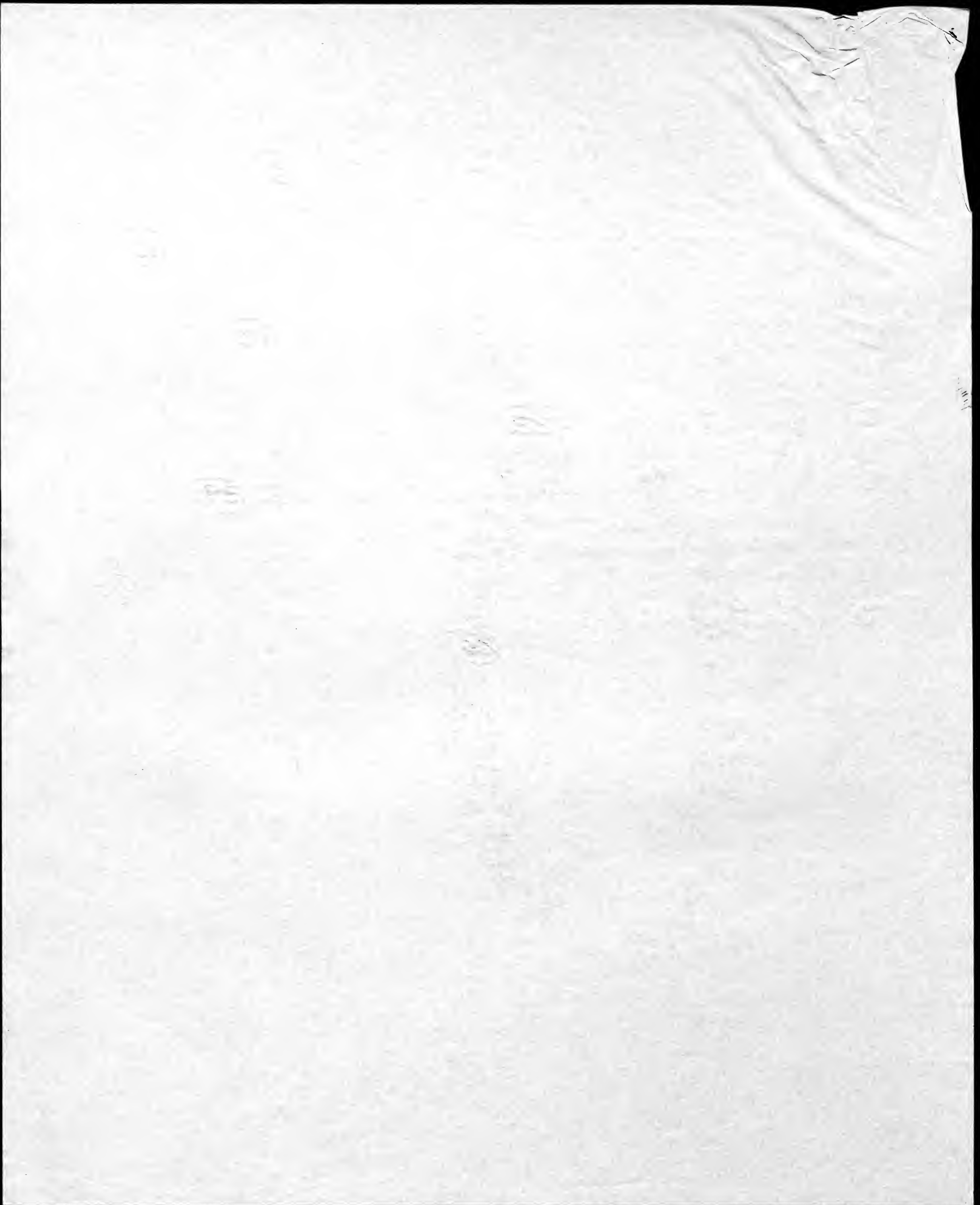
XII Undifferentiated Quits Barbareal (14)

✓ V Triplet Chirrup (33)

XIII Single undifferentiated quit-like note (39)

✓ VIII Swoosh - Moan - Peculiar Moan - chuck - "Uuli"
(48)

✓ XI Tull isolated 2A ♀ (60)



Comparison with other Platyrrhini. Resemblance to Alouatta, p. 45. Resemblance to Ateles, 12. Resemblance to Pitheciini, 85. Resemblance to Saguinus, Charrupung, 100; White, 107. Probable relationship between vocalizations of a juvenile and vocalizations of Ateles and Saguinus, 10. Differences from Ateles, 77. Much less Ateles-like than Saguinus, 46.

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Friday 8:30

CALLICEBUS

I.

100-100000



Callicebus (torquatus?)

①

cupreus?

November 10, 1958

Jappon Zoo

There is a single Titi here, which I think belongs to the species listed above. In a small cage by itself. I was only able to watch it for about a half hour.

Looks quite remarkably marmoset-like. Also quite like the Night Monkey, almost exactly intermediate between the two in fact. From the little I saw, it sits hunched up like the Night Monkey. Uses its fingers all together, like the marmosets and the uakari (and presumably, the night monkey).

This animal was also surprisingly silent. Much more silent than any other apparently healthy monkey I have ever observed in similar circumstances.

The only display it showed was a form of yell. This was not infrequent, apparently provoked by and directed toward me. Very very soft, even softer than the yell's of Cebuella (see today's notes on the latter genus.) Always single, but sometimes the single yell note was moderately prolonged. Always done with mouth apparently absolutely closed. This yell was much more like the yells of such forms as the capuchins than like the yells of the Panama Phebe's — in sound — and I think possibly also in motivation. Possibly uttered when the escape drive was stronger than attack, but not accompanied by indications of very wild panic.

This animal did not do any side to side swaying & peering when it was obviously alarmed by my presence.

November 21, 1958

Barro Colorado

The single Jiti from the Tarpon Zoo was sent down here and arrived a couple of days ago. It is a ♀. I shall call it A.

It is either a very tame animal, or slightly sick, or this species is relatively very quiet in behavior. The animal was first put in a large cage with the Squirrel Monkeys. It did almost nothing there, except eat a little, feed a lot, and occasionally try to join up with the Squirrel Monkeys (who usually tried to avoid it). I thought it must be sick, so I brought it into my house today, where it seems to have perked up a little. Or, at least, where I have been able to observe some behavior of some interest. Some corrections to my previous notes.

The general proportions, a hunched manner of sitting, of this species are most reminiscent of the Night Monkey. So is its fur.

It tends to use its fingers all appressed together, when walking on branches or manipulating food. But I have seen it walk along a small branch with its thumb completely appressed to all the other fingers, and the thumb is sometimes slightly appressed when it manipulates such objects as grapes. I have also, once, seen it appose the first 2 fingers to the others, slightly, when walking along the edge of a window sill.

It seems to scratch & groom itself primarily with its hind feet, like the Panama Priche's.

It usually or always picks up food with its mouth, and then holds the food with its hands.

It cleans its face in the usual way, by rubbing it along something.

This animal has been quite vocal today. The two common calls have been the soft whistling Trill described above on Nov. 10, p. 1, and a short soft whistle. I shall call the former "S Trill" and the latter "Wtrill". An ordinary Wtrill Note seems to be exactly like the S Trill, except that it doesn't have any underlying quaver. The two patterns are obviously closely related. They are both probably hostile, and they are both probably fairly low intensity. I think that the Wtrill is probably slightly more aggressive than the S Trill. The Wtrill Notes are very commonly given when the animal is picked up in the hand, but it seems to be moderately aggressive in such circumstances, as it does try to bite from time to time (see below). The Wtrill Notes were given by A this morning after we released it in the cage in my room. The S Trill Notes are also given when the animal is picked up in the hand, but they are much less common than Wtrill Notes in such circumstances. It is my impression that the S Trill Notes are most apt to be given when I approach the animal and it seems to be poised for flight, (but at least some Wtrill Notes may also be given in the same situation). If the S Trill is really less aggressive than the Wtrill, this would indicate that it is probably homologous with the Trill's of such species as the Panama Black Spider Monkey and the Capuchin, (in which the Trills are produced when E is probably stronger than A, but both are weak — in contradistinction to the Trills of Panama Pichie's which are definitely high intensity.) I think that both the S Trill and Wtrill are usually or always given with the mou-

th almost or completely closed.

The behavior of this animal in the hand is rather peculiar. It struggles and bites a little, but does neither as much as the other monkeys we have kept (except for the little H Prichie when she was tamed). This relative (but only relative!) gentleness is probably correlated with the relatively soft notes usually uttered in such circumstances, and the animal may even struggle for several minutes quite silently, without even uttering S Trill's or Wtll's. All this may ultimately be due to the fact that this animal doesn't have very sharp teeth in comparison with most other species. It has gnawed on my fingers very vigorously at times and only drawn a very little bit of blood.

Occasionally, when the animal is held in the hand, at moments when its struggles become particularly vigorous, it may utter one or two loud notes, much much louder than the S Trill Notes and ordinary Wtll's, but equally short. These loud notes are also a sort of Trill, which I shall call "L-Trill". They don't have the whistling quality of the S Trill's, and they are definitely deeper in pitch. The L-Trill's sound quite like the ordinary Trill's of the young Panama Black Spider Monkeys, but they are obviously high intensity rather than low intensity. They may be homologous with the Trill's of the Prichie's, but the circumstances in which they occur would suggest that they are at least analogous (and possibly homologous) with the K and Scream Patterns of other species.

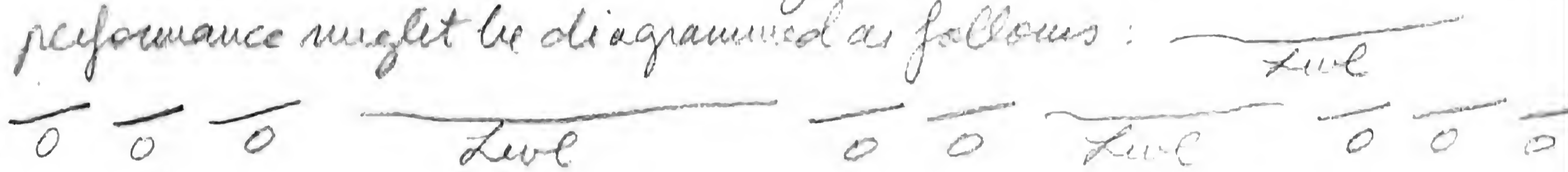
When the animal is struggling in my hand and obviously wanting to bite me, it often does a pronounced PT. Quite silent

Quite like the ET of the Old World species, except that the jaws are usually kept short.

Wtl Notes may be repeated one right after the other for quite long periods of time, and the length of the individual notes may vary somewhat, although all the "ordinary" Wtl Notes are at least moderately short. Sometimes the animal faces me and utters a series of 3 or 4 or 5 very short Wtl Notes, which are rather reminiscent of the GDC of the Panama Pichie's & Cottontops. I am not sure if this resemblance is deceptive or not.

A has also uttered quite a lot of longer & louder whistle-like notes. These are very similar in quality to the ordinary Wtl's, but very very much longer, and I shall call them "Lwl's." It is my impression that the Wtl's and Lwl's may be related in some way, but morphological intermediates between the two seem to be relatively rare. A gave its first Lwl's this morning some time after it was isolated in the cage in my house. I thought that these Lwl's might be homologous with the LW's of the Panama Pichie's. They sound very much like the LW's, except that they don't have the plaintive quality of the latter. Some of these first LW's were given by themselves alone - which accentuated their resemblance to LW's - but others were immediately followed by peculiar barking noises - and now I really don't know what to think. The barks which may occur after Lwl's are rather peculiar in quality. They are usually or always partly or completely bisyllabic. A single bark of this type might be transcribed as "Nuh-huh." Something about these barks is rather reminiscent of the gfp's of the Night Monkey, but they are

almost completely lacking in the liquid quality of the gyps.
These barking noises are probably the "rouquido" described
by Mied and Jimenez de la Espada, and the "Oh!" described by
Miller, cited by Cabrera & Yepes. I think I shall call them
O. I have never heard any O except after Lwl, and the number
of O Notes after Lwl may vary from 2 or 3 to many more (I have
heard at least 7 or 8 uttered in very rapid succession). The whole
performance might be diagrammed as follows:



etc. etc. O Notes are uttered with the mouth quite widely open,
and there is some slight tendency to close the mouth, partly and
very briefly, between notes when a series of O's is uttered in rapid
succession. All the O's are also accompanied by pronounced PL.

The O Notes are certainly remarkably resonant, almost
"ullulating", to be uttered by so small an animal.

The circumstances in which Lwl's, and Lwl-O's were
uttered later today were not particularly helpful in elucidating
their significance. Sometimes the animal just seemed to give the
calls for no obvious reason at all. There was only one definite
situation in which I seemed to be able to provoke Lwl-O's
at will, for a short period of time (perhaps 1/2 hr). This was
when the animal was sitting in my bedroom, sunning itself on the
window-sill. I would go into the bedroom from time to time,
go up close to the animal and talk to it. It responded to this
with S-Hill's and/or ordinary W-still Notes. Then, whenever I
left, just as or just after I disappeared through the doorway

the animal would invariably give a single *Ful* followed by a burst of *O*'s. This might be interpreted in either one of two ways. A may have been trying to "call me back" — in which case the whole performance might well be at least analogous with the *W*'s of the *Pithecia*'s. It is also possible, however, that the performance was hostile and somewhat aggressive. My approach to A obviously stimulated his hostility, and my retreat must have reduced the strength of his *E* drive. (Arguing against this latter interpretation, however, is the fact that neither *Ful*'s nor *O*'s are uttered by the animal when I pick it up in my hand.)

This A animal showed two other interesting non-vocal hostile reactions today.

Whenever I put my hand close to its face, if it didn't flee immediately, it would close its eyes. Frequently did this when it was quite silent, but also during *S* *Ful*'s and *W* *W*'s. Obviously an alarm reaction (This species also closes or partly closes its eyes when seizing insects to eat. Obviously adaptive in these latter circumstances.) I shall call this pattern "EC".

A also showed a tendency to lower its head slightly, bending it down toward its chest, when it was alarmed. This did not always occur when it was alarmed, and the movement is so inconspicuous, that I was not sure that it really "meant" anything at all, but once this afternoon, when it was walking across the floor and I suddenly moved toward it, it puts its head way down, so much so that the head was well between its arms. Just stopped a rat like that for an appreciable number of words. This must have been significant. It is ju

alarmed or frightened by me.

I have sometimes got the impression that the S Trill was just a low intensity form of whatever the Wtll is. This raises a problem, as some of the Wtll's seem to be almost certainly hostile. It is possible, however, that they are both "general frustration" reactions at least to some extent. It is possible, in fact, that the whole series may be $\text{Lwl} + \text{O} > \text{Wtll} > \text{S Trill}$. The only problem with this theory is that I can't really tell why the animal should be so strongly frustrated in the not very destructive circumstances in which it gives $\text{Lwl} + \text{O}$. I do have some evidence to support this theory, however. Today, not only did the animal give relatively fewer Wtll's than yesterday, but it also only gave one or two relatively very brief bursts of $\text{Lwl} + \text{O}$. In other words, the $\text{Lwl} + \text{O}$ had decreased a great deal while the Wtll's had only decreased a moderate amount. Another incident this evening proved even more significant in this connection. The animal got stuck way on top of a cornice, and I had to grab it. When I first got it, it uttered a lot of Wtll Notes, but later on, while I held it in my hand and scratched and stroked it, it gradually calmed down & almost ceased to struggle. After it calmed down, it gave me few notes, and these were all S Trill's.

Another interesting aspect of this latter incident is that when I first grabbed the monkey and it was struggling most violently, most of its Wtll Notes were very short, and repeated very rapidly. The rhythm made me think of the KK of the Pichie's. It is possible, I think, that these rapid Wtll Notes were really homologous with the KK. If so, some, at least, of the longer, out-

mean, Wtl's must be homologous with the K Notes of the Piches.

I suppose that one might compare the "equivalent" notes of several species more or less as follows.

<u>Saguinus</u>		<u>Callicebus</u>		<u>Atetes etc.</u>
		Srll	=	Squ
K	=	Ordinary Wtl's	=	Single or slow B
KK	=	Rapid repeated Wtl's	=	Rapid series of B
Srll	=	L-Frll		

This little Siti showed one pattern today which I had not noticed before. This is what I will call "grasping" (gn) Done after I picked it up, while I was still holding it in my hand. Opening & closing the mouth repeatedly and very rapidly, with a quite definite sharp sound when the teeth snapped together each time, but without any real call or notes. Presumably hostile and aggressive, probably related to the int. movs. of biting. Once directed directly toward me, once apparently directed at its own reflection in the mirror.

Twice today, A did LD when I startled him by moving suddenly. Quite definite, although less extreme than the most extreme case yesterday.

So far, all the "sneezing" this animal has done has seemed to be completely a cleaning reaction, connected with rubbing the face to get rid of traces of food or dirt. It may be significant in connection with Salivari - that none of this sneezing has been accompanied by any sideways flicking movements of the head.

November 23, 1958

Barro Colorado

Little A is still doing quite well. (I am not sure if she is really full grown or not. She is certainly much smaller than the Squint Monkeys.)

She does a lot of sleeping during the day, when she sits in the usual erect sitting posture with head tucked down. She also doesn't seem to mind too much where she sleeps during the day. At night, however, she always tries to crawl into the flattest crevice she can find. She likes to sleep under a particularly low chest of drawers, for instance. She much prefers this spot to the nice roomy cardboard box with towel I have given her.

She doesn't do any RB like the mammals. She cleans, or at least manipulates, her genitals with her hand instead.

I noticed today that when she was trying to eat a fairly large piece of white orange pith she grasped the pith with both hands, with both thumbs fully opposed.

(S?) She has done quite a bit of Wtl-ing today, and even more ch Trll-ing. I am now sure that, neither is essentially hostile. She tends to give quite a lot of (S?) ch Trll's and moderately long single Wtl Notes when she is locked in her cage, which she seems to dislike — as she always leaps out immediately when her door is opened.

She has also done more LD and Gn today, in the same circumstances as yesterday. Once this LD led to scratching or cleaning the genitals. Postural facilitation? (She always bends her head

down to do this anyway.)

November 23, 1958

Callicebus torquatus, I. Barro Colorado

A is continuing to behave in much the same way as before. She is generally quite sluggish, except for brief bursts of fairly rapid activity. Did the Night Monkeys behave the same way? I think so - at least to some extent.

I am now quite sure that the Sill and ordinary Wtl are general frustration notes, differing only in intensity. She gives lots & lots of Wtl when confined to her cage, wanting out or wanting different food.

She seems to need a remarkably great degree of heat. She spends a very great deal of time sitting right on top of a very hot lamp.

Several times today she has given little bursts of what is obviously a very low-intensity version of the Fwl-O performance. A few Fwl Notes, quite short, apparently intermediate between typical Fwl and typical Wtl Notes, followed by a few of the monosyllabic type of O Notes. These performances sound quite remarkably like some of the Squ-B performances of the S Spider Monkey we used to have here. Is this really significant??

The mouth definitely does open & close, not too much but quite appreciably, with all Sill, Wtl, and Fwl Notes. It opens & closes even more conspicuously with O Notes. And the O Notes may be accompanied by a slight indication of PL. (This certainly increases the resemblance between the O of this Site and the B of the Spider Monkey. And I might add that A's actual face is not un-

(Like the face of a Spider Monkey.)

This afternoon I took A first into the cage of the Rio Napo Tamarins and then into the cage of the Capuchin. Surprisingly enough, she quite ignored the other two species (except for trying to steal a few grasshoppers from the Tamarins). She didn't even do much display. Not a trace of the Owl-O complex. Just a few Gill's and Wail Notes — no more frequent than they are when she is in her own cage by herself.

I think that Gn must be rather low intensity. I noticed this afternoon when I picked A up to take out of the Capuchin cage, she struggled, etc., a lot at first, and then relaxed, and only then did she do a couple of little bursts of Gn.

There is a slightly different pattern which may be related to Gn but even lower intensity. This is repeated (3 or 4 times) silent opening & closing of the mouth, much slower than the Gn movements, and without any sound of teeth clashing together. Feels almost as if she were chewing or swallowing something, something which she had just belched up into her mouth. Difficult to tell if this pattern (which I shall call "MO") is really significant or not. At least she does it when she is fixating me quite intently.

Of course — right after my comment on Nov. 23 — A has begun to sleep high on a cornice at nights. Does this mean that she is getting more tame or less tame?

It is possible that this species has a "fel" pattern more or less like that of the Spider Monkeys. This afternoon, after I had brought A back to her own cage, and she was uttering quite a

Callicebus torquatus, Nov. 25, 1958, II. (14)

Set of S Trill and Wail Notes, and was probably quite upset; she did a lot of scratching, mostly scratching her front limbs with her hind feet and/or scratching her hind limbs with her hands. The scratching movements themselves appeared to be quite normal and antechthonous in physical form, but they were much more frequent than I have ever seen her do before.

Callicebus torquatus, I November 27, 1958
Barro Colorado

Regret to say poor A died tonight - in convulsions.

Before I forget, I should add one point to the description of the Owl-O performances which I submitted before. A often tended to look slightly upward when uttering these notes (see my sketch in the large drawing pad).

Callicebus torquatus, I December 15, 1958
Iquitos

A very young ♀ Tití (about $\frac{1}{3}$ of the size of poor A) was brought into the animal compound here today. Seems quite healthy & vigorous, except that it has an injured hand. I shall call this animal B.

The man who brought it in treated it rather roughly, sort of throwing it about from hand to hand. During this process it uttered a lot of short & rapidly repeated soft little whistles sounded quite like the Wail's of A, but much shorter & more

repeated. Almost entirely hostile

Since then B has spent quite a lot of time sitting hunched up in much the same way that A did.

Once it got provoked off its perch by a Night Monkey in the same cage, which started off a general hubbub among most of the monkeys in the cage. This ended by B leaping on the back of a baby Woolly Monkey, in just the way all baby monkeys would leap on the back of its parent. When it did this, B began to utter S-Hll after S-Hll. The Woolly Monkey eventually succeeded in throwing B off, but B then spent a lot of time following and approaching various other monkeys in the cage — presumably still looking for a parent to cling to — and it uttered lots of S-Hll's and nothing else as it did so. This confirms the essentially non-hostile nature of the S-Hll of this species — I think

B tends to split the fingers of its hand 2-3 when walking along a wooden bar (see today's notes on Lagothrix).

Callicebus torquatus, I.

December 14, 1958

Iquitos

B has continued to behave today in much the same way as yesterday.

The only new thing I have noticed is that when the animal is pulled up in the hand, it struggles very violently, and utters longer whistle-like notes, apparently identical with the Woll's of A, as well as the shorter whistles I mentioned yesterday. These shorter notes are identical with the Woll in quality, and are presumably only

Callicebus torquatus, Dec 16, 1958, I

(16)

Low-intensity (juvenile?) version of the Wtl.

If I continue to hold B in my hand for a while, its Wtl's gradually stop, and its struggles decline, and it begins to give S-Hill's without too much movement. Just like A.

It is obvious now that the Wtl of this species is the strict analogue (and possibly homologous?) of the Scream & K of other species. This is one of the most peculiar features of the species, as all the whistling notes of other species (with the possible exception of the Golden Lion-Marmoset????? — and the Squid Monkey — see today's notes on Saimiri) occur in very different circumstances.

Callicebus torquatus, I. December 19, 1958
Iquitos

The little B Tit is getting a little tamer now. When I pick him up he only does S-Hill's now.

He quite ignored a baby ocelot walking around in the next cage.

B is really quite sluggish in general still. Both the Tit's and the Sals seem to be much less active in general than the Woollies, Squirrels, or Capuchins (or marmosets for that matter). This may be of some evolutionary significance.

Callicebus torquatus, I. December 22, 1958
Iquitos

We got a new little *Fiti* a couple of days ago. Even smaller than B, and much tamer, supposedly ♂. I shall call it C.

It is so much tamer than B that it only gives S-Fill's when I pick it up, or even remains quite silent. It has not yet given a Whistle-like note of any sort to my knowledge.

When I pick it up and put it in my hair (!) or on my shoulder, this little C frequently utters a very soft murmuring noise, a soft little murmuring trill or a series of little murmuring grunts. I shall call this "Mu." It seems to be the lowest intensity version, in a sense, of the S-Fill. It is probably strictly homologous and analogous with the S-Fill's given by baby woolly monkeys sitting down to cling on some one or just very slightly disturbed when clinging. It presumably occurs when the animal is almost perfectly content, in contact with its "parent" and only very slightly frustrated in some way. It is the sort of thing which is often called a "contentment note", but a perfectly content animal of this species as well as others is absolutely silent.

Both B & C tend to make little "chewing" movements & noises when sitting on my shoulder. This may be an intention movement of feeding or the initial stage of Gn (but there is no sound of clicking teeth).

Both B & C spend quite a remarkable amount of time sleeping, as much or more than the *Salis*. They also seem to eat relatively little.

B almost always puts her head down, or just looks down at the ground, in what seems to be a low-intensity LD pattern.

Callicebus torquatus, Dec. 22, 1958, I (18)

whenever she is confronted with anything "frightening", like my fingers or the nipple of the milk bottle (which she doesn't seem to learn to recognize or dislike because I have to hold her to give her the milk.

Callicebus torquatus, I December 23, 1958
Quinton

Last night, B was locked on the outside of the cage in which the babies were. She seems to have adopted them as parents, and it is probably significant, therefore, that she raised madly up & down & around the cage, trying frantically to get in to join the babies and uttering very loud & long S-Hill's! She dislikes being picked up by me, still, and when I picked her up today, she uttered more of the very brief W-stl's. It is obvious that the S-Hill's she directed to the babies were very high intensity, while the W-stl's to me were relatively very low intensity. These incidents would suggest that the difference between the S-Hill and W-stl patterns is not purely one of intensity. The W-stl's are probably purely hostile, while the S-Hill's of these young animals are probably largely or completely the result of thwarted "infantile" motivation.

Callicebus torquatus, I December 28, 1958
Barro Colorado

I have managed to bring B & C back safely here. During the trip I was able to hear some of their calls a little more clearly,

away from the noise of other species.

When the 2 animals start to settle down for the night, they do quite a lot of adjusting or re-adjusting & wrestling as they each try to get on top of the other. (They are neither even very happy unless they can cling on top of something furry.) This is always accompanied by lots of S-Hill's, often short, wooden, & broken up into fairly distinct syllables. These sound identical, to my ears, with some of the S-Hill's of some young Woollies.

C seems to give MV whenever it is almost completely comfortably settled on me or on B. B may also do this when it is almost completely comfortably settled on C. The MV stops when the animal becomes entirely comfortable, after which it doesn't move anymore. A series of MV Notes might be described as a series of short abrupt "purr"s. (See Carpenter on the Howler.)

Now B & C are installed in a small (inside) cage by themselves, and C has turned out to be quite gay & energetic. Leaping about from perch to perch in an active if awkward way. B is still rather sluggish, but this may be because of her bad hand which she still doesn't like to use very much.

Callicebus torquatus, I December 30, 1958
Barro Colorado

No damn luck at all! B got a bad cold yesterday & died today.

C was naturally much upset; but he seems to have settled down quite rapidly, and now seems quite happy with

Callicebus torquatus, Dec 30, 1958, I (20)

human beings.

He has developed one new pattern of interest. His "chewing" has developed into definite Gn. Very rapid clicking of the teeth. The lips are not puckered during this — they seem to be pursed instead (i.e. not protruded at all). This is done in such a way that the front lower teeth are quite conspicuous. I am sure this is a definitely purely hostile pattern now. He does it when I first come close to him to pick him up — which he doesn't like — rather than when I am holding or carrying him — which he does like. I can also provoke it almost at will by imitating it by clicking my own teeth.

Callicebus torquatus, I.

January 15, 1959

Barro Colorado

I have been too busy to watch C very much, but he seems to be happy and flourishing (except for the fact that he seems to have parasites or is just growing warts).

There is no doubt but that he is naturally a gay and very active little animal. He loves to play, dashing back & forth and all around his cage and my bed. I noticed that when he is moving on a flat surface (at least) he doesn't usually walk or pace, but gallops or leaps. When playing (at least) he does lots of high leaps which seem to be almost pounces. Like a kitten playing with a ball of yarn. He is generally a very good leaper indeed, both from a narrow perch and a flat surface.

He doesn't seem to know how to eat insects. He will also

ays chase or jump at an insect put in his cage, and often manages to catch it, but once he has it he doesn't seem to know quite what to do with it. He usually gives it a few tentative bites, but these are too weak, and he doesn't seem to have tendency at all to bite at the head of the insect rather than any other part of its body.

I might make a slight connection w/ something I said about 30th. He may have retained something like a "chewing" pattern (in addition to Gr - which is still quite common). He may make chewing sounds when he is sitting on my shoulder (always when I can't see him), and these are often accompanied by burping or belching noises. The whole thing may be nothing more than a digestive upset - and I am not sure if this pattern is really related to the earlier "chewing" or not.

I haven't heard him give Mu recently, even when he is settling down on me. This may be significant, as he has become devoted to me and rather likes to cling to me.

He still gives a lot of S-Hll's as a largely or completely non-hostile distress or "frustrated vocal" pattern, e.g. when I put him down after carrying him a while - when he obviously wants to get back on me, and will do so if given half a chance.

He also still gives brief Wtl's as a hostile pattern. He usually gives a burst of these short notes, for instance, when I catch him in his cage (In spite of the fact that he likes to be carried on my shoulders or head, he hates to be picked up in the hand and almost always struggles quite violently.)

Several times, when I have picked him up in the hand, his Wtl's have suddenly become louder and somehow more gulp-like.

at the climax of the struggle (when he still thinks he can get away). I don't think that there are really a special pattern in this species, but they may suggest how the Gfp patterns of the Night Monkey might have evolved.

He does have one very distinct and separate vocal pattern which I never heard A or B give. This is a "Chuck" Note (CHN), almost always uttered in series of variable lengths, usually, I think, with an appreciable interval, of several seconds, between consecutive notes. It is difficult to tell what precipitates this CHN, or what its function might be. It is usually, I think uttered by the animal when he is moving about his cage by himself. I think that it might possibly be some sort of "loneliness" reaction. He seems to have a slight tendency to give series of CHN's early in the morning, just after I have taken him out of his night box and put him in his cage, when he can see me in the other room, still in bed.

Once, early in the morning, when I was still half asleep and less than semi-conscious, he gave series of CHN's which seemed to culminate in a series of notes which were probably O Notes!!! (I was so nearly completely asleep during these incidents that I can't really compare the quality of these "O Notes" with the O's of A, but I thought of the latter as soon as I heard C's notes). Once the notes immediately preceding O by C were a series of doublet CHN's, — — — — —, followed by one brief Wtt note, followed immediately by the first of the O Notes.

C seems to be learning what is edible purely by a process of trial and error. Whenever I take him for a walk, he usually tries to nibble any small object he comes across.


The CHN's are always quite soft, and hollow and wood-
en-sounding.

Callicebus torquatus, I. January 19, 1959
Barro Colorado

C still seems to be flourishing.

He may have retained an Mu pattern after all. Sometimes
when he sits on my shoulder he gives a peculiar performance which re-
sembles like a combination of "chewing" and Mu.

I presume the fact that the Mu has at least become very rare
now means that it did contain a frustration or hostile component.
Now he just loves to cling to me — in fact he leaps on me when-
ever I pass by. No hostility or frustration left.

This morning again, he began to give an O performance as
soon as my alarm clock went off. This time began by a long series
of CHN's. Rather irregularly arranged, but essentially a series of single
notes. Then suddenly this culminated in a series of O Notes. The O
Notes sounded very much like nothing more than a suddenly accelerated
series of CHN's. Very similar in sound — just a little more gulping
in sound. Might be transcribed as "Yup" or even "Yulp". Each
note more or less like this , I think. The whole performance
CHN - O was repeated again & again. More or less like this.

etc. etc.

The O Notes were really quite remarkably penetrating. I

Callicebus torquatus, Jan 17, 1959, II

(24)

could hear it very very plainly up in the dining room.

I am now certain that the gulp like noises he sometimes makes when I pick him up in the hand are related to the CHN-O Notes. Might even be brief and stifled O Notes as far as their actual sound goes.

Now he has just given real Mu just like he used to weeks ago. He was sitting on my head, and he gave the Mu immediately when I tilted my head to try to throw him off. Absolute confirmation of the frustration hypothesis.

He seems to use the fingers of the hand in almost exactly the same way as the Night Howler and the Cotton-top (see today's notes on Saguinus oedipus). I & anything can be applied to anything.

Callicebus torquatus, I

February 26, 1959

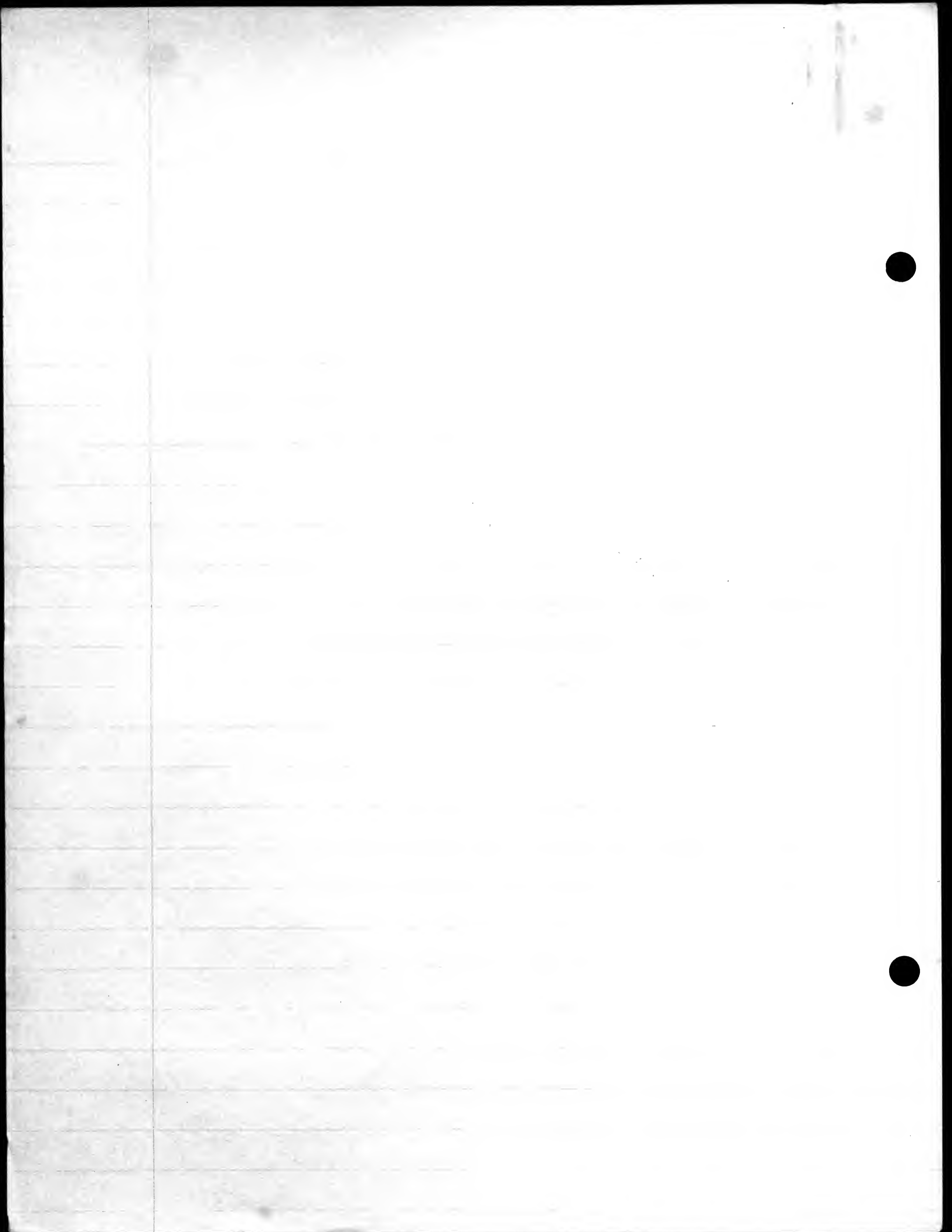
Barro Colorado

Nothing much new in C's behavior — except that he has more or less attached himself to the baby Howler A instead of to me.

I have put him in the big cage with all the howlers, and I have noticed that, when he first comes close to a monkey, he has never met before, he often arches his back — just like Night Howler does in the same situation.

CALLICEBUS

II.



(25)

Callithrix torquatus, I March 13, 1959
Barro Colorado

C's behavior has changed somewhat now, as the little Howler Monkey A, on whom he was fixated, died a week ago when he was in Clinique.

C has rather reverted to his fixation on me. He is much more eager to ride on my shoulders now, sleep there peacefully, and does Mu when I touch him when he is asleep on my shoulder.

Every night he is put in a cage by himself in Chapman House. Then early every morning, long before dawn (ca. 4:00 a.m.), as soon as he wakes up, he becomes very vocal. Long & repeated CHN-O performances (see below).

These are obviously provoked by "loneliness". He stops calling as soon as I appear, and will not start again as long as he knows I am anywhere in the neighborhood. (This doesn't make it any easier to study the CHN-O).

The actual form of the CHN-O is quite variable. Always begins with the CHN's. These are really very difficult to transcribe. I don't think "chuck" is very good. "Gulp" might be better. But this morning most of them sounded like "Euh", although they still had a slight gulping quality. (This gulping quality of the notes this morning was less obvious than when he gives just a very few CHN's when I pick him up in my hand and he doesn't like it - see Jan. 17, p. 25. This might suggest that the particularly gulping-like CHN's are relatively low intensity. I am

almost certain, however, that the CHN's he gave this morning before O are really closely related to the more gulping CHN's he gives in my hand. This would indicate that the CHN pattern, as a whole, can be produced by a wide variety of frustration. Sometimes C only gave 6 or 7 CHN's in a series. Then the series was not followed by real O (see below). More often he gave much longer series. At least 20 or 30 notes, possibly more. Such long series were usually followed by real O. When he did give a long series, the successive notes usually became slightly but progressively (sometimes irregularly) louder. The early notes of a long series usually had a slightly "squeaky" quality, but this quality apparently always declined as the series continued. In some of the long series the notes occurred at very even intervals. In others, there were occasionally slightly longer pauses here or there in the middle of the series. In any case, the notes were always uttered very rapidly. All CHN's are always very short (the notes themselves, that is).

The transition to real O was always abrupt during the performances I heard this morning. Suddenly, after a long series of CHN's, he would utter "Ooah ooah ooah...", (the first real O note, "Ooah", coming right after the last CHN with just the same interval as that between the CHN's themselves). The O Notes were definitely louder, I think, than even the loudest CHN's. They are similar enough to CHN's, however, to suggest that they are really a "regretted" or highly specialized high intensity version of the CHN. (I should mention, however, that I think that the O Notes C gave today were more distinct, less like ordinary CHN's, than the

notes I called "O" on Jan. 15 and Jan. 17. His notes today had a distinct trace of a bryllabic Swinon "Oo-ah". (Like the O notes of the A Feti described on Nov 21, 1958, p. 3.) (Never gave more than 5 or 6 O Notes in a series this morning. They always occurred after a series of CHN's, and the vocalization always stopped, at least temporarily after the last O Note. Never any CHN's immediately after O.

As far as I could tell, all C's CHN-O performances were given from perfectly unventralized postures. Just sitting with curved back as he always does.

Callicebus torquatus, I. March 15, 1959
Barro Colorado

C has been behaving in much the same way, with a few variations, the last 2 mornings, and I have had a chance to observe the CHN-O performance a little better.

The most interesting aspect of his performances the last two days is that none of them has included bryllabic "Ooah" Notes. Otherwise they have been very much like the performances described above on Mar. 13. The first notes of most long series are really quite squeaky. They are quite reminiscent of the Q's of tamarins, in fact, in actual sound. This squeaky quality declines as a series progresses, but some trace of it is often still present in the last notes of even very long series (at least when "Ooah"s don't develop). Although the rhythm of very long series of CHN's may be irregular, I noticed today that the notes are not infrequently accelerated, become louder, and become deeper.

Callicebus torquatus, Mar. 15, 1959, II

(28)

in pitch in a rather regular manner. Course ca:



The difference between
first and last notes
in this diagram is really
greatly exaggerated

I think that this sort of gradual change may well be characteristic of relatively high intensity CHN and CHN-O performances. The last notes of such a long CHN series are really deep "baying" "Ooooh" sounds. Sometimes there are almost pure "Ooooh"s, with very little squealing quality, sometimes they sound as if both a deep "Ooooh" and a definite & quite extreme squeal at the same time.

I think that the animal tends to look up a little during most CHN-O performances. As in my drawing of A in the large pad.

When I am in the same room as C, he stops CHN-O and gives S-Hll's instead. When I am out of the room, however, he usually or always gives Wtl's (I am not sure if these should be distinguished from Lwl's), when he is not giving the CHN-O itself. So it is conceivable that the S-Hll - Wtl - CHN-O series is one of increasing intensity.

Callicebus torquatus, I.

June 5, 1959

Barro Colorado

Unfortunately C died shortly after the notes above. Apparently the same thing that caused D off.

Yesterday I got a new Fiti sent from Peru. A ♂. Perhaps half grown or more, but almost certainly not adult. Obviously a different subspecies from any Fiti I have had before. Rather heavily built. Black face

with black fur all around the face. Black forehead & side of head merging into wine-colored or copper back & tail. Entirely black underneath, including ruff (which seems to be shorter than the ruffs of B and C), except for yellow "mitten" on the front paws and a not very large white crescent on throat. I shall call this animal D. He does not seem to be in good health - possibly worms - and is quite inactive most of the time (although some of this may be "Hold" - see below), but it is obvious that his behavior is very similar to that of the Fitis I have had before in many ways. He is not tame, but reacts to me quite vigorously in a hostile manner. I have put him in a cage with the "Albert-Lola" young Howler, and he reacts to the howler in both friendly and hostile ways.

He certainly has a well developed and extreme "Hold" reaction. Possibly by the most extreme of any Fitis I have had. Inevitable reaction when frightened (and possibly irritated to some extent) and unable to flee.

He has BT and Chewing patterns quite like those of the other Fitis. The BT is obviously quite aggressive, as it is an indication that he is quite willing to bite me, but it is probably not as high intensity as the S Trill and Wtl patterns (see below). The Chewing may also be slightly aggressive (at least neither D nor any of the other Fitis has usually retreated during chewing), and I think that it may well be even lower intensity than the BT. Sometimes, for instance, he does Chewing when I look at him intently from 5 or 6 ft. away, and then does BT when I come closer to his cage.

He also has Wtl and S Trill patterns like the those of the other Fitis in most respects. He gives series of Wtl's notes whenever I pick him up in the hand, or whenever Albert jostles him (Albert has reached the playful stage, and is constantly nuzzling at and poking D, in an apparent effort to start a good wrestling match). The series of Wtl's uttered

Calliobates sp., June 5, 1959, III.

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when I pick him up are often "bubbling", largely composed of short notes, just like the same calls of C in the same circumstances. Some of the notes in the same sequence as a response to Albert's getting are longer. D also gives S-Hill's in such circumstances, but less commonly. He occasionally gives one or two long S-Hill's when he is sitting by himself in his cage, and these notes might possibly be due to frustrated gregariousness. In general, it would appear that his S-Hill's are either lower intensity and/or less hostile than his Will's — just as in the other Titis.

Surprisingly enough, D has never given any gulping or chuck. Like notes like those of D when I pick him up in my hand.

Several times, however, he has uttered one, two, or three single grunt- or bark-like notes when sitting by himself. Varying from monosyllabic to almost trisyllabic, "Uh" to "Uh-uh-wah". Again, the only explanation for these notes that I can think of is that they are produced by frustrated gregariousness. They may well be a form of CHN — like the CHN's of C which preceded O. I expect that they will eventually develop into a CHN-O performance — if D lives so long!

D does not usually approach or follow the Howler in his cage, but he does apparently like to sleep huddled against the Howler. This afternoon, around 3 o'clock, there was a sudden, terrific, thunder & rain storm, and I was amused to see that D and the howler huddled toward each other, and sat side by side, in an extreme Old Posture (apparently asleep) as long as the storm lasted. An innate reaction to tropical storms?

Calliobates sp., I.

June 7, 1959,

Barro Colorado

D may well be torquatus s.s., or something very close

June 5: he weighed approx. 450 gm.

His behavior has remained much the same over the last two days.

He is going along swimmingly with the Howler and me.

He has continued to utter series of single queering notes, like those described above, which I think may be CHN's, (I shall call them "CHN" for the time being). Difficult to determine exactly what they are. Utters them quite frequently when sitting alone & apparently peacefully in his cage, particularly when I approach. Also gives them when riding on my shoulder. This might suggest that they are alarm reactions of some sort. (The only other likely possibility is that they are due to frustrated queering attempts — but I rather doubt this, as I think that the SHL is its usual "lonely" call — see below). When he utters "CHN"s in his cage, at least, they are usually regularly alternated with SHL's and or Wtl's — much more frequently the latter than the former. This might suggest that the "CHN"s are produced by the same motivation as the Wtl's, but at a stronger intensity, and probably only in some circumstances.

After I had become fixated a little on the Howler, I carried the Howler around on my shoulder for a while, leaving D alone in the cage. Then, when I approached the cage, still carrying the Howler, D came over to the rear side of the cage and uttered a lot of SHL's. This looked very much as if he were calling to me and/or the Howler. Very reminiscent of the behavior of C when separated from B in Iquitos (see above, Dec. 23, 1958, p. 18).

We had a dreadful accident this morning in the kitchen. I saw some rice and leapt at it, and landed in the hot soup by mistake. Of course we all leapt after him and grabbed him. This must have been very painful to him, both the heat of the soup and the fact that he lost a toenail in the scramble, and in addition he very much dislikes being grabbed and handled suddenly. He was, in fact, very much upset. He uttered lots of Wtl's, one right after the

Callicebus sp., June 17, 1959 III

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other, and the climax of the whole fracas may of these Writl's become longer, louder, and hoarser. Very much like the screams of other monkeys, in fact I am fairly certain that these notes really are homologous with the screams of other species - and I shall call them by the same name.

It would thus appear that there are probably at least two patterns which higher intensity than the Writl, but quite different from each other, i.e. the "CHN" and the scream.

Surprisingly enough, D just started to do "Tooth Grinding" (GR) just like the Y Howler (see today's notes on Alouatta) late this afternoon. While sitting on my shoulder. I don't think he can have learned this from the Y Howler, as the Howler was not performing GR just before D started. D did it while perched on my shoulder.

Callicebus sp. I

June 11, 1959
Barro Colorado

Of course, D died finally today. Apparently the usual thing. He only did two interesting things before he went.

A couple of nights ago, I carried him into dinner on my shoulder. He gave a few single "CHN"s, and then burst into a series of O Notes. Quite like those of the other Titis I have had. Probably most of the O Notes might be transcribed by something like "Took". The series was not very long, definitely shorter than the usual O performances of C. Probably just low intensity.

He also gave quite a lot of "CHN"s at other times during the last couple of days before he died. I think almost all of them might be transcribed by something like "Huh". A few of them ended fairly abruptly, and

these notes were most similar to the CHN's of the other Jitis I have had (although never as gripping as the most extreme CHN's of C). Most of the CHN's of D, however, did not end very abruptly - just sort of "died out". Many of them quite plaintive or meaning in quality. They actually rounded, in fact, as if they were "quints of pain" - but I think this appearance was deceptive.

One thing I did notice about D was that he performed peculiar tail movements which may have been ritualized. D, and all the other Jiti monkeys I have had, switched their tails from side to side, vigorously but rather irregularly, when pulled up in the hand. I once saw D do the same thing, when he was not being held in my hand. Getting on a perch but obviously extremely irritated. I think this must be a hostile display. Probably high intensity, with attack predominant. It is quite possible that my other Jitis had the same pattern - which I overlooked except when I pulled them up in my hand.

Calliobates ssp., I

September 2, 1959
Bronx Zoo

There is a single Jiti here. About 3/4 grown. Apparently the same form as the first Jiti I ever kept at BCI (see above). Kept in a cage with a Night Monkey.

This morning, when their usual cage was being cleaned, this Jiti and its companion were moved into an adjacent, smaller, dark cage. The Jiti didn't seem to like this very much, and it repeatedly uttered long series of Wits:

These series were very reminiscent of the cc (and cc - "ccc") series of the Uakaris in both sound & general organization.

I am surprised, in fact, by how much of a resemblance there is between large parts of the whole vocal repertoires of the Titis and the Uakaris!!

Callicebus, II

May 1, 1964
Barro Colorado

Late last night, we received 5 new Titis. All more or less similar to the ABC individuals (not D). Now distributed in 2 large inside cages as follows:

Cage 1. One adult and one young (no more than half grown).

♂ 1A. Adult. Naked skin of face is in two colors (!): light pinkish gray around eyes, black on "muzzle" (whole pattern quite reminiscent of Saimiri). Conspicuous white "bar" on forehead. Brownish "agouti" or "pepper and salt" on back and sides, including outside of legs and upper arms. Reddish chestnut below, including outside of forearms and inside of all limbs, and on ruff. Fur on upper surface of hands and feet also chestnut. Tail whitish gray.

♂ 1B. Juvenile. Naked skin of face black all over. Blackish fur on forehead. No trace white forehead bar. Otherwise similar to 1A, except for tail, which is darker.

Cage 2. Two adults and one slightly smaller individual which is probably sub-adult.

♀ 2A. Adult. Like 1B, but black on forehead probably even more extensive.

♀ 2B Adult Like 1B, but with much less black on forehead
(black confined to a narrow line along front edge forehead fur). Top of
crown "agouti" suffused with reddish chestnut.

♂ 2C. ~~Sub-adult~~ Like 2B, but top of head "blonde agouti"
(much yellow than usual), without suffusion of red.

Last night and this morning I watched the animals fairly intently,
but without taking notes during the actual periods of observations. The
following behavior patterns were noted.

General locomotory patterns like those of other Sites observed pre-
viously. The animals are moderately active.

Quite gregarious. Sitting clumped together. This was particularly
obvious in Cage 2. Individuals 2B and 2C frequently sat side by side, with
the their tails intertwined. Sometimes (but relatively rarely) 2A
intertwined its tail with those of 2B and 2C, usually
or always after the latter had intertwined with one another.
The individuals were still new to their cages when this intertwining
was performed. Intertwining may be a way of lend-
ing moral support to one another. (2B and 2C may have a par-
ental-infantile relationship with one another. 1A and 1B may have a similar relationship.)

The animals feed like Aotus. Usually pick up food with mouth,
then hold with hands. But they may also use hands first. Possibly more frequ-
ently than Aotus.

1A and at least two of the 2's occasionally stretch out along a
branch. Resting sometimes with legs dangling. Like Alouatta and
most other monkeys. But not like Aotus (I think Aotus does not do
this because it retires to a hole whenever it wants to rest.)

Callithrix, May 1, 1964, III

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The animals have performed lots of Allogrooming Using hands, to every and across. Slow and placid-looking. Silent. Apparently, not reciprocal. 1A has groomed 1B, and vice versa. And at least two of the 2's have performed Allogrooming.

All the animals have performed lots of rather slight HD. Especially during the first few hours after arrival.

There has been no sign of anything like RB.

At least several of the animals have performed Gn. Obviously hostile. Reaction to humans. Probably low intensity. Probably performed when the escape tendency is not predominant. Has been performed by 1B, the tamest of all the animals, when the nearest human was approximately 10 ft away.

All the animals have performed Squeezing. Definitely not a "pure" comfort pattern in most cases. Obviously hostile. Reaction to humans. Sometimes when humans quite close. Low to (?) moderate intensity. Probably produced when the escape tendency is predominant. May precede retreat. (But not as definitely pre-locomotory as some notes of Night Monkeys.) Squeezes are usually accompanied by some head-movement(s). A jerk. Sometimes (diagonally) lateral. But definitely not a ritualized Head-fluke. Squeezes are essentially single, but are sometimes repeated once or twice at irregular intervals.

Sometimes the animals may perform one "General Shake" in the same circumstances (but not at exactly the same time) as Squeezes. The body is raised up (the hands coming off the perch) and shaken as a whole. Back not arched. Whole pattern quite like General Shakes of duels. Silent. This may, conceivably, be a ritualized signal pattern — but I doubt it. Probably purely comfort.

The commonest vocal patterns of these animals are S-Till's. With

Callitriches, May 1, 1964, IV.

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ered by all or most of the individuals. Soft High pitched. Probably variable in pattern. Contentment notes (or subtle elements) not conspicuously repeated or distinct. Uttered in a wide variety of ambiguous circumstances. But sometimes, at least, apparently hostile. Uttered by individuals retreating slowly before me.

There has been at least one fight between the 2 animals. Probably involving 2A and 2B. Apparently started when one individual tried to insert itself between the other two, which were clumped together. Fight accompanied by loud Wtl's. Of moderate length. (Presumably what I called "Fowl's before.")

I am not sure if these individuals have uttered soft Wtl's (without any of the rattling quality of S All's) or not.

The two adult 2's (and probably the presumed sub-adult) also uttered a few much lower notes early this morning - when they had more or less recovered from their trip but were still not relaxed or happy in their new surroundings. Possibly best described as "breathy grunts". Might be transcribed as "Vuh". Uttered singly or in series of 2-4 notes. Obviously hostile. Reaction to me. Probably at least slightly aggressive. Usually or (more probably) always accompanied by Arch Postures (see below) seldom or never accompanied by retreat movements. I shall call these notes "VN", at least for the time being. Obviously related to some or all of the notes I called "CHN" earlier. Probably only some (e.g. some of the notes uttered by D). Probably there are 2 types of "CHN"s - one hostile, the other non-hostile. See also below. (COMMENT. The brief series of VN's sounded very much like the beginning of Notes "Resonant Grunt" performances.)

The Arch Postures were apparently identical with those of Night

Callicebus, May 1, 1964, I.

(78)

Monkeys. Both "standing" (with hands off perch) and "sitting" (hands firmly grasping perch). Some with UN's. Some silent (possibly only before or after UN's ???)

The 1A individual has "song". Beginning about the middle of the morning (by which time it had "settled down" nicely). Form of song quite distinctive. Beginning with Wtl's of moderate length or (more probably) "Tucka" Notes with a very strong whistling "undertone", and continuing with (more) "Tucka" Notes, the first ones with a definite whistling undertone. As the series continued, the whistling undertone became progressively less conspicuous. Possibly last notes of each "song" series without any whistling undertone at all - just pure "Tucka"s. At least ten notes in each series. Possibly considerably more. Once, at least, the individual "sang" while lying down along a branch. I think that it was sitting up during some other song performances. None of the songs produced any reaction in any of the other individuals of the species. The songs were not correlated with Abouatta Roars. I presume that these "Tucka" Notes are at least closely related to some of the notes I called "CHN" above (possibly also some or all of the notes called "O" above).

I did not notice any obviously ritualized "displacement" auto-grooming or "set" pattern by any of these Titis.

So far, none of the Titis has shown any tendency to go into the boxes in their cages. At least in the daytime.

Callicebus, I

May 2, 1964

Barro Colorado

Arrive near Titis 2:50 p.m. All taking a siesta

One of the 2's utters a short but fairly loud Wtl's, retreating before me

1A does so when I approach, but does not retreat. Just sits looking at me

1A grooming 1B. Silent 2C grooming 2A. Silent. Then 2A grooms 2B. Silent.

I am now getting the impression that these animals pick up food with their hands relatively more frequently than do Night Monkeys

2A grooms 2B. Silent. Then 2A presents to 2C. Lying down on its side in front of 2C, presenting its back to 2C. 2C begins to groom 2A. Silent. Then 2A makes one or two tentative grooming movements toward 2C. Then 2A grooms 2B again. Then 2C grooms 2B also, while 2A continues. Then 2A stops. 2C continues grooming 2B. Then 2B (finally) grooms 2C.

Then 2A grooms 2C. Then 2A performs what looks like RB, right on top of box, right where it has been sitting to groom 2C. But it does not continue grooming while it performs the RB movements

All animals very quiet now 3:15 p.m.

1A grooming 1B again. Again. Again. Quite violent. 1B utters Sll's - apparently in protest. When I go up to cage, 1A stops grooming, 1B stops Sll's, but I see that 1B has BT (probably reaction to 1A grooming, not my approach).

Small dispute among 2's. Apparently (also) provoked by too rough allogrooming. Accompanied by series moderately short but loud Wtl's.

2B grooms 2A. Silent. Then all three 2's move around cage. Not very rapidly. One or more uttering Sll's.

— — — Pelvic movements not well defined. "Wtl" notes uttered either in rhythm with pelvic thrusts or (more probably) more slowly. 2B uttered series of "CHN" notes. Of the "uck" type, with underlying undertone. Series probably irregular in rhythm. Cops quite long unattended. Possibly successful. No post cop display. 2C just let go and walked away.

1A sings while separated from 1B series of Wtl's. Last notes with "Nek" undertones.

Then 1B grooms 1A Then 1A grooms 1B.

2C grooms 2B stops. 2A grooms 2B

2C performs what looks like brief RB

Several individuals are uttering S-Hll's. But I can't tell who or why. Possibly just 2A who is moving about its cage quite rapidly.

2B grooms 2C silent. Then presents to 2C and is groomed in turn. Still silent.

1A grooming 1B roughly again. Leads to real wrestling. 1B runs away uttering S-Hll's. Again Again Again Again.

Again 1B utters S-Hll's when grabbed by 1A. This time S-Hll's uttered with mouth wide open.

2C grooms 2B. (2A definitely seems to be the odd man out in this message).

Then (of course) 2C grooms 2A!

2C stops. 2A moves over to 2B. 2B grabs 2A's fur, with apparent attempt at grooming. 2A resists. Small fight. Strutting with the hands. Accompanied by (S-Hll - "uck") notes. Brief. Animals separate almost immediately.

Callicebus, May 2, 1964, IV

(42)

Another cop attempt ??? 2C grabs 2B by scruff of neck. Apparently tries to mount. But 2B turns head over shoulder to look at 2C, and utters Wtl's, S'ill's, and "Uek"-type CHN's. 2C freezes. Then 2B lies down, and 2C begins grooming instead of continuing to try to copulate. 2C quite silent throughout.

A few minutes later, 2C begins to groom 2A.

1A grooming 1B steadily, 4:07. 1B utters occasional S'ill. Otherwise silent. No escape movements.

2C grooms 2B again. Ignores 2A soliciting grooming a few inches away.

4:12 pm. 1A sings. Lying flat on branch, legs dangling. Near 1B, but facing away from the latter. Lifts face diagonally upward during song. Song is series of Wtl's gradually changing into "Tucka" notes with whistling undertones. Then 1A moves a few feet away from 1B. Utters another song, similar in form, while sitting upright in usual hunched posture.

4:20. Good heavens! Lots of excitement in 1 cage. 1A repeatedly following and chasing 1B. 1B escaping with S'ill's. 1A silent. Every once in a while 1A catches up with 1B and grabs it. This usually leads to fight. Lots of Wtl's, S'ill's, and "Uek" or "Muh" or "Tucka" "CHN"s by one or both individuals. 1B usually manages to stop the actual fight by leaping onto back of 1A. Apparently in futile rather than sexual, as 1B usually leaps onto upper back of 1A. 1A usually quit stops moving when leapt upon. Both animals usually fall silent at same time. But once 1A responds by uttering deep loud "Muh" notes. Two or three of them. Apparently same as cop. notes of 2C. In any case, 1B usually dismounts. And whole procedure

Callitrichus, May 2, 1964, VI

(43)

starts over again. Once 1A actually catches & mounts 1B. Appears the usual, not infantile, but no rumble pulse throats. 1A utters two or three more "Wuh" notes while mounted. Possibly slightly bungle-like, i.e. "Wuhuh". Then 1B escapes and chasing continues until I break it up.

If the σ^7 s of this species really are mostly vocal during copulations, it is probably one of the most peculiar features of the species.

My God! Look up to find 2B and 2C in full copulation. Again 2C fucking 2B. Lots and lots of pulse throats, repeated very rapidly one right after the other. 2C uttering "Wuh" notes in rapid rhythm. — — — — —. 2B uttering "Uck" notes with the strong whistling undertones in similar rhythm. Cop. apparently successful. Then 2C dismounts. Both animals fall silent at same time. No immediate post cop display. 2C walks away. 2B follows. Eventually 2C lies down, and is groomed by 2B.

Every time I go up to the 1 Cage, 1A just looks at me and does Gn. Or, at least, what I think is Gn. Mouth opening and closing. Little or no audible sound of teeth clicking (I think). Not accompanied by (other) overt, unmistakable, hostile movements. Is this related to the "greeting" mouth movements of Ateles and some species of Cebus ????? (Certainly not accompanied by any special lip movements — no P2 or "grins".)

Leaving 5:00 p.m.

Callitrichus, I

May 3, 1964
Barro Colorado

Starting observations 12:45 pm Everything very quiet.

Animals resting

Watching the boys prepare food. Walking about cage a little.

Uttering a few S Trill's

2A does what looks like RB. How side to side rubbing.

Probably purely a cleaning pattern.

Several animals sneeze repeatedly during and immediately after feeding. This sneezing observed, due to food up noses

Feeding quite silent.

1A begins singing in sitting posture, while separated from 1B.

First song composed of Wilt's alone. But terminal Wilt's are definitely braylike ("zee zee zee"). Second song begins with Wilt's, changing into "Tucka" notes with strong Wilt undertone.

2's getting on another a bit. Not intense. Accompanied by S Trill's and "Uk" or "Tucka" notes with Wilt undertone. Uttered in more or less random order (i.e. not in song sequence)

2A presents, soliciting grooming, to 2C. No response. 2C busy eating

Both 1's sound asleep 1:20 pm. 1A stretched out. 1B sitting hunched.

Again 2A presents to 2C. Again no response. Even though 2C has stopped eating.

Small dispute among 2's. One loud Wilt, of the type that is almost a scream (the end of this might almost be transcribed as "Waaah")

Callithrix, May 3, 1969, II

(45)

Callithrix is a rapid series short, non-scream-like, Wilt's

All these individuals are rather remarkable insofar as they almost completely ignore me when I am writing or drawing or moving about in a light way.

Does this species have very few predators in the wild ??? (By the "Cap Notes").

2A grooms 2C. Then 2B starts to groom 2C at same time

These animals ignore me much more consistently than any other species with which I am familiar. Certainly much more "oblivious" than either Night Monkeys or tamarins. (It should be remembered, however, that they come from a zoo.)

All the 2's stop grooming for a while. Just sit. Then 2A grooms 2C again. Stops. 2B grooms 2C. Stops. 2B grooms 2C. Stops. A few minutes later, 2C grooms 2B.

Resting behavior of these animals is very howler-like

2C stops grooming 2B. 2A comes up to 2C and prevents. 2C starts to groom 2A

2A apparently utters squeals (short loud Wilt ???) just before running away from 2C. 2C goes over and starts to groom 2B. Stops. 2A grooms 2C.

1A sings while sitting closely pressed against 1B. Wilt's → "Tucka" notes with strong Wilt undertones. Again, Again. Then moves away from 1B, to far corner of cage, and sings again. As before 1B then moves over to join 1A (apparently response to 1A's songs). Sits pressed against 1A. One or both animals utter(s) several very deep, loud, resonant "Wuh" and "Wuhuh" notes. Apparently what I have been calling "Cap" Notes. Then stop. Sit side by side.

Calliobus, May 3, 1964, III

(46)

Are these "Cap" notes related to O's ???

Then 1B moves away. 1A just sits. One of the animals, presumably 1A, utters more "Cap" notes. But without opening mouth (1A in perfectly normal sitting posture at time.) These "Cap" notes sound a penetrating, but sort of "muffled" in quality (i.e. sounding as you would expect if uttered with mouth closed.) Some of them might be transcribed as "Nuh" — but they are much longer than the obviously hostile "Nuh"s (and probably much lower) uttered by 2's, as response to me, during their first 24 hrs here. (Latter presumably type of "CHW") These "Cap" notes may be largely or completely non-hostile.

Everything still very quiet 2:00 pm.

All three animals use their hands for autogrooming quite frequently.

1B joins 1A, uttering one or two short Wtl's. 1A moves away. 1B follows, uttering one S-Hll. Then the two animals separate.

2:06. 1A Sings by itself. Wtl → "Jucka" with Wtl under tone. This also is uttered with mouth closed!

It is interesting that 2A — the "odd man out" in the 2 Cage — does not Sing. Is 2A ♀. Is Singing confined to ♂'s ???

2A repeatedly presents to 2B. No response.

Perhaps Allogrooming is at least primarily sexual in this species too.

2C Grooms 2B again.

There is no doubt but that these animals pick up food with their hands relatively much more frequently than Night Monkeys.

All in all, I am gradually coming to the conclusion that this genus is much less mammout-like than Aotus.

Callicebus, May 3, 1964, IV

(47)

1A sitting by itself. Usual posture. Utters a few loud, deep, muffled "Puh" notes when 1B walks near by. No other overt reaction. It looks as if 1A has learned that 1B isn't "worth" copulating with.

Incidentally, it has just occurred to me that the animals have not intertwined their tails at all, either yesterday or today. Presumably an indication that they are no longer frightened.

When walking on the ground, all the animals hold their tails curved up.



But not when walking along branches.

This seems to be another difference from Aotus (?).

1A starts to groom 1B 2:25 p.m. Using both hands and teeth. 1B resists. Utters S-Hll's. Runs away.

In general, these animals seem to be much less active than Night Monkeys. Also much more walkers and much less leapers. And when they do move, they move more slowly on the average.

2C grooming 2B again. Then 2C grooms 2A. Then 2C goes back to 2B. SNF at her anal-genital region. She just sits. Then 2C steps SNF's feet. Lays one hand on 2B's back. Then SNF's at her anal-genital region again. Then mounts her. Not very rapidly. Still she just sits. 2C remains mounted for some moments. Both animals quite relaxed. No pelvic thrusts. 2C gets off, walks away, lies down. 2B still

Callithrix, May 3, 1964, VI.

(49)

Is allogrooming performed by individuals that are strongly motivated or is sexual motivation thwarted ??? Viz. the fact that 2C is primarily a groomer today was primarily a groomer yesterday. See also differences between 1A and 1B.

Will will !!! Now 2C and 2B have their tails intertwined sitting hunched side by side but certainly not obviously frightened.

2A presents to 2C. Latter starts to raise hand. Then stops. Lowers hand again. No other response. 2A gets up, walks around. Then back to 2C and presents again. This time 2C does groom it. Then 2A grooms 2C. Then 2C grooms 2A again. 3:22 pm Then 2C grooms 2B.

The howlers burst into long, loud burst of Rearing when plane flies overhead. Sits remain silent throughout.

3:25. Good heavens !!! 2B suddenly grabs & mounts 2A !!! Apparently copulatory. But no pelvic thrusts. 2A utters lots of Sill-screams. 2C comes over and studies at genital-anal region of 2B with hand. 2B gets off 2A — and suddenly mounts 2C !!! Again apparently sexual but without pelvic thrusts. One or both animals utters Wtl's and/or Wtl's with "uck" undertones. Then 2B dismounts. Then, immediately, 2C mounts 2B. Again apparently copulatory but without pelvic thrusts. Both animals silent, I think. 2C gets off. No display. Life gets complicated!

1A lumps while sitting right beside 1B. Wtl's and Wtl's → "Sucka" Note with whittle undertone

3:34. 2C SNF the genital-anal region of 2B. 2B just sits. Does not SNF back. Then 2C lifts head, puts one hand on 2B's back, in an apparent intention movement of mounting. Still no movement by 2B. Then 2C SNF's 2B's genital-anal region again. Then mounts 2B.

Callicebus, May 3, 1964 VII.

50

Copulation. Lots of pelvic thrusts in very rapid succession. Apparently successful. Squealing. Both animals silent throughout. AC remains silent. Walks away. No post-cop display.

A few moments later 2B grabs 2A with hands. 2A utters Sill-scream patterns. Then stops, lies down. And 2B grooms 2A. Both animals silent. Again, a few minutes later, 2B grabs 2A and the latter utters Sill-screams. And again 2B hangs on for some moments, but 2A eventually breaks away. Then 2B grooms 2A. Then 2C grooms 2B.

1A does repeated Gn while looking in direction of 2's (which are quite visible from his cage). While uttering Gn, posture (No (other) signs of hostility. Chewing of teeth almost man-like.

The three 2's are sitting clumped together. 2A and 2C with their tails intertwined. Obviously not frightened. I suppose that these animals just tend to intertwine whenever they clump.

One of the 2's sings while they are all clumped together. Song pure "CHN" of "Tucka" type. Little or nothing in way of whistle under ones.

2C back grooming 2B.

Some of the animals utter Sill's from time to time — when there is nothing else very obvious going on. Just some walking around. Some Sill's must be very low intensity.

Stopping observations temporarily 4:00 pm

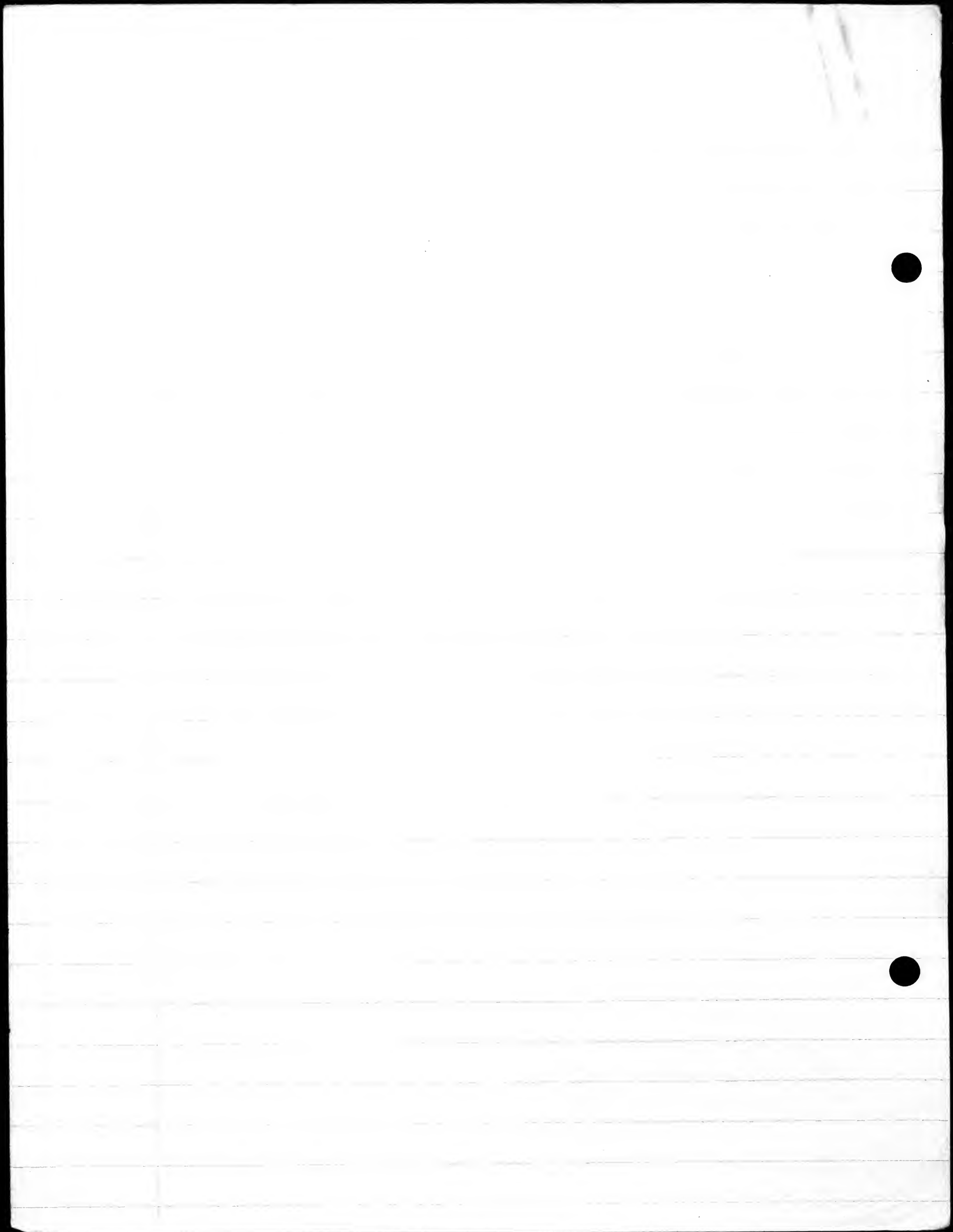
Back 5:30 pm.

2A utters several "Guh" type "CHN"s as reaction to me when I approach. Without any trace of Arch. Just before retreating

1B does Gn to me when I approach. At same time, it appoa

CALLICEBUS

III.



Then I go to dinner

Come back to 6:30, to find all the animals more or less ready to go to bed

All three 2's still group, however, clumped together. All three with tails inter-twined. One of them (2A ????) repeatedly sings short song while clumped with the others. Although short, all the songs are pure "Tucha" with little or no whistling undertone. I.E. the difference between Witt and "Tucha" song is not purely intensity. Is it a subspecific difference ???

1A grooming 1B. Silent.

The 2's changing places. Outside individual trying to get in the center. The changeover accompanied by Witt's and brief series of "Tucha" notes. Latter quite soft but organized in series as in song

Sudden dispute between 1A and 1B. Accompanied by rather long, loud Witt's.

Now brief soft song in 2 group. As before. 6:58 p.m.

Leaving 7:07 p.m. Everything quiet.

Callitriches, I

May 4, 1964
Barro Colorado

Arrive 4:37 a.m. 2's still clumped together, more or less as before. 1's a little more alert (their cage has more light at night) 1A runs around cage a little when I arrive. But quickly goes back to clump with 1B

All three members of 2 group with tails inter-twined. Also 1A and 1B. So inter-twining seems to be "usual" or regular

Callicebus, May 4, 1964, II

(22)

One or more of the 2's utter (s) a few soft, short Whill's while talking with Boca (outside house) briefly. Without undrinking or detaching tails. 5:05 a.m.

Leave 5:10 a.m. (I have to go to toilet). Back 5:22 with out disturbing the animals very much. Some short soft Whill's in the group. Possibly also Gu.

1A does Gu while clumped with 1B. Looking in the direction of the 2 cage (altho I am not sure that he can see the 2's from the spot he is in at the time).

Both 1A and 1B go down to floor, eye to light, 5:25. Silent. At same time, there is short burst of vocalizations among 2's. Series low muffled notes "Wh uh uh uh..." ("Cop" notes? and/or O?) followed by burst short soft Whill's. Then what sounds like Gu. Again. Not accompanied by obvious movements or changes of posture.

1A utters burst 4 or 7 "Wh" or "Whuhuh" notes while close to 1B. Probably preceded by Gu! 5:27 a.m.

Then 1A does Gu just after putting hand on 1B's back, probably as an int. mov. of Allogrooming.

5:32 a.m. First burst Roaring by howlers. Both outside and inside animals. More or less ignored by Titi. Only 1A looks at Bull.

Again 1A does Gu (noise of teeth clicking together quite audible at distance of 15-20 ft) looking in direction of 2's. Getting up spot from which 2's must certainly be visible.

It is beginning to look as if Gu is almost low intensity "song" a form of summoning a companion.

1B begins eating 5:37 a.m.

Oh oh! Three times, 1A utters what seems to be Arch while

Colobus, May 7, 1964, III.

Looking at 2's. One does Gn in "Archi"! So Gn may be hostile of
the all. (These "Archi" a little peculiar. Animal sitting in normal
sitting posture, with curved back, folded hind legs. Then straightens
out legs, i.e. "stands up", while keeping hands on perch. This involves
an curvature of back. If these really are Arches, they presumably are of
relatively low intensity.)

Howlers in full morning now, 5:43; but 2's still more or less
asleep.

Again 1A does Gn looking at 2's. Sitting in normal curved
posture. Then does "Archi", as before, looking at 2's. Without Gn.
Then does Gn again, without "Archi".

Then 1A utters 2 or 3 ^{muffled} "Whuh" or "Whuhuh" notes looking at
2's. From normal sitting posture 5:48 a.m. Then does Gn, followed
d immediately by one ^{muffled} "Whuhuh" while looking at 2's. Then more Gn.
All Gn quite audible.

2's still asleep 5:52, although all or almost all the other
animals and birds are awake and active. Are they sick?!?

Again 1A utters several low, muffled "Whuhuh" notes. Ag
ain. Again not looking at 2's. Sitting normal posture not far from
1B. Again utters two more notes of the same type. Then walks around
a bit. Then does Gn followed immediately by two or three "Whuhuh"
s.

Then one of the 2's utters series 4-6 "Whuh"s. While still
lumped with the others. Again. Notes quite muffled.

All "Whuh"s and "Whuhuh"s are slightly plaintive.

Again a 2 (2A?) utters series "Whuh"s. Apparently form of
low intensity song.

Callirubus, May 4, 1964, IV.

(54)

When 1A and one of the 2's start to desert. 1A utter series "Uuk" or "Juka" Notes with little or no whistle undertone. 2 responds by series of "Whuh" or "Whuhuh" Notes.

Oh my god! Sudden clamorous noise all over. 1A and at least two of the 2's singing madly. 1A starts with others join in almost immediately. 1A begins with very loud, sharp "Uuk" and/or "Juka" Notes (with little or relatively inconspicuous whistle undertone). Then suddenly switches to very loud, very low, "Soak" Notes. Latter very similar to "Whuh" 's and "Whuhuh" 's heard earlier, but much louder. First "Uuk" or "Juka" Notes uttered at moderate and possibly slightly irregular intervals preceding "Soak" 's uttered very rapidly one right after the other. Transition from "CHN" 's to "O" 's abrupt. Rhythm of "Soak" 's possibly slightly accelerating. After long series of "Soak" 's, 1A suddenly switches to "Uuh" 's just as loud as "Soak" 's, possibly even lower. First "Uuh" 's also uttered very rapidly one right after the other. But then tend to slow down (possibly becoming even lower at same time). This performance stops (temporarily). Thus each complete song phrase of 1A includes "CHN" 's, followed by bisyllabic "O" 's, ending with monosyllabic "O" 's. More or less comme ça:

(Very rough!)

Callulobus, May 4, 1944, II

(55)

1A uttered song phrase after song phrase of this type. Starting around 6:22, continuing until 6:15 (when Alvarez arrives to begin work). All phrases were similar, but with some variation. Length of first "CHN" phase probably quite variable. Sometimes only one "CHN" uttered before beginning of "O"s. Sometimes whole "O" phase composed of bisyllabic notes, without any monosyllables.

As 1A continues, I can see that it is 2B and 2C that are responding by song phrases of their own. Not 2A. Are 2B and 2C defending song territory? 2C frequently begins song phrases a little before 2B, and its song phrases may be somewhat longer on the average.

Song phrases of both 2's quite similar to those of 1A. But all or most of the phrases of the 2's include only one "CHN" or none. And at least once, one of the 2's uttered a phrase which included first bisyllabic "O"s, then monosyllabic "O"s, then bisyllabic "O"s again (these notes marked the end of this particular phrase).

All the "O" parts of these songs quite strongly "booming" or "ululating". And unbelievably loud. When the Tit started, this set off Bull, who began to Roar. And the "O"s of the Tit seemed to be quite as loud as his Roars.

After 1A had been singing for some time, I noticed that 1B was also joining in. Its phrases a little different. Lots of preliminary "CHN"s. Quite as loud as those of 1A, and equally sharp. But probably slightly higher pitched, and with more conspicuous whistle undertone. 1B apparently also uttered "O"s, but only after 1A had switched from "CHN"s to "O"s. Thus its "CHN" phrases were relatively longer, and its "O" phrases relatively shorter, than the corresponding phrases of 1A. Possibly the peculiarities of 1B were typically juvenile ?????

Callitrichus, May 4, 1964, VI

30

All the songs uttered from similar postures. However, in the young perch. Keep at least partly straightened. I.E. they probably do not have enough "room" (in some part of their vocal apparatus) to utter such high intensity songs while sitting down. (Could definitely be proved during songs. To a very appreciable degree - but probably not quite as much as in high intensity, "real", Arch displays.

This high intensity singing stops completely after boys arrive. But every once in a while, 1A and/or one of the 2's utters brief phrase of muffled "Wuh" or "Whuhuh" Notes. Obviously just low intensity song.

None of the songs this morning has included any trace of pure Wuh's.

6:40. 1A starts "CHN" phase of high intensity song, but stops short. One of the 2's responds by uttering "Whuh" and "Whuhuh" Notes.

6:45. I start to walk around and talk to the boys. Surprisingly enough, this seems to stimulate the Tits to start high intensity "baying" songs again.

Leaving 6:50 a.m.

It seems obvious that both types of "O" Notes uttered during singing, the "Wuh" Notes uttered during copulations, and the (usually muffled) "Wuh" and "Whuhuh" Notes uttered apart from copulations are closely related to one another. Presumably also the "Wuh" Notes occasionally uttered (usually with Arches) as reactions to human beings. The whole group of patterns obviously related to "Greet complex" of Aotus and "B complex" of other New World monkeys. It will be convenient to call the whole group of patterns "the O complex".

The "O complex" patterns may be distinguished, as a group, from the Wuh-S-Tull patterns. The latter may be called "the High complex" obviously related to Squawk - High Tull patterns of Actus. (But, as far as I can tell, the Wuh-S-Tull patterns of Actus are just as much adult patterns as infantile patterns). Are all the O complex patterns relatively high intensity and all the High complex patterns relatively low intensity ?????

In any case, it seems obvious that the "CHN"s of the "Nek" - "Jucka" type are intermediate between the O complex and the High complex.

NOTE: Yesterday evening, whenever Neal or I went up to the 1 cage, 1A began to scratch its chest with one hand (I think it sometimes used its right hand and some time its left hand). This was so regular that it looked like some kind of "Set".

ADDITION - just for the sake of clarity. Some of the individual "Wuh" notes uttered during copulations may be identical in sound with some of the individual "Wuh" notes (the less muffled notes) uttered apart from both copulation and singing. Only the copulatory "Wuh" notes are uttered in rapid, regular rhythm, and usually in series of many notes, while the non-copulatory "Wuh" notes are uttered in slower and less regular rhythm and in shorter series.

A thought has just occurred to me. . . . Both the Cop Notes and the singing of Actus are compound of many short notes uttered very rapidly one right after the other. They also may be the highest intensity of all the O complex patterns. Their basic form and rhythm seem to be essentially identical with those of such sound patterns Galloping, Chirping, and Cop Calls. Presumably the two groups have developed their

Callicebus, May 4, 1964, VII.

(38)

"high intensity rhythm" patterns independently. Why ??? What are the particularly advantageous diurnal properties of such patterns? Do they provide the maximum amount of stimulus contrast ???

Callicebus, I.

May 5, 1964
Barro Colorado

Start observations, 4:15 p.m. All animals seem to be in good health, but very quiet. 2's sitting huddled, clumped together. All three to do interesting.

Everything is so quiet, 4:30, that I'm beginning to think that the animals are not in good health!

They certainly don't seem to have any independent "locomotor" drive. Nor, as far as I have been able to discover, are they particularly active in the evenings. Perhaps they are not more crepuscular than all or most other diurnal species?

4:37 1A utters muffled "Wah" Notes, then does Ju, looking toward 2's.

2C is clumped between 2A and 2B. This is usual, I think. Is it the position of honor?

2A looking around me, alertly when there is lots of Red-legged Blue Honeycreeper HCN in neighborhood. Definitely seems to be responding to sound.

1A grooming 1B. Silent Again. But 1B runs away.

2B grooms 2C. Silent. Then 2A grooms 2C. Are males more

re-groomer than groomer, when all individuals involved are adult (and sexually motivated)? In any case, the allogrooming of this type

Calliobus, May 3, 1964, II.

(59)

ues seem to be rather different from that of actus. Less of a pronounced rhythmic pattern.)

2A still grooming 2C, 4:50 p.m. Then starts to groom itself (Postural facilitation?). Using hands in both cases.

All 2's back, sitting or half asleep, with tails intertwined. One of the 2's (2A?) utters lots of "Nuh" type "CHN"s, with the tail unbuttoned, when the boys start to come in and out of the animal house. These are really very different, in sound, from the grunt-like "Nuh"-type "CHN"s sometimes uttered as a response to a close approach by a human being.

Incidentally, the animals seem to have stopped "signal" sneezing. Is this because they are less alarmed now than earlier?

2A presents to 2C, inviting Allogrooming. No response.

(Incidentally, all the presenting and soliciting I have seen so far seems to have been inviting Allogrooming. I have yet to see anything that seems to be soliciting for copulation.)

2C grooms 2B briefly.

Are the muffled "Nuh" and "Whuhuh" notes of this species homologous with the Moans of Night Monkeys ???

Stopping observations 5:05 p.m.

Calliobus, I

May 14, 1964
Barro Colorado

5:00 a.m. Going to try to record the Jettis this morning. But they are still asleep now.

1A and 1B sitting clumped, with tails intertwined.

Calliabus, May 7, 1964, II

(50)

Recording goes very well (almost filled no. 1 tape).

I am going to give special names to various vocal patterns. I shall restrict the term "CHN" to the "Chin" type notes, such as those uttered by IA at the beginning of song phrases. I shall also restrict the term "O" to the loud, deep, booming notes, both long and short syllabic, which make up the bulk of typical high intensity song phrases. I shall call the obviously hostile "Tink" notes uttered as reactions to humans "G" (Greet). I shall call the muffled, plaintive "Wah" or "Whuhuh" notes "BM" (Booming Moans).

During the recording, I had time to notice only a few reactions.

When IA was excited, waltzing as, in the intervals between songs, it scratched its chest with its hands. Again and again and again. I am coming to the conclusion that this must be ritualized set.

Songs are really remarkably contagious. IA responded beautifully to play backs of his song. Uttered CHN's when CHN's were played back. Sometimes uttered the full CHN-O series as a reaction to CHN's alone. And always uttered O (and/or CHN-O) when O's were played back.

Once, at least, IA uttered a CHN apparently in response to a squeeze ("Sn") on the recorder.

IA showed a very strong tendency to synchronize his songs with songs coming over the play back. Sometimes synchronization was so nearly perfect that it was difficult to tell that more than one animal was involved. 2C always or almost always started to sing a few seconds after IA. But it is possible that the notes of his songs also were synchronized with those of IA (and the machine).

It is clear on the tape, that whenever 2c sang CHN-0 plus
and one or both of the other 2's uttered Wtl's.

The BM's are less contagious than CHN-0 song. But at least once 1A responded to the playback of BM notes by uttering BM's of its own. Not synchronized (not necessarily - in view of the shortness of the series of such notes)

As the last part of the recording session this morning, we caught 1B and held him. Uttered "Screams". Very similar to the high intensity, long, loud Wtl's, ending with a rasping sound, which I have heard before (and which are described above). But this time it was obvious that all or most of these sounds (at least the whistling parts) also had a faint tutting quality. It will be interesting to see how these come out on the spectrograms.

(Incidentally, we caught both 1B and 2A the day before yesterday, when Dr. Gale was out here, and both animals uttered long, loud, "Tutting Whistle - Screams" just like 1B today. (Very typical of the species.)

Watching animals around 1:15 p.m. Very sleepy and sluggish, except when grasshoppers put in cages. At one time, 1A and 1B were sitting hunched close together, clumping with their tails intertwined.

1:40. 2B grooming both 2A and 2C. Then 2A grooms 2C. Then 2B grooms 2C. Then 2C grooms 2A. (This is pretty much of a round robin!) Occasional Sill's coming from a group, but I can't tell who is giving them or why.

One of the 1's, presumably 1A, utters a "song" composed of Wtl's and "Uk" and/or "Jucka" notes with whistling undertones. Uttered wh

Callicebus, May 17, 1964, IV

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de lying stretched out along a branch.

2:00 pm. All three 2's down on ground. Then 2B goes up to top of box, sits. 2C follows, and SNF's at 2B's genital region. 2B sitting in normal posture, with back curved. His left hand turned almost to a horizontal position to "facilitate" 2C's sitting. When 2C stops, 2B lowers tail. 2C put into by 2B. Then 2B SNF's the anal-genital region of 2C. Briefly. 2C does not lift tail. Both animals silent throughout. So SNF'ing can be mutual in this species (although perhaps not synchronously mutual).

Later this afternoon we did some more recording. What we did was play back the recording made this morning, and then record the responses of 1A. He responded beautifully to some of the play back. More or less as follows:

(a). When BM's (by one of the 2's, I think) came through the play back, 1A began by doing silent Sct (scratching his chest, as usual, in a nervous "compulsive" manner, then he assumed a silent Arch Posture (sometimes with hands raised, sometimes with hands grasping the perch). Some or all of this Arch Posture may have been "preparatory" to Singing. Finally, he did Gn, while remaining in an Arch.

(b). When full, high intensity, CHN-O song came through the play-back for the first time, 1A began by doing Gn in an Arch Posture, and then uttering low to moderate intensity song (I didn't catch all of this, but the end of the song phrase was composed of low "Tucka" type notes, i.e. bisyllabic O Notes with CHN undertones.)

(c). When BM came through again, 1A responded by assuming a silent Arch Posture, then performed Gn in the Arch, and then uttered a brief burst of what was either BM or partial O-type song.

Callicebus, May 7, 1964, V.

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(d). When full high-intensity CHN-O type song came through a gain, 1A responded by uttering the same type of song in almost complete synchronization (quite remarkably good). In Arch or semi-Arch Posture.

(e). The same thing happened again when full CHN-O song came through for the third time.

These reactions would suggest that set is very low intensity, that silent, simple, Arch Postures are slightly higher intensity, that Arch Postures with Gn are slightly higher yet, and that vocalizations (with Arch Postures?) are the highest of all (??????).

Callicebus, I

May 8, 1964
Barro Colorado

Recording the monkeys this morning in the same way as yesterday morning. When I arrive, the 1's are awake and active, while the 2's are still asleep.

First sounds heard 5:15 a.m. BM by 1A. Series of notes. I think that the series of BM Notes uttered by these animals before dawn are a type of low-intensity song. But certainly not the same type as the "Willa-Dacka" performances uttered by 1A in the afternoon. What is the difference between the two types????

About 5:30, 1A mounted 1B. Apparently copulatory. Obviously unsuccessful. No preliminary displays. No post-cop displays.

When 1A finally begins full CHN-O song, the first response by a 2 is a series of BM Notes.

Then both 2B and 2C respond to subsequent 1A CHN-O song.

Callicebus, May 8, 1964, II.

(64)

is by singing themselves. Also CHN-O. But somewhat different in detail from the song of 1A. 1A's songs begin with a lot of CHN's. The songs of the 2's include only a few preliminary CHN's. (This difference may be largely due to the fact that the songs of the 2's are responses to 1A.) The O phases of 1A's songs usually or always end with syllabic "oah" notes. The O phases of 2's songs usually or always end with a very rapid series of very short nonsyllabic "Tuh" notes. Is this a interspecific difference ???

Apart from these differences, the animals tended to synchronize their songs - more or less.

It is possible that some of 1A's songs are responses to Roaring by howlers in forest. But certainly not all.

About 17:50, we decide to take the 2A ♀ and put her in the same cage as 1A and 1B. When she is first released, she bounds across cage, and then sits, in usual crouched back posture, quite close to both 1A and 1B. One or more of the animals utter(s) S-Hll's while they are close together.

Then 1A assumes an Arch Posture. Silent. Then does Jm in Arch. Then SNF's 2A, more or less nose to nose. Puts his hand on 2A's back. Int. mov. of mounting? Then lowers hand. Then both animals sit side by side, silent, and looking in different directions.

After a couple of minutes, 2A leaps over to another branch. 1A responds by uttering a few BM Notes. Then follows 2A to new branch. SNF's at 2A's genital-anal region. She does not lift her tail to facilitate this SNF'ing. Then ♂ mounts and begins to copulate immediately. Very, very long sustained. Many, many, pelvic thrusts. And three "major", probably "quivering" thrusts. Major thrusts at long intervals. Last major

Colinus, May 8, 1964, III.

(5)

Mount, middle end of cop. attempt. Both animals almost completely silent throughout. Only sounds are a few "Cop Notes" (presumably by ♂) in the middle of the cop. Listening to these notes on the play back (later) they sound like muffed, low-pitched, CHN's. (It seems likely that the so-called "Cop Notes" of this species are not really sexual. And perhaps not typical of most cop. attempts. Presumably at least predominantly hostile. And uttered only when a cop. attempt contains hostile components.) When the ♂ finally dismounted, there was no post-cop. display. Both animals just sat.

After this, we played back the morning's recordings. Rather surprisingly, 1A did not respond to first play back of CHN's. Was his threshold raised by the performance of a successful copulation ??? (If so, this would be good evidence that song is at least partly sexual, even copulatory, in motivation.) But then he did respond to play backs of full CHN-O Song a very few minutes later. Uttered CHN-O too. And, very significantly, whenever he heard a play-back of 2C songs which ended with a rapid burst of short "Tuli" Notes, he uttered songs of exactly the same type, ending with similar burst of short notes. So the different endings of the song phrases of the two animals earlier this morning presumably were not simply

intrinsic characters

After 1A had responded to several CHN-O songs on the play-back, 1B also began to sing. Usually beginning each phrase a few seconds after 1A. 1B's so



Callicebus, May 8, 1964, VI

(66)

was were CHN-O. But I could not determine if they ended with bi-syllabic or monosyllabic notes.

Most of its songs were uttered from an Arch Posture. Sometimes a perfectly typical Arch with hands grasping perch. Back very curved. At other times, the Arch was like the posture shown on the preceding page. Back less curved. Head low. Rear end elevated. A few songs were uttered from an apparently unritualized "semi-sitting" posture. Legs only very slightly unflexed. Back only slightly, or not at all, more curved than in ordinary sitting posture.

As far as I could tell, all the songs of 1A, 1B, 2B, and 2C this morning were accompanied by the same mouth movements. Mouth kept completely closed during CHN's. No lip movements. And mouth kept open throughout O phases (not closed between notes). Little or no trace of PL. Teeth not visible.

Callicebus, I

May 10, 1964

Barro Colorado

Starting observations 10:00 a.m. All animals quite placid. But not asleep. According to Boca, the 1A-1B-2A group is doing fine. No fights.

1A grooms 1B. Latter utters S-Hll's and moves away 10:04. 1A half mounts 1B, from side. Silent. Then begins to groom 1B. Apparently, this species has two types of mounting. Like Actus. Grooming becomes more vigorous 1B utters S-Hll's. Then moves off. 2C grooms 2B. Not very vigorously. 1A and 1B are certainly staying closer to one another than

Callicebus, May 19, 1964, IV

(127)

2C still Grooming 2B 10:10 am Then 2B finally moves away All quite silent Then 2B rejoins 2C. He starts Grooming her again 2A joins 1B. Sets hands on her. He SNF's at her genital-anal region. She does not lift tail. As she moves away 1A does not follow

It is beginning to look as if ♂'s perform more Allogrooming than do females

Speak of the devil! Now 2A starts to groom 1A Then they reverse, and 1A Grooms 2A Then goes on to groom himself. 2A grooms himself at same time. Then she Grooms him again Again He lies down in order to prevent her back to her

All grooming today, both Allo- and auto-, done with hands. This species seems to use teeth in grooming only relatively very rarely.

Now 1B grooms 2A. Briefly. Then 1B stops, 1A starts to groom 2A Then they move, and 2A Grooms 1A Then 2A and 1B groom 1A simultaneously. 1B stops almost immediately. Then 1A grooms 2A

The fact that 1B is performing Allogrooming much less frequently than either 1A or 2A might suggest that Allogrooming also is sexual in this species, even if it is not copulatory.

1B and 1A are leaping about and wrestling. 10:25. Apparent play! One or both — probably only 1B — utters lots of Still's. Then 1A catches 1B. Holds 1B's fur with its hands. Then, apparently SNF's at 1B's genital-anal region. Then mounts 1B. Apparently copulatory. Apparently at least one or two pelvic thrusts. While mounted, 1A tries to sniff or smell under 1B's arm. Is there a scent gland in the armpit? Both animals quite silent throughout. Then 1A dis

Callitrichus, May 10, 1964, III.

(18)

mounts. IB begins to groom IA.

Then there is more "play" wrestling between IA and IB. IB utters lots of S-Hill's. At least some of these S-Hill's definitely accompanied by BT.

Then I suddenly look up to find IB mounted on IA. Definitely copulatory. Lots of pelvic thrusts. Quite long sustained. Then IB dismounts. No post-cop display.

But a few moments later, the two animals are back "play" wrestling again. Lots of S-Hill's by IB. Some ending in "Tch" sounds. Especially when wrestling is most vigorous.

ADDITION: Before this IA-IB subrolic began, there was a brief dispute or wrestling match between 2A and IB. Not obviously playful. Violent. It ended when IB leapt onto 2A's back, and uttered lots of loud Hill's there. This apparently an escape reaction (like a baby leaping on to its mother). It will be necessary to distinguish three types of mounting: (1) copulatory; (2) grooming; (3) escape.

COMMENT: It is possible that the association between "play" wrestling and copulatory behavior is reminiscent of Attila.

10:45. 2A Grooming IA Long sustained. Then 2A lies down and presents back to IA. IA responds by allogrooming. Then IB joins the group. But the others ignore it, and IB moves on. Utters a couple of S-Hill's while moving about by itself. Then 2A goes back to grooming IA. IA scratches itself while being groomed.

My God, this species certainly performs a lot of allogrooming. More than any other species with which I am familiar. Why? What is the adaptive function ???

Then IA walks around cage a little. Goes back to 2A and begins

Callisaurus May 10, 1964, II.

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was to get to

2B goes to AC. Paying special attention to AC's chest. Is there a good reason?

1A, 1B, 2A all clumped together. 1A in center. 2A grooming 1A. But at the same time 2A and 1B intertwine their tails while 1A keeps his separate. Neal says that they slept this way last night. 1B and 2A intertwined. 1A not. Could it be significant, in this connection, that 1B and 2A seem to be same subspecies, while 1A is a different subspecies (????)?

Taking a break 11:00 am Back 11:10.

1B hopping & leaping about cage all by itself. Really quite playful. But all the adults are very placid now. This is certainly not an active species on the whole.

2A grooming 1A AC grooming 2B. Then 2B grooms 2C. 2A continues to groom 1A. Then 1B grooms 1A simultaneously. Then 1A grooms 1B. Then 1B grooms 1A again. 2A stops grooming. Then all three sit clumped together. All three with tails intertwined. 2A starts grooming 1A again.

Going to try drawing 11:22

Back observing 1:12 pm Everything very quiet.

1:15. 1B suddenly leaps on 2A's back. Apparently an escape mounting. But I didn't see what provoked it. 1B utters lots of SNL's while he mounted. With BT. Then just gets off.

Then there is a cop. attempt. 1A mounting 2A. Little or no pre-claim. 1A may have started to SNF 2A, but certainly did not SNF for any appreciable length of time. Cop itself possibly successful. Several pre-claim attempts. 2A quite silent throughout. 1A utters MB throughout.

Calliacabus, May 10, 1964, I

(70)

Quite typical MB. Long, irregular, unvarying, plaintive notes then A dismounts. No post copulatory display.

One or both of 2B-2C pair uttered, one or two short MB notes during 1A-2A cop. Then, when I look up after dismounting the latter, I find that 2B and 2C are then done in full cop. Very long sustained and obviously unvaried. Utters "Wah" notes in fast pumping rhythm throughout. Utters several short bursts of "Wah-CHN" type notes "Eccyuk eccyuk ..." in similar rhythm. Also does silent Gn at one point. Eventually dismounts. No post-cop display.

It looks as if copulations are also contiguous in this species.

1A utters several short songs while the 2B-2C copulation is in progress. Songs composed of long syllabic O notes, without any CHN's or Wah's. Accompanied by Arch Posture.

A few minutes later, see 1A and 1B "play" wrestling. Then 1A greets 1B. Then mounts 1B. Little or no SNF beforehand. No mating obviously cop. Long sustained. 1A silent. Few or no pelvic thrusts. 1B utters S-Till's. Then 1A dismounts. 1B greets 1A immediately.

One of the 2's vocalizes during 1A-1B cop. attempt. Short, muffled, low notes. Presumably very low intensity MB and/or O notes. Monosyllabic.

O and MB seem to intergrade most frequently (i.e. are most frequently indistinguishable) at low intensities.

Mouth seems to be opened during MB in exactly the same way as during O. (Probably also opened during G in same way.)

Cataglyphis May 10, 1964, VI

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While writing previous pages, look up to find 2B and 2C copulating again. 1:35 p.m. As before. With more vocalizations 1A watches them. Utters pure O Song as before. In Arch. 2C dismounts. Stands beside 2B. Looks at 1A. Utters MB in Arch. Then does silent Gn in Arch, still looking at 1A. Then mounts and cops with 2B again. Usual cop. vocalizations. Then dismounts. No post cop display.

My, these animals do copulate a lot! Especially after lunch! Not only are cops apparently contagious, but the sight of a cop seems to induce vocalizations by adjacent males.

The sexual vocalization behavior of the two adult males is rather surprisingly different. 2C utters fast pumping Cop Call (I shall confine the term to calls of this type) during actual copulation. And more or less typical MB when it sees copulation by other animals. 1A, on the other hand, is either silent or utters MB when actually copulating and utters O Song when it sees a copulation by other animals.

Vocalizing at the sight of copulation may be characteristic of non-gregarious species (???)

Apart from the O Songs as a reaction to 2B-2C cops, 1A has not uttered any songs today. Particularly interesting that it has not uttered any Wail - "Tucka" Songs. Is this because it has a female in the cage now ???

Most of the animals half asleep now 1:50 p.m.

2:00 p.m. 2A and 1A sitting clumped with tails intertwined, while 1B sits apart. (Intertwining seems to be more or completely random.)

2B Grooms 2C Then 2C Grooms 2B. 1A Grooms 2A.

Callicebus, May 10, 1964 VII

(12)

Then 2A Grooms 1A.

It seems obvious that allogrooming is essentially mutual. Any individual seems to be particularly apt to groom another immediately after it, itself, has been groomed. And any individual seems to be particularly willing to be groomed immediately after it has finished grooming another. (In many cases, a groomer "presents", solicits grooming, immediately after it has finished grooming another.)

Everything dead quiet 2:55 p.m. All animals drowsy and sleeping.

Then 2B and 2C start to feed and move around a bit. 2B does about Arch looking at us. It is certainly my impression that at these animals assume Arch Postures, at least low to moderate Arches, much more frequently than either Actus or Alouatta. Presumably, the Arch has a comparatively low threshold in this species.

It is probably significant that highly ritualized and exaggerated Arch patterns seem to be confined to species with particularly loud roars and elaborate air sacs. Probably originated as int. mov. of vocalizing. (Probably also related to "Jud" Postures of other species.)

None of these animals has shown any tendency to enter boxes. Probably do not sleep in holes like Actus and marmosets. (Incidentally, the latter may be another indication that Night Monkeys and marmosets are closely related to one another.)

2C repeatedly SNF's at genital-anal region of 2B. Coming up from lower branch. But then does not mount. I.E. the motivation of SNF-ing and copulations may be qualitatively different.

I can see no signs of "dominance" among the adults of the

Callicebus, May 10, 1964, VIII

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2 species. It is very difficult to give way to females as vice versa.
2B and 2C with a side by side near camp. Then 2B starts
to move around and 2C performs something that looks very in-
teresting like 2C or 2B.

1A utters a few muffled unpaired MB's when 2B moves
around. At same time, scatters dirt with hand in "Set".

The Arch Postures of this species may be accompanied by
a general ruffling of all the body hair. But this is difficult to confirm
- simply because the animals have such long dense fur.

Leaving 4:05 p.m. Everything asleep.

Callicebus, I

June 1, 1964
Barro Colorado

Back to Panama, to find all Fitis as before. Apparently fl
overhanging.

Ca. 9:30 a.m. I went up to look at the animals and put my
head close to their cages. In both cages, the adult ♂ sat close to the
adult ♀, and reacted beautifully to my approach.

The 2C ♂ began by doing G, and then did a medley of Gn, BM's
and Squeezes. Then repeated medleys of Gn, BM's, and Squeezes whenever
I approached the cage again.


Most of the BM's occurred in series. Usually just after Gn.

The animal did not seem to be either more aggressive toward me,
or more afraid of me, today than in early May, when it did not utter
BM's at my approach. (I.E. it did not perform more advance or retreat
movements today than earlier.) Then why did it perform BM today?

Callithrix, Jan. 1, 1964, II

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Is BM partly hostile and partly friendly? (Is 2C becoming accustomed to our presence now??)

All the BM's by 2C were accompanied by PL !!
Common ca:  Teeth not visible during PL.

One aspect of the Gn was particularly conspicuous. Every time the animal began Gn, it turned its head toward its mate (2B). Often put its face right into mate's fur. Observed "redirection" (even slightly reminiscent of howlers). Gn was not accompanied by PL.

Whenever BM followed right after Gn, the animal kept its face facing its mate at the beginning of the vocalization. Then, usually, turned to face me as the vocalization continued.

The success seemed to be scattered at random among the Gn performances. Not associated closely with BM. (Obviously lower intensity than BM.)

Neither 2C nor 2B showed any trace of RB (or Anls).

The last time I approached the cage, 2C uttered a few soft sq wails and/or short Wtl's after its Gn-Su-BM performance.

When I approached the cage containing the 1A ♂ and the 2A ♀ (and the 1B sub-adult), 1A did silent PL (again quite extreme in form). Then uttered soft squeals and/or short Wtl's. Then it also did Gn with its face pressed in fur of its mate!

Soft squeals and/or short Wtl's do seem to be purely adult pattern(s).

This species does seem to have a variety of facial expressions. (Including, possibly, partial closure of eyes — see photographs in Korschkovitz paper.)

Callithrix, IJuly 29, 1964,
Barro Colorado.

All the birds are still alive, and apparently flourishing. Still kept in two cages, 1A ♂, 2A ♀, and 1B young ♂ in one cage; 2B ♀, and 2C ♂ in the other. The 1A, 2A, 1B group is getting quite tame.

This tame group is very playful. Lots of wrestling and running about. The other day, I even saw 1B hanging from 1A's tail and swinging back & forth. The wrestling does not usually provoke much in the way of hostility. And certainly nothing serious.

The animals still sing quite frequently. But much less than at first. Now, the songs usually are obviously reactions to the appearance and/or sounds of human beings. Especially when the people are doing something unusual (i.e. recording or using other or acoustic equipment). This is good evidence that the songs are at least partly hostile.

Beginning observations this morning 10:15 a.m.

1A ♂ grooms 2A ♀. I think this is "usual". More common than 2A grooming 1A. But both types of grooming occur with appreciable actual frequency. And the young 1B ♂ also is frequently involved in the allogrooming in this cage, grooms and is groomed by both 1A and 2A. This is further evidence that the allogrooming of this species is not primarily sexual.

The 2A ♀ does PL with low BM-G Notes, facing me, when I approach her cage. Obviously not greatly alarmed.

The 2C ♂ does Aids with Squeezes when I approach. Each

Callicebus, July 29, 1964, II

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Sneeze is accompanied by a brief, rapid, lateral movement of the head. Apparently SF (but possibly not ritualized). Then he retreats. Obviously quite definitely alarmed throughout.

Then the 2C ♂ does Arch with sneezes (+ SF) and Ju when I approach again. Then he retreats again.

The Arches can not be very aggressive in this species!

The sneezes may be strictly equivalent to, and/or homologous with, the "Trit" Notes of other species. But I can't see that they have any very conspicuous signal effect. They don't provoke panic in all the other individuals hearing them.

Either 2B or 2C utters a brief series of a few O-BM Notes as a response to a series of single Wtl - Ck Notes by 1A or 2A.

All the Trits ignore the loud sound of an accented generator when it starts up, right outside the library. This species seems to be very "unresponsive" to sounds not uttered by conspecific individuals.

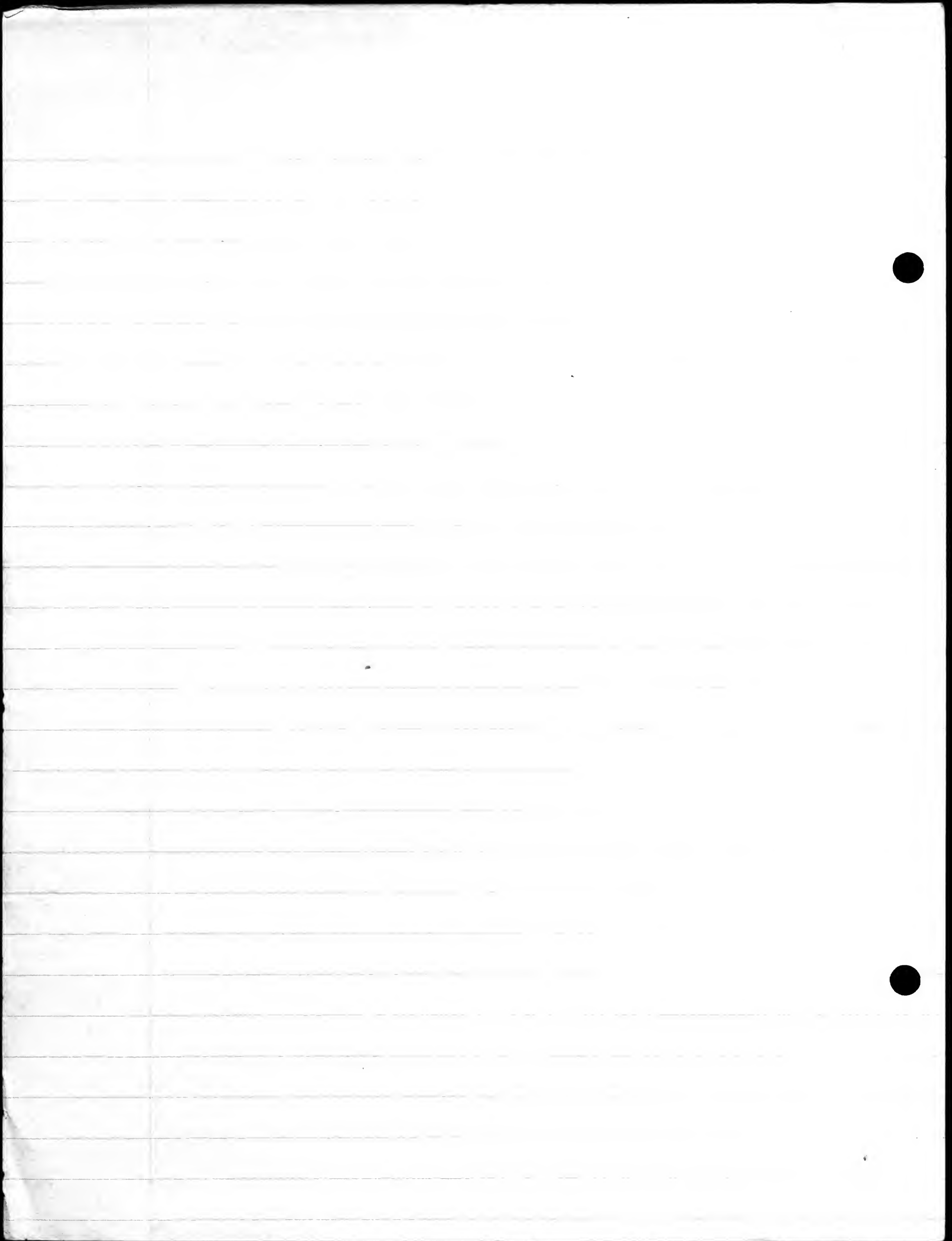
11:00 a.m. 1B ♂ grooming 2A ♀. Then 1A ♂ joins group. Some posturing. 1B retreats, uttering S-Hll's. Then comes back. Then 1A grooms 1B ♂.

2C ♂ does MO, then BT with definite PL, then Ju, in Arch or semi-Arch when I approach cage. While standing, Ju looking at me. Then starts to utter sneezes, and then retreats.

I am certain that the combination of PL with BT is unusual. The PL during this above incident probably began with the MO and was just "carried over" into the BT pattern. The MO itself was probably little or nothing more than silent BM (and/or, less

CALLICEBUS

IV



Callicebus, July 27, 1964, III.

(714)

Probably, ♂).

Now 2A ♀ is grooming 1A ♂ while the latter grooms 1B ♂. Is it possible that in this species (as in the Pichie's) the dominant animal grooms the subordinate more frequently than vice versa? 2A ♀ may well be dominant over 1A ♂. She is at least as large (if not larger) than he is. And she certainly is less shy of me than he is. (It may also be worth stating that the 2B ♀ is certainly larger than the 2C ♂.) If the ♀ of this species is usually dominant over the ♂, it cannot be purely the result of the ♂'s role in child-rearing. Viz Aotus, in which the dominance relations are different.

Possibly the dominance relations can be used as another example of the surprising large difference between Callicebus and Aotus.

Now the 2B ♀ is grooming the 2C ♂. 11:15 a.m.

Callicebus, I

September 23, 1964

Huancabamba, Barbasal, Colomb.

5:25 a.m. Song begins. Probably 2 inds. Very long. Quite like the songs of BCI animals. Except that CHN's are much more conspicuous throughout. Probably 1 CHN before every O Note (or after every O Note). Viz the spectrographs.

Also some BM in most songs.

All or most songs end with low-mongyllabic notes.

Sometimes terminal notes definitely slowing down in rhythm.

In some songs, the prelude CHN phase is very long.

Callitriches, Sept 23, 1964, II

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In general, whole range of variation seems to be such as in BT animals.

This pair still continuing 5:33. None of its neighbors has joined in yet.

Area of forest here looks like much of BT near site. I.E. second growth of moderate age (ca. 50 years). Lots of tangles.

Singing animals about 30-40 ft above ground.

Incidentally, the phrases of the two members of this pair are not well synchronized. Quite obviously two inds at work.

This pair stops singing 5:36 a.m. None of the other animals in area has begun to sing yet.

Then another pair begins to sing in distance 5:40. The pair near us, that sang earlier, does not respond to distant pair. Remain quite silent.

Obvious that songs are answered only when original singer(s) and responder(s) are fairly close together.

Second pair sings only briefly. Then general silence.

5:47. A burst of pure CHN song from nearby inds.

Quite brief. Obviously low intensity. Then silence. Then full song by distant pair. Again probably 2 inds involved, and not well synchronized. Then silence again. Then burst of CHN-Whistle notes by nearby animals.

Probably all these animals seem to group their CHN notes in conspicuous doublets and triplets when uttering long series of such notes.

CHN²? Now, 5:55 a.m., nearby pair beginning to move around to feed. Uttering occasional series CHN's.

Callitriches, Sept. 23, 1964, III

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Then one ind. utters series of 3 or 4 bisyllabic BM Notes
Both members of pair now going from tree to tree. Leap
of long distances then running along branches. Utter more or less
brief series CHN's and/or CHN-Will's occasionally, when looking
at us. Otherwise silent. "CHN" = CHNR?

Sudden burst ferrous. Quite like those BCI animals,
except some, possibly, slightly lower in pitch. Followed by muffled
MB. Apparently ♂ of this pair attacked his own ♀, when she
started to move over to adjacent pair (♂)!

Now pair sitting side by side. Tail intertucked. One
does SS (very rapid but slow) with soft CHN's while looking
at me.

No trace of ST by any of these animals yet.

Then one ind. (♂?) utters short series MB. Turns
away to look at mate briefly, as it does so.

6:35 a.m. Both animals feeding quite actively. Fruits and
buds. In general, these inds seem quite as active as Night Monkeys
feeding peacefully. I.E. the absence of separate locomotory drive
in these animals is not obvious in the wild.

They certainly are incredibly tame!

They quite ignore a hawk perched above them. Also a jeep
driving slowly.

Doing a lot of tail turning whenever they pause.

PARTIAL CORRECTION: Animals utter both typical, mo-
no-syllabic, CHN's and bisyllabic "chuk-ah" Notes during some
"series of CHN's". The bisyllabic notes are very similar to, or even
identical with, typical CHN's in tone and pitch. — but probably are act

Callicebus, Sept. 23, 1964, II -

(80)

usually intermediate between typical CHN's and typical MB Notes
Marion calls both monosyllabic and bisyllabic notes "chirp"s

According to Marion, the bisyllabic "chuck-ah" Notes
are perhaps the most common notes among the animals here

Much more common than typical monosyllabic CHN's. I think I will
call these bisyllabic notes "CHN2"

4:17. Two pairs close together. One individual utters
long series CHN's and CHN2's (all mingled together). Another in-
dividual, different pair, utters brief series MB Notes (extremely low)

Half grown individual (I₂, according to Marion's termi-
nology) with one of the pairs. Also uttering series CHN2's. Its no-
tes are conspicuously higher pitched than the corresponding notes of the
adults. At least on the average.

In general, the CHN2 Notes of an individual are lower pitch-
ed than the CHN Notes of the same individual

Then pair with young retreats

8:00 a.m. Remaining pair feeding quite silently and placid-
ly. Probably going into rest period.

8:15. ♀ sees me unexpectedly when I move. Looks at me,
does SS, with series of notes beginning as pure syll's or short
Witt's and then developing into typical CHN's. Then stops
and moves away

A second later, ♂ does "chest rubbing" ("CR").
Two rubs of chest along branch. Pushing with hind legs. Arms
dangling more or less free. Obviously equivalent of RB of Night
Monkeys. Marion says that this is common.

Pair goes into rest tree 8:50 a.m.

Callicebus, Sept. 23, 1964, IV.

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♀ utters a few Squ's when she sees us. Then silence
9:10. Two animals in adjacent tunnel. Apparently alone
Utters long series CHNA's. I record 4 of them some irregular
SS. She begins to sit now and to scratch chest with hand.
CHNA's uttered with more to completion. No BT or PL or
PL. This individual definitely adult

When I approach same individual again a few minutes
later, it utters more CHNA's, with slight irregular SS. Then
moves off gradually. CHNA notes tend to become louder immedi-
ately before leaps. Then second individual, large young, appears.
Following first. Does irregular silent SS to me. No BT or PL.
Then, perhaps, utters 1 or 2 CHNA's. Then both move off silently.

9:40. Pair watched earlier starts to move. One ind utters
series of notes, beginning Squ's, changing gradually into CHNA's.
Then both sit. ♀ utters Squ's from time to time while fixating me.
Obviously nervous. Then both move off. Uttering Squ's as they go.

Leaving 10:30 a.m.

COMMENT: All or almost all the vocal patterns utter-
ed by the animals here today are nearly or completely the same
as the patterns of the captive animals which seem to be strongly
ambivalent, i.e. definitely both hostile and friendly. No G's or
pure Wtl's. No BT. Only one Scream. This would suggest
that the whole group of Callicebus in this particular patch of
forest (which Maron calls "foceay") is a "community". In
spite of the fact that individual pairs or family groups maintain
individual territories. Viz Maron's ideas of the general social
structure of the group, capture or straying or exchange of ♀'s, etc.

The habitat preferences of the Callicebus here are very reminiscent of the Pithecia's in Panama. Occur in similar-looking vegetation, apparently second growth, at similar heights above ground. Show similar preference for tangles of vines. These sites do, in fact, seem to be the ecological vicars of tamarins (except that they may be more frugivorous). Probably not coincidental that both tamarins and marmosets are absent throughout this whole region. (This seems to be definite. According to Marou, the local people don't even know what a marmoset or tamarin is.)

According to Marou, almost all the local Sitis are in groups of 3 now. An adult pair, plus one young (known or presumed). Also one group of 2, an adult pair alone. Also two groups of 4 inds. In this respect, the Sitis seem quite Actitis-like.

Certainly the local Sitis have some vocal patterns which are absent in the BCI animals — or which I have overlooked in the BCI animals. The CHN2. And what Marou calls the "Lan glung Call" (which seems to be an accelerated brief long phrase).

The CR pattern seems to be quite common, according to Marou. He has seen ♂'s sniff at the site rubbed immediately after rubbing. And once he saw a ♂ use his hands to rub or push along his sides, probably squeezing something out of the gland in the center of the chest.

According to Marou, SS also is common. Sometimes including vertical components. "Bobbing and weaving".

Still according to Marou (and I believe him!) the full songs of the Sitis here are not very contagious. Individuals answer one another with full songs only when close together and engaged.

Callicebus, Sept. 23, 1964, VI.

(83)

I'm becoming suspicious. What is contagious — and may circulate a whole "community" round-robin, going from pair to pair — is the "Singing Call" or Accelerated Song.

Going to try another patch of forest, where there are supposed to be a lot of other species also, in afternoon. "Monte Seco" Start 2:30 pm. Hot and arid. Nothing!

Callicebus, I

September 24, 1964
Hacienda Barbacud

Working in Monte Seco forest again this morning. Hoping to hear vocal overlaps between Titis and other monkeys. SEE YESTERDAY'S NOTES ON MIXED MONKEYS. Early in the morning, I had no luck. Both nearby Howlers and nearby Titis silent. Then the Titis sang 6:15 - 6:25. Against a lot of background noise birds and insects. Recorded. Then I stop recording 6:45.

6:50. Walking along path not far away. Come across pair Titis. In tangles 20-30 ft above ground. Area of relatively young second growth. No other species annotated. One of the inds utters long series CHN2's. (Some of the CHN2 Notes are really tri-syllabic, "Tuck-ah-tuh". But such notes are relatively rare.

SEE ALSO TODAY'S NOTES ON MIXED MONKEYS

NOTE: According to Mason, the Titis have a definite breeding season. Copulations became common a couple of months ago. It looks as if the young will be born at the beginning of the dry season — more or less like the Pichie's in Panama.

Callicebus, Sept. 24, 1964 II

(84)

Mason has seen Jiti's swing their tails from side to side during "part song" of BM Notes. Also, probably, during complete song.

He says that series of CHN2 Notes are the usual response to a human intruder here. But full songs may also be given (or given instead) in the same circumstances.

Incidentally, the songs uttered by the pair(s) heard this morning were similar to those heard yesterday in one important respect. Songs of different individuals definitely were not synchronized.

Going to work in the Socay forest this afternoon. Try to record again.

First Jiti seen 3:10 pm. Presumably one of Mason's pair to

Callicebus, I

September 24, 1964
Hacienda Barbudal

Going to work in Socay again this morning

No luck early in the morning trying to record.

Only some CHN2 series to me.

8:30 am. Return to find Mason watching encounter between 2 family groups (2 and 2 inds or 2 and 3 inds). In same tree, only a few meters apart. Some chasing back and forth. Silent after I arrive. But Mason says that one of them uttered a series of BM Notes immediately after a chase. In also occurred at some point during this "dispute".

These "opponents" certainly are very well acquainted - habituated to one another.

One ind. down below of ... toward me. With SS. Up and down as well as side to side. *Definitely* no BT or PL or SF

Nothing more in morning.
Try again in afternoon.

Rain starts sporadically 2:40 pm. A few minutes later, there is a burst of full song from territory of distant pair. According to Mason, the Tels are more apt to respond to the accompanying wind (and sound?) than to the actual rain. Somewhat Howler-like

A few minutes later another individual utters several calls which Mason considers more or less typical "Laughing Calls". Short series many short notes. "Tuck-a-tuck-a-tuck-a-.....". Sounds perfectly intermediate between typical series CHN2 Notes and a full song. Apparently another reaction to wind and/or rain.

Mason has not noticed any ritualized HD pattern in the animals here. But he says that they will look away abruptly (turning the head sharply to one side and then bringing it back, more or less slowly and gradually) when slightly nervous of human intruders. This usually occurs after SS ("Bobbing and Weaving") has been performed (and died down). Somewhat reminiscent of fakes and Nakams.

5:35 pm. Pair 6, which has been feeding and sitting very quietly for hours on end, suddenly explodes into activity. One ind. takes off for an adjacent tree in a hurry. The other follows a second later. One or both utter (s) a lot of what Mason calls "Whines". These sound like loud Wstl's of moderate length, but with a def

Callucbus, Sept. 25, 1964, III

(26)

into whining or plaintive quality and uttered at surprisingly regular intervals. Also each note seems to be quite uniform in pitch.

According to Mason, these are uttered in a variety of circumstances. Usually or always when both members of a pair are more or less together. Possibly with some element of frustration involved. Might mean something like "Please follow me" or "Let me move out". Could there be intermediate between typical Wtl's and BM ??? Could they be homologous with the LW of Pucke's ???

According to Mason, Whines tend to occur in fairly long series when they do occur - although they do not occur very often.

NOTE: According to Mason, the principal "song-type" vocalizations occur in the following circumstances

CHN2 Series ("Chirps")

- (1) As a response to human intruders
- (2) As a response to other Tit's intruding.
- (3) Initial response to separation from mate

BM Series ("Part Song")

- (1) During copulation
- (2) Before and after chases, during territorial disputes (sometimes before Full Song).
- (3) As "greeting" between mates (possibly only when ♀ is receptive)

"Laughing Songs"

- (1) When mates are separated
- (2) During "Round robins" (presumably proclaiming ownership of territory)

Callicebus, Sept. 25, 1964, IV

(87)

Full Song

- (1) When mates are separated.
- (2) First (or almost first) reaction in the morning.
- (3) During "vocal interchanges" between territorial neighbors (presumably disputes).
- (4) During heavy rains.
- (5) Toward human intruders.
- (6) Sometimes after Round-robin "Laughing".

Almost all the Song and Song-like patterns of these animals are uttered obviously in response to overt stimuli. The only definite exceptions are the Full Songs at (or before) dawn (and the BM Notes which frequently are uttered just before, more or less as introductions to, the Full Songs in such circumstances). Another possible exception is provided by the "Laughing Songs" uttered in Round-robin. Mary doesn't know what provokes them.

Callicebus, I

September 26, 1964
Hacienda Barbacud

Young to observe (not record) in a patch of woods called El Campamento this morning.

4 First Song from Foray forest heard 6:05 a.m.

According to Bill, he has also been classifying abbreviated and accelerated Full Songs as "Laughing Calls". In addition to the CHN & like patterns such as the one heard yesterday. (Of course, the two patterns

Callicebus, Sept 26, 1964, II.

(27)

are not very different, at best. And they certainly are part of an intergrading continuum.)

6:50 a.m. Not a peep out of the Titis here yet (altho they were seen here yesterday). Bill says that all the Titis in this region are much quieter than a month or so ago. Presumably finished copulating and just waiting for the young to arrive.

Stopping observations 7:15 a.m.

Trying another patch of forest, Puerto Rico, 8:15 a.m.

Nothing!

Trying same patch (Puerto Rico) again this afternoon.

Still Nothing!

Callicebus, I

September 27, 1964

Hauwaka Barbados

Going to work in Soray Forest today. Just watching Titis, not recording.

First songs heard, in distance, 5:15 a.m. Still very dark. These Titis are quite unlike Pouché's in Panama, insofar as they usually (not always) get up very early, like diurnal birds.

Nearly animals, pair 6, begin to sing 5:31 a.m. Full songs, phrase after phrase after phrase. Apparently at least 2 birds involved. Moderately well synchronized at first. Then less well so. For a while, it sounds as if one bird (presumably the ♂) is uttering full songs, while the other is uttering nothing but "Pumping Notes" (see outline of vocal repertoire of species on separate sheet).

Then these animals shut up. A minute or so later, hear

Callitrichus, Sept. 27, 1964, II

(89)

Lots of songs by individuals in another forest. This does not provoke any audible response by individuals in our forest. It is my impression that these early morning songs are not very contagious (from pair to pair).

Then distant animals shut up. A few seconds later, some other birds in our forest begin to sing. Possibly pair 5. Apparently 2 birds involved. Not synchronized. Then shut up. Then still another pair begins full song. Possibly pair 3. Again apparently 2 birds involved. Again not synchronized!

So far, there has been absolutely no overlap between songs of different pairs. 5:45 a.m. This may be taken as evidence of the importance of keeping the songs of different pairs clear and distinct from one another.

Then pair 5 shuts up. Pair 6 utters some series of BM Notes "Part Song". Then shifts to CHN2 Notes. Then Pair 5 sings again. 6 continues (s) CHN2 Notes throughout 5's song. Then 5's shut up. Pair 6 resumes BM Notes. Then general silence.

5:50 a.m. More songs by pair in distant forest.

6's moving out to feed. Utter a few Wtl - CHN2 Notes as they move. Reaction to me?

Pair 6 feeding quietly. Moving gradually in direction pair 7. Can hear 7's moving about, quite near. This seems to be the route followed by pair 6 every morning. These animals tend to be very regular in their peregrinations.

♀ 6 suddenly becomes aware of my presence. Utters

Wtl - CHN → Wtl - CHN2 looking at me. Accompanied by brief SS (the up-and-

Calliobus Sept 27, 1964, III.

25

down, bobbing and weaving, type). Then resumed feeding peacefully.

All songs stopped a few minutes ago 6.02 a.m.

Gentle rain starting 6.04 Down!

♂ has now moved at least 50 ft away from ♀. Both still feeding. Both silent. Then ♀ joins him. Then ♂ moves off again ♀ follows immediately. One or both utter (2) 3 or 4 short Wist's as movement starts joining in direction Pair 17 boundary.

Then hear several series BM Notes coming from this area. Go over to find vigorous dispute between Pair 6 and one or more 17's in progress. Lots of "pendulum" movements. Can't see 17's well but get good view of 6's. At beginning one of the 6's (presumably ♂) would leave its mate and rush forward toward 17. Mate remains sitting with no sign advance int. moves. Presumed ♂'s rush forward usually or always silent. Rapid and brief. After a second or so, he always rushes back to mate. Once, at least, he uttered short Wist's as he returned. Then the 2 6's would sit side by side, facing toward 17's, and utter series of BM's ("Part Song"). Apparently both birds uttering BM's. Obviously a sort of "Triumph Ceremony". One of the birds sometimes (not always) turned its head toward its mate during the BM's. Not exaggerated in form. Certainly not pressing face into mate's fur.

After some minutes of this, the advances and retreats became less frequent. And both 6's began to utter more elaborate songs. In first instance, the presumed ♂ returned to ♀, both uttered BM's as usual, and then both began Resonating Notes followed by Pumping Notes. BM-Resonating - Pumping transition quite smooth. No trace of initial CHN's. After later returns by the ♂, there was little or no BM; both animals

Callisaurus, Sept. 27, 1969 IV

(91)

young straight into territory - Pumping. At this time, I noticed that the Posturing of one of the birds was really either Posturing - CHN or Posturing (more probably) composed of typical Posturing notes and typical CHN's in some degree (alternation (possibly "contaminating" one another - see also spectrograms)

After some minutes, the birds began and retreating (or chasing back and forth) steps. The ♂'s quit it side by side, continuing Posturing (with CHN component in one case) - Pumping. Series after series. No tendency by either to turn toward its mate during these vocalizations. Finally, ♀ retreats. ♂'s move back into another tree, about 10 ft from boundary. Peace and quiet reigns for a minute or so. Then, suddenly, a ♀ appears and leaps into tree where the ♂'s are. A territory fight breaks out! At first, all I can hear is a lot of thrashing and screaming. Then 2 birds, one ♀ and one ♂ (presumably ♂) actually fall out of tree, grappling with one another. Silent as they fall. Fall must be 20-25 ft. Land with a dull thud. Separate. ♀ retreats into its territory. ♂, on ground, seems slightly stunned. Follows ♀ slowly. Remaining ♂, presumably ♀, still in tree where fight broke out, begins to utter CHN's. Long series. The ♂ who fought advances toward boundary of its territory, stops, facing ♀, 15-20 ft away. Then it (the ♂) is joined by its mate. Both begin Posturing (with CHN component in one case) - Pumping. No advances and retreats. This time, I am sure that it is the ♂ whose Posturing notes are associated with CHN.

The ♂'s give all their Posturing - Pumping patterns from same postures as the captive birds on B.I. Usually sitting, with hind legs slightly un-flexed. Occasionally (when songs are loud and mes

couple, from standing up posture, both hands and feet firmly grasping branch, and rear end of body elevated. (Same posture as before earlier in my notes.) Once, at least, one of the 6's licks its tail from side to side, about 3 movements in each direction, while Resonating in this "rear end up" posture.

After some time, the 7 retreats. The 6's shut up. Remain sitting quietly where they were. Then both go to one side to feed.

Then a 7 (presumably same individual as before) apparently enters 6 territory some distance away. Passing 6's diagonally, about 30 ft away. 6's

The 6's apparently don't notice this for some seconds.

Then one 6 (presumably ♂) starts to run toward 7. I lose sight of both animals for a while. Hear a few short BM series in distance. Then, apparently, 7 retreats (for good this time). Then the other 6, who has remained behind in feeding tree, goes over to join its mate. One or both utter(s) series BM's when they come together, as "Greeting" and/or "Triumph Ceremony". Then both move off into usual feeding - resting area. Quietly.

As far as I could tell, there was only one 7 involved in this whole dispute (♂ trying to capture ♀ ???) Also, as far as I could tell, the 7 was quite silent throughout.

The sequential relationship of calls during this dispute is quite good evidence that BM is produced by weaker motivation than some or all of the Resonating - Pumping Notes. But quite possibly motivation of the same type as Resonating Notes.

Calliebers, Sept. 27, 1964, VI

(93)

I did not hear any during this dispute. But I might have overlooked a few during the actual fight.

The whole dispute lasted approximately 6:10 - 6:35 a.m.

All quiet now 7:09 a.m.

When I stood up with a camera, one utterer (Will-CHN) → CHN's series. Observed reaction to me. CHN's accelerated almost into jabbing. Then both utterers retreat. Disappear into tangle. Apparently resting.

7:29. Hear one brief Jiti song in distant forest

Go on to another area. Find another Jiti (or two) in top very tall tree (at least 50 ft above ground). Presumably a 3 or a 4. Utters Will-CHN2 when it sees me.

Rain, which stopped during 6-17 fight, begins again 7:33 a.m. Quite hard. One Jiti in distance (probably a 5) utters 5 BM Notes. Utters five or six of these notes. But not really organized into well defined series. Then utters song of BM-Ronating-Pumping. Reaction to rain? Again.

Then there is a burst of Ronating-Pumping from another pair (8?). Then 5's start again. Overlap broadly with 8's. Then a more distant pair also utters song of BM-Ronating-Pumping (or Ronating-Pumping alone). Again broad overlaps. Then both 5's and 8's utter more songs as before. Broad overlaps songs from areas of at least three different pairs.

Then silence 7:37 a.m. Rain continues

7:42 Another burst of songs from 8 area. Again. Again. Again. Again. I rush over to area to find two 8's sitting side by side. Singing in a real "frenzy". All songs Ronating-Pumping.

Callitrichus Sept 21st 70

(5)

Sometimes with introductory one or two BM's. No introductory CHN's. Some tail-lashing by one ind. at least once.

Finally see that there is at least one other ♀ in area. About 20 ft from singing pair. In the direction in which they are facing. Then this third individual moves a little. Away from pair & in direction of territory. Is this the same ♀ individual involved with pair earlier???

At same time, the ♂'s become aware of my presence. One or both utters CHN2 series. Then go back to singing. This singing directed to me or to me and the ♀ simultaneously. Significantly enough, their songs are CHN-Renovating-Pumping.

Then the ♂'s apparently get used to my presence. Go back to singing facing straight in direction of ♀. At same time, their songs go back to BM-Renovating-Pumping and simple Renovating-Pumping forms. Then they finally shut up. ♀ seems to have disappeared by this time.

There certainly seems to be something queer about ♀ this morning!!! Lost mate?

During one of the bursts of song by ♂ pair toward ♀, I thought that one of the ♂'s had the hair of its back (but not its tail) erected. Apart from this one possible case, I have not seen any pilo-erection of any kind during any of the disputes this morning.

Perhaps significantly, the presumed ♀ also seemed to be quite silent during this dispute with ♂'s. Just as during disputes with ♀'s earlier.

I wonder why I haven't seen any Arches today. Have I just overlooked them???

Callinabus, Sept. 27, 1964, VIII.

(95)

Rain stopped 2:20 am.

There was singing & was Resonating Pumping and/or BM-Resonating Pumping.

Certainly CHN-Resonating-Pumping is not the usual form of song note! This may be an indication that CHN is purely territorial.

Was song 6 area. Pairs over to pair 6's engaged in dispute with 5 pair. Two pairs facing one another about 10-15 ft apart. Lots of singing (uniform) by 6's. 5's apparently silent. Whole group apparently in 6 territory (where I have seen 6's before). Then 5's retreat & fall silent. Then I hear long loud burst of song from 5 territory. "Triumph" or "Quitting" ceremony, by 5's.

In any case, it certainly looks as if birds are much, much more likely to sing when in their own territory than when trespassing on another's.

Then 5's come back to boundary with 6 territory. Both 5's (adults) utter lots of BM-Resonating-Pumping songs. Then they are joined by a young animal. I don't know if it sings or not. In any case, it soon wanders back toward center 5 territory.

All this while, the 6's have been well within their own territory, not close to border. As far as I can tell (which isn't much), they do not react to 5's.

Then the adult 5's become aware of my presence. Start to utter lots of CHN's with SS. Then move off back into their territory.

All quiet now 8:30 am.

Rain again 8:32 am.

All well, I would say that these sites are almost 100

Calliobates, Sept. 27, 1964, III

(96)

even completely) as aggressive as Night Monkeys

Rain stops and sky begins to clear 8:10 am. Rain starts again a few minutes later.

8:50 am Walking around 7 area, to see if I can find the animal (s), in order to determine its sex. No luck. Invisible and inaudible. Apparently resting.

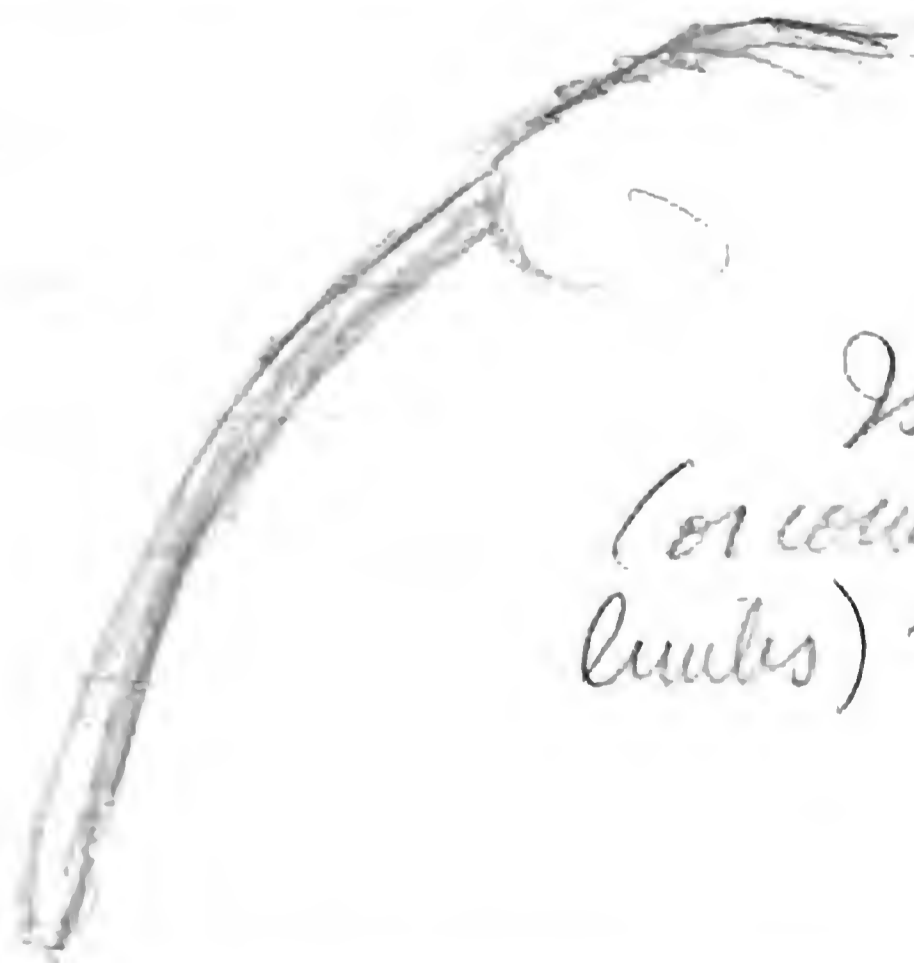
Leaving 9:06 am

According to Mason, the songs of different pairs of Tets do overlap, at dawn, when songs are most common and most prolonged (i.e. 1-2 months ago).

Back to Sogay Forest 3:20 pm. Everything dead still

3:50 pm. Come across single individual in Group or Pair 1 area. Does lots of CHN2 when it sees me, and then gradually moves off. CHN2 Notes become louder just before leaps. Since this individual utters Will-CHN Notes (single) when I make sudden movements.

I notice that it holds tail out diagonally, all or most of the time while uttering CHN2's toward me. More or less common.



Definitely, not hanging straight down.

Is this an int. mov. of leaping (or correlated with pre-leaping posture of limbs) ??? Is it an int. mov. of escape ??

4:17 pm Come across 2 animals (probably group 5?) near 5-6

Callicebus, Sept. 27, 1964, I.

(97)

branches. Also quite far apart when first seen. First animal to see no does Will's CHN → CHN2 with vigorous SS. This apparently induces its mate to come over and join it. Then the two animals are within a few feet apart. The second ind. does vigorous SS but much less than the first. Then the first ind. gradually calms down. Will's CHN and Will's in same rhythm as CHN2 series! When this occurs, the second individual goes back to where it was before.

Both inds hold their tails out diagonally (and downward) when they first begin to react to me. Both when performing SS and when not, when silent as well as when uttering CHN2's. I am now quite convinced that this partial raising of the tail is an intention movement of locomotion. After all, tail is usually stretched out horizontally, or even held above the horizontal, when walking or running (or leaping).

On the whole, everything very quiet here this afternoon. Birds as well as mammals.

Leaving 5:00 pm

Callicebus, I

September 28, 1964
Hacienda Barbacial

Working in Joray Forest again this morning. Also recording (i.e. my written notes will be lousy).

One pair (6?) begins to sing before 5:30 a.m. Only pair audible at the time.

Callitriches, Sept. 28, 1964 II

(78)

5:33 Hear what sounds like pure Gobbling in distant forest. Only one pair. No round-robin. Then silence. Then another pair of what sounds like Gobbling (from another pair). Then silence again.

The song of the presumed pair 6 were preceded (at intervals or intervals) by several short bursts of BM Notes. This is typical. The BM's of these animals today were very soft and muffled. This may be typical.

This is all for here this morning. There was a lot more singing later in the morning. Apparently a territorial dispute (But the Hagna went on the blink and I was distracted).

NOTE: Talking to Mason again, a few more aspects of the calls have become clear. The Gobbling is largely confined to two situations: (1) During Round-robins, as proclamation of territorial ownership. (2) By an individual which has lost contact with its mate. (It is not known if Gobbling is uttered only by males, or only by females, or by both sexes.) According to Mason, Gobbling in situation (2) is sometimes obviously effortful. I.E. he has seen individuals move to join their mates after the latter had uttered Gobbling. All this would suggest that Gobbling is a low-intensity version of the complete Full Song (CHN - Reverberating - Pu rruping). (In this connection, it should be stressed that the Full Song seems to be the exact equivalent of the songs of many birds. Both hostile and non-hostile. Uttered during territorial disputes. Also by single animals in captivity, on BCI, presumably attempting to attract a mate.) Thus it is not surprising that Gobbling also is both hostile and non-hostile.

If this interpretation of Gobbling is correct, then BM presumably

Callisaurus Sept. 28, 1964, III

(79)

is either a low-intensity version of the Resonating Notes (alone) and/or slightly more frequent and slightly less discrete, on the average, than the Full Song.

Callisaurus I

September 29, 1964
Hacienda Barbana

Working in Sycamore Forest again this morning.

Field songs start 5:15 a.m. Usual sequence BM - Resonating (I think both with and without CHN component - altho the former is usual) - Pumping. The burst of song by one pair ended with BM, after Pumping, but I am not sure that the ind that did the terminal BM was the same as the one that did all or most of the Resonating - Pumping. Some of the later songs during the first burst of Dawn Singing have little or nothing in the way of initial BM. Apparently start straight in with the Resonating.

One song at Dawn (about 5 minutes after the first burst) began with CHNs rather than BM. But I think that this may have been uttered by the ind(s) being watched by Mason (and Fern). Possibly partly a reaction to human intruders.

NOTE: I forgot to stress, yesterday, that the Gobbling uttered by an ind. which has lost contact with its mate is frequently (probably usually?) associated with (probably usually eventually followed by) Full Song. Presumably as intensity increases.

I should add that CHN's are seldom or (more probably) never associated with early morning Dawn Singing.

Things beginning to quiet down 5:50 a.m. Songs much

Callicebus, Sept 29, 1964, II

(20)

less frequent now.

One of the 6's utters CHN's when it sees us.

The CHN would seem to be the exact equivalent of the TW of Pucos. Is it at all related???

5:55 Dispute starts between 6 and 7. Lots of singing. First burst begins with BM. Second burst without BM. Then a long burst of CHN's, followed by Resonating - Pumping, just like my BCI animals!

Two inds have tail fluffed during one chase back and forth.

Then more singing. Little or no BM. Lots of Resonating. Apparently little Pumping. Altho it does sound as if one individual were uttering notes quite similar to Pumping Notes but in Resonating rhythm while another is uttering full Resonating (with CHN component). Perhaps these Pumping-like Notes are relatively low-intensity?? (More nearly purely hostile than BM???)

Dispute still continuing 6:02. Apparently 2 7's involved as well as 2 6's.

There is a burst of short Whl's by one ind. between bursts of song by several inds.

CHN component very conspicuous in Resonating of at least some of these inds.

Whenever songs tend to become particularly long, they do so by lengthening the Resonating phase.

Dispute seems to die down 6:04. At the end, one of the 6's utters BM Notes. Presumably as "Triumph" or redirection toward the ♀. But I didn't actually see the animals.

Afternoon... with general... create...

Afternoon... 7's... (Potts... 7's are... There is... usually "Isuph" - ... but again I failed to see the answer during the actual...)

Then there is a burst of what Mason calls real, typical, early morning gobbling. Rather different from the "gobbling" heard a few days ago. Not just accelerated series CHN's. Brief accelerated series, beginning with CHN(s) and developing into rapid "Nuh nuh nuh nuh". Sometimes beginning gradually: "CHN... CHN... CHN. (CHN-Nuh) (CHN-Nuh) Nuh Nuh Nuh Nuh Nuh Nuh Nuh" sort of thing. At other times beginning more abruptly with only one CHN or only (CHN-Nuh)'s instead of pure CHN. There certainly are intermediates between pure CHN and typical "Nuh" Notes - but the transition between the two is usually fairly brief. In other words, many Gobbling phrases may be more or less comme ça: $\frac{1}{10}$ CHN, $\frac{1}{10}$ (CHN-Nuh), and $\frac{8}{10}$ Nuh. Nevertheless, the transition between pure CHN and pure Nuh is fairly smooth - not just in two major steps. It is my impression that the successive "Nuh" Notes during a phrase become progressively lower (and probably shorter). As far as I can tell, the "Nuh" Notes during Gobbling are typical Pumping Notes.

This Gobbling was started by the 7's. By at least 2 of the 7's. Almost simultaneously. (There seem to be 3 ind. in the 7 gr...

up now.) And it is immediately taken up, Round-robin, by one or two other pairs (or members of other pairs). Huge overlap (in spite of the fact that all Gobble phrases are very short). Then 7's Gobble again. As before. Again then up Round-robin. Then 7's shut up. Go to feed. (During all the BM and Gobbling by 7's, the 6's, who had retreated into their own territories earlier, were just feeding peacefully. Ignored the whole thing. Did not join in Round-robin.)

The fact that the Gobbling occurred after the end of the dispute is another indication that Gobbling is lower intensity than full fight.

It would appear that only the CHN and Pumping are really highly contagious. Or, at least, they are much more contagious than the BM-Renovating group of patterns.

If the song patterns of this species can be explained purely in terms of hostile and "friendly" tendencies, then it is obvious that the CHN and Pumping are relatively more hostile and less "friendly" than the BM and Renovating. Even if there is some independent "Singing Drive", it seems obvious that both the CHN and Renovating have been derived from purely hostile patterns. CHN obviously related to Alarm Notes other species. Pumping probably related to G. (It is quite similar in sound to human ears.)

One would expect that largely or purely hostile notes would be more contagious than less hostile ones. This is the only way the animals can maintain territories under crowded conditions.

According to Mason, there are 28 individuals (in 9 groups) in this forest which is approximately 300 m. x 300 m.

7:00 a.m. Two inds of the 7 group, quite far apart, look

Callipepla, Sept. 29, 1964, II

(103)

at us, at different times, and then look fixedly away to the side. This looking away seems to be quite characteristic of the species.

7:45 a.m. Eventually there are 4 males with 17 groups. Three nesting in a tangle. The other three some considerable distance away. When we approach the latter, it does "Pill's", then CHN2 with SS, then utters a brief song which I thought was "pobbling" but which I think was probably just a brief, sort of slurred, song. Begins with CHN2, not CHN. Later notes monosyllabic "Pill's", but not in a very fast pumping, descending rhythm. Mason thinks that this song was a reaction to isolation. I think that it probably was largely reaction to us. Probably both, in fact.

May be, the brief song of this isolated 17 was answered by BM by one of the other 17's.

Some moments later, two (at least) of the other 17's move in direction of the isolated individual, but do not actually join it (immediately).

5
2 This species certainly runs more frequently than it leaps. But both types of movements are actually common.

8:10. Three of the 17's go over to feed near to territory. Co \rightarrow comes over to look at them. Sits in tree 20 ft away from them. Just looks, no display of any sort.

During the feeding, one of the 17's (♂?) gets left behind by the others. Eventually runs off after them. As it does so, it utters at least one Wtll of moderate length. Was this a reaction to isolation? Is the Wtll ambivalent also? According to Mason, this sort of Wtll intergrades completely with "Whines".

Leaving 9:30 a.m.

Calliobus, Sept. 27, 1964, VI,

(104)

COMMENT: Mason came back from Socay Forest this afternoon saying that he had heard a number of "Laughing Calls" (gobbling) which seemed to be composed of "Chirps". These calls presumably were the same as the "gobbling" of CHN₂ Notes that I heard a few days ago. I.E. there seem to be two types of "gobbling" or "Laughing Calls". One composed of CHN - Pumping, the other composed of CHN₂ Notes. Similar in rhythm, but otherwise distinct. The CHN - Pumping is characteristic of early morning. Presumably high intensity. The CHN₂ series are characteristic of later in the day. Presumably lower intensity.

Calliobus, I.

September 30, 1964
Hauenda Barbascal

Working in Socay again. Arrive 5:30 a.m.

Hear a couple of short series of BM's. Presumably preliminary to Dawn Song. (This is characteristic. The animals begin with several short bursts of BM, at irregular, sometimes long, intervals. The first series BM's do not usually develop into Fall Song. It is only the third or fourth series, in most cases, which leads to the vocal "explosion".) Presumably one of the reasons that BM is the usual initial pattern is that it is uttered while the mates are still clumped together.

5:33 a.m. Hear several Fall Songs by distant pairs. Pairs already moving about. Apparently going to feed. More songs in distance. I think that there is little or no overlap songs different pairs.

Parasite in air 15 minutes. 7 somewhat separated from 6. Then see response to 7. Then BM is "singing". Then both 6 and 7 see BM. He then does CMA and Will's. Then both sing. Parasite in air. With definite general pel. orientation (and view) in. Then both advance toward 7 territory silent. Then both break into their own territory. 6 side by side. Sing. BM - Resonating (with CMA component) - Pumping. Again then time out and utter BM immediately after full song. 5:45.

Sail during pile-erection looks comical:
 (big fat sausage)
 (skirt not visible)

A few minutes later there is another burst full songs from 6's. Singing 7 territory. (I can't actually see 7's from here.) Again with pile-erection. And one of the 6's sings with its hands raised off perch. (Archi?). The other keeps hands grasping perch.

CORRECTION: There are at least two 7's in same tree as 6's. Apparently silent. Retreat. 6's give burst of full song after 7's retreat. Then silence. 6's begin to feed 5:54 a.m.

Then 6's rush together again. Sing BM - Resonating - Pumping. At same time, I see that there is at least one 7 nearby. Then 6's sing Resonating - Pumping. During both bursts of song, both 6's lashed their tails violently from side to side at the beginning of the phrase, but stopped before the end of the phrase.

7(s) apparently retreat. 6's shut up. Immediately afterwards, both 6's and 7's ignore several

Callinectes, Sept 30, 1964, II

(106)

bursts of Gobbling (at least one round-robin) in another part of same forest. All Gobbling this morning CHN-Pumping type.

But c's eventually move off in direction of Gobbling. Probably just feeding. In any case, don't get far. (Sometimes the Gobbling soon is succeeded by full songs.)

All quiet 6:05 a.m.

The two types of Gobbling phrases, CHN-Pumping and CHN2, are not very easy to distinguish when heard at a distance. All the phrases are so short and rapid.

Both c's and 17's feeding vigorously, 6:15. But getting closer together again. 17's start to retreat. But c's still sing at boundary. BM-Resonating-Pumping. Several bursts. Then c's stop singing. One of the c's utters one fairly long Wttl immediately after song 6:18. Then c's move back toward center their territory. Start to feed again.

One c utters series Wttls - (Wttl-CHN2) Notes when it comes close to me.

Lots of full songs by at least 2 pairs in distance. Apparently being ignored by both c's and 17's. 6:22 a.m. Full songs in distance certainly are not contagious in this population!

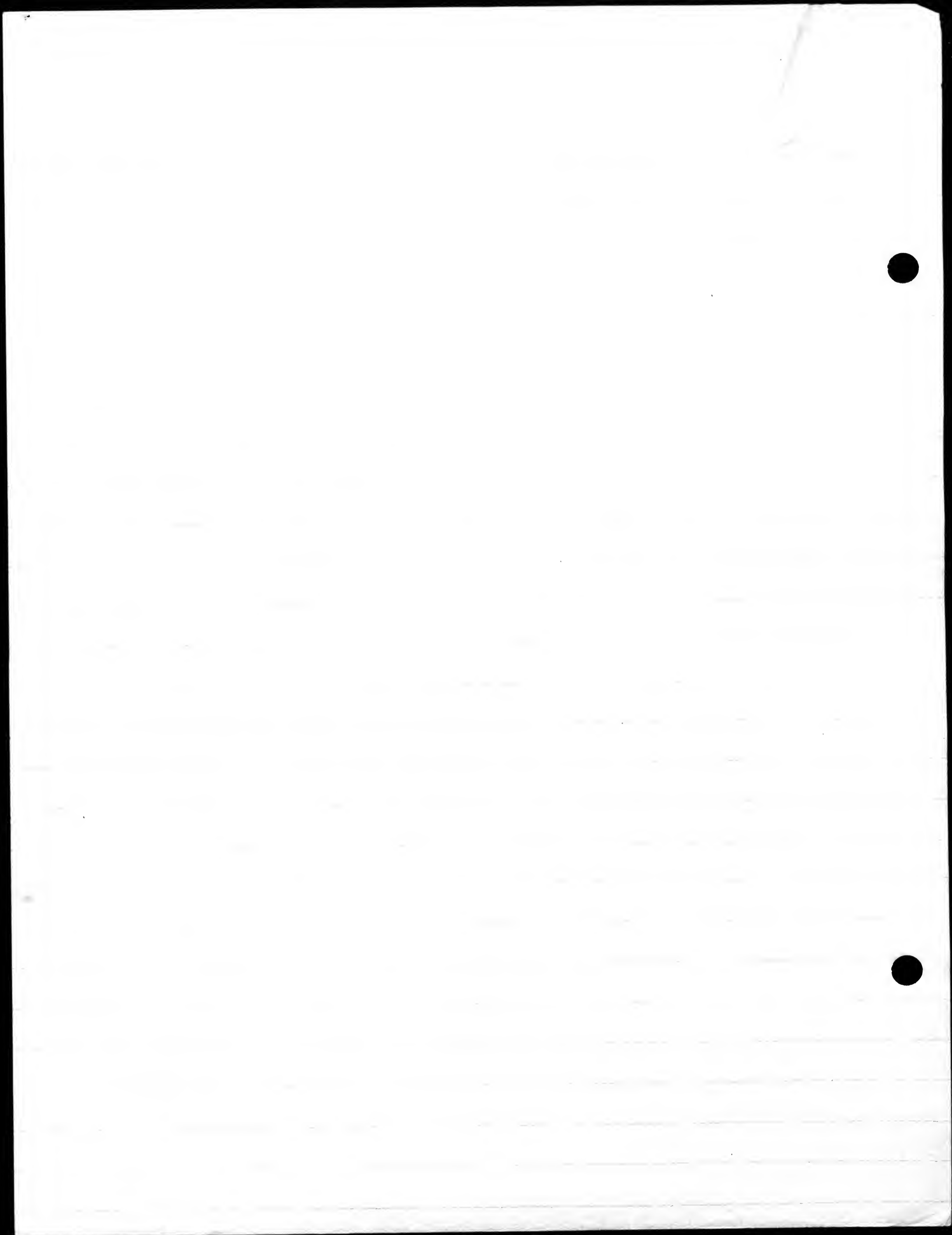
This species certainly does not, on the whole, sound very bird-like. Is this correlated with the fact that it is vegetarian, not insectivorous? Certainly there are relatively few flycatchers around here. The background is not filled with a muddle of whistles, trills, and rattles.

Leaving this area 6:35 a.m.

Go down to 2 area. 2's engaged in dispute with 17's now. 2's uttering lots of Gobbling. Usually CHN-Pumping. Sometimes

CALLICERBUS

IV.



Callicebus Sept. 30, 1964, IV.

(107)

CHN - CHN2 - Pumping. four times. (Whit - CHN) - Pumping. According to (and) the use of following during face to face disputes is unusual.

Sequences following develop into full song. In our case, sequence was as follows: typical following → a series of notes, each of which seemed to be identical with typical Pumping Notes, but which are uttered in a much slower rhythm than typical Pumping → Resonating (with 1st component) → typical Pumping.

This may be typical of such sequences

7's seem to be quite silent while 2's are in full voice.

Speaking of this species in general, I should guess that intermediates between major types of vocalizations (as a group) are at least half as frequent as the major types (as a group) themselves. Perhaps more.

Scene now - 6:45 a.m.

Then rounds of a dispute at 6-7 boundary. The 7's certainly seem to be trouble makers!! Dispute doesn't last long. All quiet by 6:58.

Then one of the 2's does lots of CHN2. To whom?

NOTE: Maron says that he has heard an isolated juvenile utter "Whines" when it became separated from its group. I.E. these Whines probably are homologous with the LW of Puiche's. But they certainly are not organized into doublets. Variable series. (I am fairly certain that the "Whines" of this juvenile were Whines in my sense, not Whit's. Maron says that it sounded like a Puppy.)

Leaving 7:30 a.m.

Callicebus, I

October 14, 1924
Barro Colorado

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I have been checking on the color patterns of my animals here, in order to determine their subspecies. The results are as follows. The 2B ♀, 2A ♀, and 1B ♂ have comparatively red forearms (both inside and out). Definitely cupreus. The 2C ♂ has only a little bit of red on the outside of its forearms, but lots of red on the inside. ♀. cupreus, possibly with some brunneus blood.

The two young animals from Iquitos presumably were of discolor or cupreus ⇒ discolor.

Of our young animal, A, is problematical. Presumably from litorea. Either abnormal discolor or ornatus without frontal band, or a cupreus in an unusual place.

The 1A ♂ has red on both outside and inside forearms. Probably discolor.

I panned by the various Niti cages several times this afternoon, in the course of doing many other things. They all reacted to me quite vigorously, but I had time to see and note down only a few items.

The 1A ♂ repeatedly did set. One band to dent. Usually just one scratch each time I approached. No Pilo-erection.

2B and 2C usually reacted, at first, by running actively about their cage. With Pilo-erection. (I think that some or all Pilo-erection must be low intensity.)

Since the ♂ 2C did Gn, while sitting right beside the ♀. Each time his head was turned toward her, nose almost pressed into her fur.

Callisaurus, Oct. 14, 1964, III

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Several times the ♂ also uttered short series of BM's, turning to the female each time he did so.

Once the ♂ did Qu-BM-Pumpkin (brief) song, facing me. In extreme Arch, with hands lifted off perch. With Pilo erection. The ♀ uttered a few Squ-Will-CHN Notes, in semi-arch, with Pilo, while the ♂ sang.

Some Arch Postures also must be rather low-intensity.

Callisaurus, I

October 17, 1964
Barro Colorado

Today I took the 1A ♂ out of its "home" cage, which it shares with 1B ♂ and 2A ♀, and put it in more or less isolated cages, by itself.

This morning I put it in the cage in the recording room of the laboratory. Starting 8:35 a.m. The animal remained quite silent for some time (approximately 15 mins.) after being put in the new cage. Then it began to vocalize.

First a lot of Chuck and Chuck-like Notes. A long irregular series, not organized into song or even approximately song-like phrases. Many Chucks loud, high, and sharp, (more or less what I have been considering "typical" Chucks). Also some Chirrup. Quite like those of the Panbarcal animals (although relatively much rarer). Also some monosyllabic notes quite like typical Chucks but much lower in pitch. There seemed to be every possible intermediate between Low-Chucks and High Chucks. It was my impression that the low Chucks were intermediate between typical Chucks and typical Pumping Notes. I.E. Chucks intergrade both with BM and Pumping (and Will's, of course).

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Then the animal uttered some Chuck-Will Notes.

Then it burst into full song: Chuck-Pumping - Resonating - Pumping. Then it "reburied" into more Chuck Notes, with occasional bursts of two or three Chorups, interrupted by two more song phrases. One song was Chuck-Resonating. The other was Chuck-Pumping-Pumping.

All this took place in approximately 15-30 mins. After this, the animal remained quiet as the morning wore on. I.E. it became silent just when other species, such as the Puck, would be uttering "lost calls", e.g. W, W, W & frantically. (And this in spite of the fact that it probably could hear the other tits in the animal house in the distance.) This would suggest, to me, that the Chuck-Chorup-Resonating-Pumping patterns uttered more or less immediately after being isolated were not "lost calls", but rather expressions of invitation. (They probably were not expressions of alarm. See below.)

Much later in the morning, 1A (still in same cage) began to utter lots of soft, high-pitched, very bird-like Squ-Chuck Notes. Each note very brief. Sometimes single. Sometimes in series of two or three notes. I don't see how these could have functioned as "lost calls". They were much too soft (unless they had large ultra-sonic components) And in any case the animal became engaged in a "vocal dispute" or choral song performance with the other tits a few seconds later. First, 1A began to utter low Chucks. Sometimes in series comme ça: - - - No Chorups. Then the other tits in the animal house began to sing. Their first song phrases were "Gobbling", Chuck-Pumping, songs, I think. 1A responded by singing too. Certainly his first songs were Gobbling, Chuck-Pumping phrases. Not perfectly synchronized. 1A always began his Gobbling phrases a few seconds after the other(s). Difference in

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onset quite noticeable (see also below).

After this finishing phase, all or most of the animals began to sing "full" songs with more or less conspicuous Resonating phases. This number of songs became low but not absent. Nearly continuous up near all over the place for some seconds.

This sequence may be further evidence that Gobbling phrases are merely low intensity versions of "full" songs. More or less "introductory" before the animals become fully worked up.

After the period of constant clamor all the individuals gradually calmed down. Uttering fewer song phrases and at longer intervals. Interestingly enough, there was relatively little Gobbling during the decline (see also below). Some individuals probably did not utter any Gobbling at all during the decline. This seems to be typical of the species (if I remember my Barbascial animals correctly.)

1A uttered lots of song phrases of Chuck - Chirrup - Resonating. This seems to be typical of him. He omits terminal Pumping much more frequently than the 2C ♂ (or the animals at Barbascial). Throughout this phase, 1A continued to begin song phrases an appreciable number of seconds after the other individuals. (It looks as if synchronization falls off very rapidly with increasing distance. Why?? Is this a highly specialized adaptation, designed to indicate the distance between singing animals ??? I think no!)

I got the impression (possibly or probably quite misleading) that 1A sometimes stopped his song phrases at the end of the Resonating phase, simply in order to listen carefully to what the other animals were saying.

The ending of Chuck - Chirrup - Resonating phrases was not, how

ever, very abrupt. Not obviously "cut off" The intervals between the last few Resonating Notes were longer than the intervals between the first. Possibly the last notes also were somewhat lower than the first. But certainly not noticeably abbreviated or less syllabic than the first.

Then 1A uttered one Chuck-Chirrup phrase. Then he resumed uttering lots of single Chuck Notes at irregular intervals. Then he began to utter a variety of vocal patterns, both single Chuck Notes and complex phrases, at very irregular intervals. Somehow this gave the impression that his motivation was "oscillating" wildly (as the incident drew to its close). One of the more complex phrases was a Chuck-Chirrup-Resonating-Pumping song phrase. Another was Chuck-Resonating, as before. But he also uttered some much more peculiar patterns. One short burst of Pumping alone! One Pumping-Resonating phrase. Also one Pumping-Resonating-Pumping-Chuck Note phrase. (In both these latter, it sounded as if the animal had started to utter Pumping alone, and then had been "swept up" into continuing with fuller song.) In any case, it is obvious that the sequential arrangement of song components is not completely fixed.

At this point I went to lunch. After lunch we put 1A by himself in a cage outside the lab, where he still could not see the other tites in the animal house.

He uttered lots of Squ-Chuck Notes and Squeezes when a ♂ Red Spider monkey came down to the ground to try and steal food from the cage. Obviously alarm.

Some time later, he did lots of extreme, silent, Tail-Carling when an adult male Coati approached the cage. Less alarm than the Squ-Chuck - Squeeze patterns?

Then he remained quiet for several hours.

Then, about 3:45 p.m., he became vocal again. Apparently as a reaction to BM's from the animal house. (I don't know what was going on in the animal house. But the BM's continued pretty steadily for three quarters of an hour off and on. Apparently not copulatory. Not in rapid pumping rhythm.)

First, IA uttered lots of short, single, Trills. Then he uttered lots of Witt-chuck Notes and some, fairly slow and apparently low intensity, BM's. (The first burst of BM began just after the other animals began BM again after a pause. BM also seems to be somewhat contagious.) Then a lot more Trills (all soft and short), Witt-chuck's, and BM. Also quite a lot of Squeezes. I.E. IA seemed to be somewhat alarmed. Why? In any case, the occurrence of Squeezes in these circumstances would suggest (or confirm) that Trills contain a relatively strong alarm component. Presumably also Witt-chuck's and BM.

Then IA utters BM in response to long song of Chuck Notes from the animal house.

Stop observations 4:30 p.m.

Is the fact that this species lacks a "real" lost call correlated with the fact that it occurs in dense and crowded populations ??? (Certainly the population of tities at Barbascal was denser, on the average, than any comparable population of Night Monkeys or Pichie's with which I am familiar.)

Callicebus, I

October 19, 1964

Barro Colorado

Note. I think I forgot to mention, yesterday, that single "ala

run" Squeezes by 1A often were followed, immediately, by single Moans.

Very reminiscent of the Moans after Squeeze - grunts by Night Howlers!

Today, we tried putting the 2A ♀ in a cage by herself, outside the lab, in the same way as 1A yesterday. Fought in the morning. Then again in the afternoon. The Magna was not working properly, as I was somewhat distracted, but I did notice the following.

In the morning, she uttered lots of long, loud Wills, Trills, and Wilt Trill s during the first half hour after being isolated. In quite regular rhythm

Some notes ending in "Ulk" components. Associated with lots of "alarm" Squeezes at first.

These notes declined in frequency quite rapidly after the first half hour. And when 2A was isolated again in the afternoon, she uttered only a few Trills.

This would suggest that her notes when isolated were hostile.

Callicebus, I

October 30, 1964
Barro Colorado

Manon came out to the island today. We tried various simple experiments.

When approached by us, 1A ♂ repeatedly squeezed his chest (gland). Silent. (This is already written up in the manuscript).

Also when approached by us, the 2C ♂ grabbed the 2B ♀, with one hand, in order to pull her closer to him, in order that he could do "redirected" Gn into her face.

In the afternoon, we put all the animals together in a new, big

Callicebus, Oct. 30, 1964, II.

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new inside cage. I went by after a few minutes. The 2B-2C group against the 1A-2A-1E group. I only noticed a few displays during the encounter. It all happened so fast!

The 2B and 2A ♀'s snuffed one another. Then burst into Rearing (no prelude?), with Arch and Pilo-erection. Then the 1A ♂ and the 2C ♂ snuffed one another. Followed by Rearing with Arch, Pilo-erection, and Tail-lashing. At the same time, the juvenile 1B ♂ performed silent Chest-rubbing or (more probably) Chest-squeezing.

A few seconds later, the 2A ♀ began Chest-rubbing or Chest-squeezing! Then did "redirected" song with 1A ♂. Then she did more Chest-squeezing (squeezing movements definite) while sitting beside him.

Then there was a long burst of high intensity Singing by all animals. All with Arch, Pilo-erection and Tail-lashing. One animal stood in Arch with Pilo-erection and with tail partly raised, as in locomotion attention movement.

Then the two groups reparated. Members of each group sat clumped side by side, with tails inter-twined. Then the real fighting began. And then we reparated the animals, into the same groups as before.

Callicebus, I

January 8, 1965
Barro Colorado

The 2A ♀ gave birth to a single infant some time in late November or early December, while I was away. The infant lived only a few days. Probably it died because the ♂(s) did not take care of it.

The 2B ♀ gave birth to a single infant on December 27,

Callicebus, Jan 2, 1964, II

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(again while I was away). This infant seems to be flourishing. I watched it today, but only very briefly and cautiously, as its parents are shy.

It suckles from the mother, of course. Apparently, the mother carries it only immediately before, during, and after suckling. Infant clinging to her stomach and abdomen.

The father (2C ♂) carries the infant the rest of the time. Infant clinging more or less transversely on upper back (or even the neck) of the father.

I have not seen the infant transferred between parents.

According to my observations (and Boca's) the infant has been quite silent since birth.

Callicebus, I

January 18, 1964
Barro Colorado

I looked at the infant, briefly, this afternoon. Still being carried by the father most of the time. Still clinging, transversely across the upper back or neck. Now has its eyes open part of the time, looking around alertly. Getting more hair.

The 1B ♂ seems full grown now. At least as large as the 1A ♂. But possibly does not have ruff fully developed yet.

Callicebus, I

February 6, 1965
Barro Colorado

According to Boca, the infant was first seen to leave its parents, and walk by itself on February 2nd. The Rands have seen it moving independently several times since then. But apparently it never goes very far from the parents.

I watched this family off and on for a couple of hours this morning. During the whole period, the infant was carried by its father. Bright eyed and alert, but quite silent. Riding high on its father's back, as usual. Grasping its father around his neck.

After I stopped observation, Boca saw the infant jumping back and forth between its parents.

A couple of days ago, Stanley saw the infant slip off a branch. The father pulled it up.

Callicebus, I

February 20, 1965
Barro Colorado

Baby still alive. Apparently flourishing. Being carried by father most of the time. But also goes by itself occasionally. According to Rugg, it is not yet feeding by itself.

When I arrived this morning, I got close to the cage before the animals noticed me. At this time, the baby was climbing independently on the roof of the cage. Father on branch nearby. When the father saw me, he bounded away, leaving the baby hanging isolated on roof. The father threatened me in usual way. The baby didn't seem

Callithrix, Feb 20, 1955

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to mind being left alone. Apparently quite happy and silent. After some minutes, the father came back to the baby. Grabbed it roughly with both hands, and jerked it toward him. The baby let go of the roof and allowed itself to be pulled without resistance. Still silent. Then quickly clambered back on to father.

The baby still rides around on the father's neck.

8:10 a.m. ♂ still carrying baby. Obviously nervous about my presence (15 ft away). Apparently uttering occasional "Awww" (I am too far away to see if these are associated with anything like "ju.") Then ♂ performs what looks like RB! Slowly and repeatedly - rubbing anal region back and forth along branch. (The movements are perfectly "straight forward" - no sign of any lateral "twist".) Apparently silent.

I think that this may well be territory-marking. The reason I think so is that the ♂ behaved in exactly the same way, in similar circumstances, the last time I was here!!!!

12 Noon. Have been watching the baby off and on throughout the morning. It is really quite active, when neither it nor its parents are alarmed. Constantly getting off its father (under its own steam) and apparently "playing". Moving around quite actively. Apparently "investigating". Constantly "sniffing" at things, such as branches, and (even more frequently) chewing or gnawing on things. Is feeding learned in this species? But it never goes more than a few inches (1 foot at most) from its father. Apparently quite silent throughout.

The baby also frequently jumps on and over its father. And several times it has climbed down its father's tail (which was hanging free at the time). Once it climbed on to its mother's back.

Callithrix, Oct. 20, 1965, III,

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But stayed only a couple of minutes. Made no attempt to suckle.

At least once the baby was groomed by its father. And it also apparently groomed its father, and/or made intention movements of long so, several times (this behavior is a little difficult to recognize, as the baby often keeps one hand on its father's back or flank when it is off - apparently keeping in touch - even when it is not at all interested in grooming)

The baby usually leaps on to its father whenever the latter starts to move away. And once the baby ran to, and climbed up on to, its father when the latter uttered a series of Moans.

When the father, carrying the baby, went down to the floor of the cage to take food from a food dish, and then sat there eating the food, the baby showed absolutely no interest in either the food or the eating process.

