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POLICY STATEMENT
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The primary purpose of the Newsletter is to provide information on maintenance and procurement of non-human primates for laboratory studies. A secondary purpose is dissemination of general information about the world of primate research. Examples of the kind of practical information that would be useful are as follows: new drugs; novel aspects of cage design; new products; evaluations of various products; references to or short summaries of articles of general interest; experiences in connection with the procurement of monkeys. The Newsletter will also publish offers to exchange monkeys (for example, older monkeys for young or infant monkeys) and requests for monkeys with special characteristics (for example, good breeders or pregnant females). If someone has a special problem, he might want to request help through the Newsletter.

As a rule, only research articles or summaries which have some practical implications or which provide general information likely to be of interest to investigators in a variety of areas of primate research will be accepted for inclusion in the Newsletter. Descriptions of current research projects will also be welcome. It should be kept in mind that the Newsletter is not a formal publication and that it is not likely to be obtainable in libraries. Therefore, citation of Newsletter notes or articles in publications is not recommended.

Information for the Newsletter will be welcome from anyone in any research area who is using monkeys. The Newsletter will appear quarterly and will continue so long as people are interested enough to contribute items of information. The mailing list is open to anyone expressing an interest. There is no subscription charge. However, only new issues and back issues for the current year will be mailed to new subscribers free of charge. Volume 1 of the Newsletter may be purchased for $1.00. (Please make checks payable to Brown University.)

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EDITORS' NOTES

In the Editors' Notes in the January, 1963, issue of the Newsletter, we forcefully concluded that the scientific name of the squirrel monkey is Saimiri sciurea. Somewhat red-faced, we find we must retract our conclusion. We became somewhat uneasy after two atlases of the squirrel monkey's brain crossed our desk with "sciureus" etched into both covers. We also received a letter from David H. Johnson, the Curator of the Division of Mammals of the U. S. National Museum, which reads in part as follows: "According to the rules of nomenclature...[Saimiri sciurea]...is incorrect. The specific name sciureus is a Latin adjective meaning squirrel-like, based on sciurus, the Latin noun for squirrel. Being an adjective the name is modified in form to agree with the gender of the genus with which it is associated. As first used by Linnaeus in the 10th edition of the Systema Naturae (1758) it was a species of the feminine genus Simia, hence had the form Simia sciurea. As used currently under the masculine genus Saimiri, it takes the form Saimiri sciureus." We had understood that the rule of priority takes precedence over rules of grammar. Since our original information on rules was obtained secondhand we decided to have a personal look at them. The first complete revision of the rules since 1905 can be found in a slim book entitled: International Code of Zoological Nomenclature adopted by the XV International Congress of Zoology (London: Int. Trust for Zool. Nomenclature, 1961). Among the rules, we found the following: "In names of the species-group, the ending must be changed, if necessary, to conform with the gender of the generic name with which the species-group name is at any time combined" (Article 34b, p. 37). According to the rules of zoological nomenclature, then, the scientific name of the squirrel monkey is Saimiri sciureus.

We recently spent a very pleasant day inspecting the ape and monkey display and research facilities at the San Diego Zoo. This zoo is clearly one of the finest in the world. Our tour was expertly guided by Clyde Hill, Assistant Curator of Mammals, and Duane Rumbaugh, a San Diego State College psychologist who is conducting comparative behavior studies on the Zoo's monkeys and apes. We were particularly impressed with the variety of monkey species, ranging from marmosets to macaques, being maintained solely on commercial monkey chow. The Zoo's experience is that almost all monkeys--the exceptions include those with sacculated stomachs, such as the proboscis--can be successfully maintained on commercial chow without the addition of vitamins, fruits, or other special supplements. The most interesting of the displays were the new Great Ape Grottos in which the gorillas are located. These animals can be seen practically at eye level from a distance of 15 feet, with only a moat separating them from the public. During the course of the day, one of the local newspapers photographed us at the Children's Zoo playing with Itu, a young orangutan, and Yula, a young gorilla. We looked a bit worried in the first few photographs, but seemed to have gained confidence with the passage of time.

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LABORATORY MAINTENANCE OF THE SQUIRREL MONKEY*

D. E. Furry, R. T. Lowery, and D. E. Beischer

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Establishment of a small squirrel monkey colony some five years ago entailed many problems involving the care and feeding of these primates. Initial high mortality rate caused considerable concern but was successfully reduced by careful management and adherence to a strict schedule.

Young animals of both sexes, weighing 300 to 400 grams, are selected by the animal laboratory staff from the distributor's farm. When the monkeys arrive at the laboratory, they are placed in cages and kept in an isolation room for a period of two weeks. After the first three days in this room the animals are weighed, given an intrapalpebral injection of tuberculin serum and a subcutaneous injection of 0.2 cc of Promintic (Imperial Chemical Industries, Ltd.) for antihelminthic therapy. This is followed five days later by a second injection of Promintic of equal strength. Stool specimens are examined on the fourteenth day for ova and parasites. Animals with negative reactions to stool and tuberculosis tests are admitted to the main colony quarters after they have been coded by a skin tattoo.

The same type of cage is used in both the isolation room and the main colony. Each is constructed of 3/4-in. woven stainless steel and measures 22 by 22 by 16 in. Three monkeys are placed in each cage which is supplied with constantly running drinking water. The daily diet for all monkeys in the laboratory consists of 6 to 8 Purina monkey pellets, one-eighth of a fresh orange, and 20 to 24 raw peanuts per animal. The room temperature is kept at 80°F with a relative humidity of 50 to 55%. All animals are given a minimum exposure of 30 minutes of ultraviolet light per day from a bank of commercial type sun lamps. With the present dietary program there is a notable absence of any nutritional deficiencies and no observation of "cage paralysis."

In the past 24 months, no deaths have been recorded in the main animal colony. Five animals have died during the isolation period. The average size of the colony at any given time is 150 animals.

Since the squirrel monkey satisfactorily adapts to confinement, it is rapidly becoming a preferred laboratory animal for primate

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*Opinions or conclusions contained in this report are those of the authors and do not necessarily reflect the views or endorsement of the Navy Department.

research. While much of the initial work of this laboratory was concerned with the use of squirrel monkeys as biological occupants in the early ballistic space flights (Graybiel et al., 1959), these monkeys are currently utilized in various behavioral (Meek et al., 1961, 1962) and environmental (Beischer, in preparation) studies. Data are presently being gathered for a report on some of the more common biometric norms of the squirrel monkey. Included in this report, which should be available soon, will be hematological, metabolic, biochemical, respiratory, cardiovascular, and other data.

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Meek, J. C., et al. Observations of canal sickness and adaptation in chimpanzees and squirrel monkeys in a Slow Rotation Room. BuMed Project MR005.13-6001 Subtask 1, Report No. 59. Pensacola, Fla.: Naval School of Aviation Medicine, 1961, and Aerospace Med., 1962, 33, 571-578.

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SQUIRREL MONKEY MAINTENANCE AT SAN DIEGO STATE COLLEGE

Duane M. Rumbaugh

In a recent issue of the Laboratory Primate Newsletter (Vol. 2, No. 1, 1963) considerable attention was given to the squirrel monkey (Saimiri sciureus) as a subject for laboratory study. I wish to report some of our experiences in maintaining the squirrel monkey, for many of our experiences are at variance with reports of others.

Our experience with this monkey spans a 5-year period with a colony which now numbers 48. All told we have had about 60 specimens for, on occasion, we have exchanged animals with the San Diego Zoo.

Caging

We have two caging arrangements. Our outdoor caging consists of large stock cages which are 7 ft. high and 6 ft. wide with lengths ranging from 3 ft. to 15 ft. Animals have been left in these cages throughout the entire year. Unheated sleeping boxes are available at all times; however, we have observed newly received specimens sleeping outside at night despite light rain and 60°F temperatures. Temperatures range from 30° to 100° in these quarters depending upon season, but tem-

peratures below 50° are atypical.

Our indoor caging consists primarily of five batteries of cages. Each battery contains two cages. Each cage is 18 in. wide, 28 in. high, and 28 in. long. Construction is of 1 in. square welded wire for the top, bottom and sides, with ends of stainless steel. Transfer cages and/or sleeping boxes can be readily attached to either end of a cage. For use out-of-doors on a year-round basis, each sleeping box can be equipped with a 15-w. lamp for heat. (Incidentally, the animals will perch on the lighted lamps with no apparent discomfort.) Each cage has two perches of wooden dowels placed 18 in. above the floor. Our current price for a battery of cages, including frame and drop pans, from La Mesa Sheet Metal Works, 8135 Center Street, La Mesa, California, is $250.00.

We rarely cage animals alone. As a rule, we have two to a cage, but we are having no apparent trouble in keeping as many as four adults in a cage of the above dimensions. Squirrel monkeys, regardless of sex, can usually be regrouped without danger of fights occurring if an unfamiliar cage is used.

Diet

Our squirrel monkeys thrive for indefinite periods on nothing other than Purina Monkey Chow. They prefer the chow soaked in milk, but this is not necessary. If water bowls are available, some animals will soak the food prior to eating. When our monkeys are not in experiments, we supplement their diet with occasional fruits and vegetables, but this is not necessary. During periods of experimental study, our present procedure is to maintain test animals on a diet of water-soaked monkey biscuits available for only 1-1/2 hr. after each test session. Fresh water is given twice daily in glazed earthenware bowls.

We wish to emphasize that squirrel monkeys thrive better on a diet that consists solely of Purina Monkey Chow than they do on one that consists solely of fruit and vegetables.

Reproduction

We have had two births, both males, in our colony--one in June of 1961 and one in November of 1962. In both instances, a female was caged with a single male. In the first instance, conception occurred while both animals were on food privation schedules and were serving in learning-set experiments. Their diet consisted of milk-soaked Purina Monkey Chow. In the second instance, we intentionally paired another female and male for the purpose of reproduction. The monkeys were paired in May and birth occurred the following November. Diet was dry Purina Monkey Chow and water. Babies in both instances were healthy and vigorous; however, the first one died in January of 1963 while serving

in an experiment. The cause of death was undetermined; the animal worked well one day and was dead the next. The second born was weaned at 3 months (weight 290 g.) and maintained on milk-soaked Purina Monkey Chow supplemented with finely chopped fruits and vegetables.

Mortality

We have lost only three animals during the last 5 years. All three died within 6 weeks of being moved from outdoor caging into our new Life Science Building. Only in one instance did autopsy reveal probable cause of death--an impacted large intestine. Lungs were clear in all three instances. No extraordinary parasitic infestation was observed.

Conclusions

In our experience we have found the squirrel monkey relatively easy to maintain under both out-of-door and indoor conditions. Admittedly, much of our favorable experience might reflect the climate of sunny Southern California. On the other hand, it is difficult to believe that climate can compensate for our relatively simple maintenance routine. In our opinion, diet (Purina Monkey Chow), fresh water, and introduction of only healthy animals into the colony are far more important than specific room temperatures and humidity control. Caging at least two to a cage equipped with wooden dowel perches and large enough to stimulate at least reasonable movement are also believed to be extremely important for our successful maintenance of the squirrel monkey.

* * *

COTTON-TOPPED PINCHÉ STUDIED

Dr. Hampton and I have completed two field trips to Colombia, South America, to study the cotton-topped pinché, Oedipomidas oedipus. The first trip, February 2-14, 1962, was preliminary in nature. From January 13-February 16, 1963, extensive field work was carried out in the vicinity of San Juan Nepomuceno, Departmento Bolivar, Colombia, South America.

The major purpose of these studies was to obtain information concerning diet, environment, and breeding which might be useful in maintaining a laboratory colony of these animals. We currently have a colony of approximately 90 animals. Blood groups, radiation response, and reproductive cycles are being studied in the laboratory.

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CURTAINS FOR THE ORANG-OUTANG?[1]

Tom Harrisson[2]

Orang-outangs are entirely different from chimpanzees and gorillas: they do not have the 'showing-offness' and 'dress-up-ability' of chimpanzees, and they do not have the surliness and grimness of gorillas. The orang is in my opinion something very close to man. Orang-outang actually means 'man of the jungle' in Malay, and the only places where these animals occur are in a small piece of Sumatra and, unfortunately, now only a few places in the great island of Borneo.

We have evidence that in the past orang-outangs were much more numerous than they are now. We have found them in the Stone Age remains of the prehistoric cave sites being excavated in Sarawak, where they are quite common down to 40,000 B.C., and were eaten by human beings at that time. We even suspect, in fact, that Stone Age men may have kept orang-outangs as pets.

Nevertheless, though man was eating and keeping and interfering with orangs a very long time ago, there is plenty of evidence that they were numerous all over Borneo and Sumatra until fairly recent times, and when the great naturalist, Alfred Russell Wallace, co-founder of Darwinism, went to Sarawak he saw orangs all over the place, and in the nature of scientists in those days, instead of observing them he slaughtered more than fifteen himself.

There were quantities of orangs until well into this century. Then three things started happening. First, the Dyak peoples of Borneo began to increase greatly; especially in the last twenty years, with new medical services and so on, there has been a huge population explosion eating into the jungle and coming into direct contact with the places where the orang-outangs lived, where for long centuries--even millions of years--the orang has been the sole arbitrator and king: because no other wild animals, nothing else except man, will take on an orang-outang. In particular, conflict arose between the Dyaks and the orangs because both of them happened to like a huge, juicy, smelly, sticky, spiky fruit called durion. Until man came along, orangs thought all the durions belonged to them, and conflict has arisen because the Dyaks have wanted to collect and preserve the durions, many of which they themselves planted in durion orchards in more recent times. In this century many Dyaks have shotguns or some sort of weapon, which has enabled them to enforce their opinion against the orang. Before that they had only blowpipes.

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[1] From the BBC's The Listener, April 25, 1963.

[2] Mr. Harrisson is Curator of the National Museum, Sarawak. His many publications include 'World Within: a Borneo story'.

Orangs are amiable, easy-going creatures; all they want to do is wander about in the jungle; but they rather want to have it to themselves. They will only attack a human being under extreme provocation, if they are wounded. Once the Dyaks and other people got guns it rather shifted the emphasis, and the Dyaks could start taking the line of aggression instead of 'live and let live'.

The second big thing that happened was the forestry and exploitation of timber of the past few decades. In North Borneo, which is one of the four territories on the island, timber is now the largest source of export revenue, and it is also important in Sarawak. Inevitably modern scientific forestry has pushed into the great jungle areas and involved the selective felling of the best trees. The whole area then becomes uninhabitable to the orangs and they move away further inland. Generally they move in parties of between four and seven or eight; they need a big space to feed and they have enormous appetites, so that their feeding becomes more and more of a problem as they get pushed back both by the expansion of man and by the expansion of forestry. Instead of orangs all over Borneo there is now a small pocket of them in the south-west of Sarawak, none at all in the north of Sarawak, none in the state of Brunei, and probably a fairly good number over in the north-east side of North Borneo and again down on the Indonesian side in Kalamantab: but these are all isolated, cut off from each other, and in many cases, inside the area where the orangs are (and this is really much more serious), they are fragmented into small parties that have been cut off from each other by human and forestry expansions. In many cases there are only one or two orangs moving about together, which is probably not enough for reproduction of the general social life, let alone the happiness of the orang in the natural state.

But in the past few years a third factor has come in: the great expansion of zoos in the world. People who are interested in animals want to see them; and zoos cater very properly for that need. Unfortunately, there are all sorts of zoos and they are increasing rapidly, especially in countries which perhaps have lower standards of zoo keeping and zoo behavior than some of those in the west. My wife has recently carried out a world census of the orangs in zoos and she estimates now that the annual demand for wild orangs for the world zoo market is about 300 a year. And we think now that there are probably not more than 3,000 orangs left in the whole of Borneo and probably considerably fewer left in Sumatra.

But the picture is even worse than that, because nobody without enormous courage and organization is going to set about trying to catch an adult orang-outang in the ordinary way. The usual thing is to catch a baby one. That is not difficult to do, especially if you are a Dyak, a native of the interior in a place where there are orangs about; but the only way you can do it is by killing the mother orang, who will violently resist your trying to catch the baby, so that nowadays you shoot the mother. For every one baby orang taken now, one female orang is going to be shot. Unfortunately, also, baby orangs, like baby human beings, are very delicate if they are suddenly wrenched away from their mother,

especially if they are wrenched away by people who have not been trained in looking after them, and the average Dyak naturally has not been so trained. A baby orang is dependent on its mother for as much as four or five years and does not become adult for about ten years. So probably for every baby who is brought down alive to the coast or to a port, at least one other dies. One live orang gets through to a port like Singapore or Hong Kong, and it has cost the lives of three others.

Further, orangs are difficult to keep alive for long periods in zoos, and our world census of zoos shows that the average expectation of life for an orang, even when it has got to a zoo, is only three years, whereas the information we have about wild orangs is that they probably live at least thirty, and often as long as forty-five years; and they have, in special circumstances, remained alive as long as that in captivity as well, in places like Edinburgh and the London Zoo and Frankfurt. Last of all, it is extremely difficult to breed the orang in zoos and few have been bred in captivity. There is one in the London Zoo now, but it is the first they have ever had.

What is going to stop it being 'curtains for the orang', with the 300 demand which is involving a turnover of about 1,000 orangs a year in a population which is certainly far under 10,000 and probably under 5,000 alive in the world? One solution, put forward especially by zoo people, is to move them all into zoos and breed them there. That is a pitiful solution for one of the finest animals of the jungle, the finest animals before man came on the scene; and the real solution must be to have orangs in reserves in Borneo and Sumatra. But that is an extremely difficult thing to do. With the help of a grant from the Wild Life Fund we in Sarawak are now trying to release baby orangs and retrain them back into the jungle in the Baffa National Park. This raises tremendous problems: we find that as well as our retraining the orangs, we spend some of our time up the trees being retrained by them--but it is around that sort of solution that we have to work in the future. --From a talk in the Home Service

Books

Comparative pathology in monkeys. Lapin, B. A., & Yakovleva, L. A. (Transl. from the Russian by the U. S. Joint Publication Research Service) Springfield, Ill.: Thomas, 1963.

This book describes the naturally occurring diseases of monkeys observed in the primate colony at the Institute of Experimental Pathology and Therapy of the U.S.S.R. Academy for Medical Sciences, which is located at Sukhumi. The colony consists of about 1000 animals, mostly rhesus monkeys and hamadryas baboons.

The mountain gorilla. Schaller, G. B. Chicago: Univer. Chicago Press, 1962.

Disease

Trypanosomes of the African lemurs, Perodicticus potto ibeanus and Galago demidovi thomasi. J. Protozool., 1963, 10, 133.

Primate diseases infectious to man. Appleby, E. C., Graham-Jones, O., & Keeble, S. A. (Royal Veterinary College, London) Vet. Rec., 1963, 75, 81-85.

Common diseases of monkeys. Soave, O. A. (Stanford U., School of Medicine, Palo Alto, California) J. Amer. Vet. Med. Assoc., 1963, 142, 284-288.

Physiology

Thyroid gland function in the infant macaque monkey (Macaca mulatta). Pickering, D. E., Settergren, K. F., and Kontaxis, N. E. (Oregon Regional Primate Research Center, Beaverton, Oregon) Amer. J. Dis. Child., 1963, 105, 77-80.

The composition of the thyroid gland with respect to total iodine, monoiodotyrosine (MIT), diiodotyrosine (DIT), and thyroxine (T_4) as well as I^{131} uptake and its distribution among the components was quantitatively determined in infant monkeys killed over a period of 75 days beginning shortly after birth.

Blood groups in man and lower primates: A review. Wiener, A. S. Transfusion, 1963, 3, 173.

Cholinesterases in the tongue of the potto (Perodicticus potto). Hodosh, M., & Montagna, W. Anat. Rec., 1963, 146, 7.

Drugs

Neuroleptanalgesia in monkeys. Marsboom, R., Mortelmans, J., & Vercruysse, J. (Research Laboratorium Dr. C. Janssen, Beerse, Belgium) Vet. Rec., 1963, 75, 132-133.

Administration of a neuroleptic and an analgesic drug in

combination was found to be a safe, effective means of producing general anesthesia in various species of monkeys.

General

The relatives of man: Modern studies of the relation of the evolution of nonhuman primates to human evolution. Buettner-Janusch, J. (Consulting Ed.) Ann. N. Y. Acad. Sc., 1962, 102, 181-514.

Series of papers presented at a conference held by the N. Y. Academy of Sciences on April 27 and 28, 1962 (see LPN, 1: No. 2.)

The establishment of a marmoset breeding colony and its four pregnancies. Benirschke, K., & Richart, R. (Dartmouth Medical School, Hanover, New Hampshire, U. S. A.) Laboratory Animal Care, 1963, 13, 70.

The experience with a colony of 27 marmosets and three callicebus monkeys is summarized. Four pregnancies were obtained in three animals in a period of approximately two years.

* * *

NEWSPAPER CLIPPINGS

MARMOSETS AND MOLARS

A creature that looks like a startled miniature lion with a thick golden mane is helping a Houston dentist learn more about tooth and gum diseases.

The animal, one of 150 marmosets in a Houston research colony, is among man's closest relatives. He and his brothers will also be members of what will probably be the world's first germ-free primate colony.

Scientists have long realized the importance of working with primates, since they are much more closely related to man than are many more common experimental animals. But most primates are too large to raise in colonies without considerable effort and expense. Still the University of Texas Dental Branch researcher had to use an animal with dental problems similar to those of humans. He turned to the smallest primate--the marmoset.

There are four species of marmosets in the colony, which is quartered in a white shingle house on Fannin Street.

Besides the lion-like species, there are two species which resemble African medicine men. One has puffs of white hair sticking straight out over the ears, and another has the puffs standing high on top of the head. There is a fourth species which looks somewhat more like an ordinary monkey.

The dentist estimates that the animals weigh about a pound apiece. They are no larger than good-sized rats. They are kept in what appear to be large bird cages, and their monkey "cheeps" are so high that they sound like bird "chirps."

When the colony was first established in Houston about two years ago, two major problems had to be overcome: First, some kind of controllable diet had to be found for the marmosets, which normally dine on such delicacies as bugs, worms, baby mice, chick embryos and raw meat. A special high-protein bread was developed for them. Commercial bakers were asked to prepare the bread for the colony, but they said they could not bake it in an ordinary oven. Now the dental branch uses an autoclave (an apparatus for cooking or sterilizing with superheated steam under pressure) to prepare about 80 cans of the bread for the marmosets every week.

Another problem was a parasitic worm which often attacked and killed the animals. Dr. Josepha Artecona, the veterinarian who cares for the dental branch animals, found a drug that cures the animals of the parasitic infection.

Now that the colony is healthy and thriving, the goal is to make it germ free. Some equipment to do this is already on order. The colony probably will not be complete for several years, however, since much has still to be learned about marmoset behavior in an ordinary environment before scientists can raise the animals germ-free.

The first step to train personnel will be taken this month when Mrs. Johnnie Goodrich, a technician who has been helping with the marmosets, will go to a symposium at Ohio State University to learn how to raise germ-free animals.

When the germ-free environment is established, the animals will live in a tank supplied with air that has been filtered to remove bacteria and other organisms. Food or objects which must be put into the tank will first be put into an autoclave on one end of the tank. The autoclave will be closed from the outside. Nothing in the tank will be touched directly by humans. Everything will be handled with long gloves built into the tank at intervals. Arms slipped into the gloves can reach anywhere in the tank.

Though only preliminary work has been done with the marmosets so far, the dentist has already gained some important information: Cancer can be induced in the marmosets by chemical agents to which African monkeys have always been resistant.

The possibilities for important scientific work with the marmosets are as great as the need to bridge the experimental gap between mice and men.

The Houston Post, Houston, Texas, July 7, 1963

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